Reducing the First Cesarean in Real Life

Alison G. Cahill, M.D., M.S.C.I
Professor
Department of Women’s Health
Maternal Fetal Medicine
The University of Texas at Austin Dell Medical School

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- No financial
- Vice-Chair of Committee for OB Practice for ACOG,
  Editor for Gabbe, Oral board examiner for ABOG

Cesarean Prevention

OBSTETRIC CARE
CONSSENSUS

Safe Prevention of the Primary Cesarean Delivery

OCC #1 Obstet & Gynecol 2014
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Why do we do them?

- Improved outcomes
  - Mom
  - Baby

Risks

- Infection
- Bleeding
- Wound complications
- Thromboembolism
- Abnormal placentation
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Burden of Cesarean-Related Postoperative Infectious Morbidity

- Most common surgical procedure in US – 1.3 million/year
- Postcesarean infectious morbidity:
  - Endometritis, sepsis, intraabdominal abscess, maternal fever, wound complications
- Most common & costly complication – affecting 130,000


Patient Burden
- Lead to prolonged hospitalization
- Impair bonding and breast feeding

Health Care Costs
- $2800-$3500 per case
- $390 million annually

Olsen et al., Infect Control Hosp Epidemiol; 2008; 29: 477-484
Scifres et al., Am J Obstet Gynecol. 2011 Sep;205(3):267
Olsen et al., Infect Control Hosp Epidemiol 2010; 31:276-282

Why prevent them?

- Some
  - Unnecessary ones

Who’s cesarean is necessary?
Cesarean Prevention

- Obstetric, other: 4%
- Maternal-fetal: 5%
- Elective: 3%
- Macrosomia: 4%
- Preeclampsia: 3%
- Multiple gestation: 7%
- Arrest of labor: 16%
- Arrest of labor, other: 15%
- Macrosomia: 4%
- Preeclampsia: 3%
- Multiple gestation: 7%
- Arrest of labor: 16%

Paradigm Shift

• Changing our behavior

Labor Management
Labor Management

- Do you counsel all nulliparous 39 week IOL?
- ARRIVE
  - Reduced likelihood of cesarean
  - Reduced risk of hypertensive disease


Labor Management

- How do you perform inductions?
  - Agent
  - Dosing
  - Combined methods
    Needs more work...

Schoen CN et al. Obstet Gynecol 2017
Connolly KA et al. AJP 2017
Gallagher LT et al. AJP 2019
Carbone JF et al. Obstet Gynecol 2013

Labor Management

- When do you admit women in spontaneous labor?
  - Admission in latent labor (5cm or less) in multiplets – associate with increase risk of cesarean
Labor Management
• Do you actively manage labor?
  – Early evidence that it shortens labor and reduces fever, but not cesarean
• Meta-analysis: ‘Early’ oxytocin use associated with increase in SVD
  – NNT is 20

Frigoletto FD et al, NEJM, 1995
Wei SQ et al, Obstet Gynecol 2009

Labor Management
• How do you use AROM?
  – Early amniotomy
    • Shortens labor
    • Reduces cesarean
  – Nullips and multips

Wei S et al, Cochrane 2012
Gagnon-Gervais K, JMFNM, 2012
Macones GA et al, AJOG, 2012

Labor Management
• What labor curve standard do you use?
Old school

- Friedman, 1955
- Prospective cohort study
- 622 nulliparous women
  - 500 complete data


'Ideal labor': 200 women


<table>
<thead>
<tr>
<th></th>
<th>Latent</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>8.6 hrs</td>
<td>3.0 cm/hr</td>
</tr>
<tr>
<td>95%ile</td>
<td>20.6 hrs</td>
<td>1.2 cm/hr</td>
</tr>
</tbody>
</table>
Was Friedman Wrong?

Sort of…

Analytic Problem

- G1P0, 39 5/7 weeks
- Presents in labor
  - SROM
  - Contractions q 2min
- Cervical exam: 3/100/0

Nullip: Labor Progress
Nullip: Labor Progress

Zhang: Labor Curves
- Consortium for Safe Labor, MFMU
- 19-center retrospective cohort study
- 64,415 singleton, vertex, spontaneous labor, vaginal delivery; 'normal outcome'
- Used interval-censored time-dependent analyses to estimate the labor curves; define normal

Shape of the Spontaneous Curve
- Transition to the active phase
- Progression to complete
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**Active Phase (4cm – 10cm)**

<table>
<thead>
<tr>
<th></th>
<th>Friedman</th>
<th>Zhang</th>
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<tbody>
<tr>
<td><strong>Nullip</strong></td>
<td>Median</td>
<td>Slowest 5%</td>
</tr>
<tr>
<td></td>
<td>3.0 cm/hour</td>
<td>1.2 cm/hour</td>
</tr>
<tr>
<td></td>
<td>1.9 cm/hour</td>
<td>0.4 cm/hour</td>
</tr>
</tbody>
</table>

Zhang et al. Obstet & Gynecol, 2010

Zhang: Conclusions

- At ≤ 6cm
  - Too many 1st stage cesareans
  - Wider width around estimates of ‘normal’
- Faster progress at end
  - No deceleration phase
- Even worse with induced labors
  - High 1st stage cesarean rate

Contemporary Cesarean Patterns

- Consortium for Safe Labor
- 19 hospitals
- 2002-2008
- 228,668 women
When do 1st stage arrest cesareans?

<table>
<thead>
<tr>
<th>cm</th>
<th>Spontaneous</th>
<th>Induced</th>
<th>Spontaneous</th>
<th>Induced</th>
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<tbody>
<tr>
<td>0</td>
<td>13.0 (0.3)</td>
<td>14.5 (4)</td>
<td>0.0 (0.1)</td>
<td>16.0 (2)</td>
</tr>
<tr>
<td>1</td>
<td>10.6 (2)</td>
<td>9.6 (10)</td>
<td>-0.1</td>
<td>15.7 (4)</td>
</tr>
<tr>
<td>2</td>
<td>5.8 (5)</td>
<td>5.6 (15)</td>
<td>-1</td>
<td>6.6 (9)</td>
</tr>
<tr>
<td>3</td>
<td>4.0 (7)</td>
<td>4.0 (28)</td>
<td>6.9 (6)</td>
<td>5.5 (18)</td>
</tr>
<tr>
<td>4</td>
<td>4.0 (17)</td>
<td>4.0 (40)</td>
<td>2.7 (14)</td>
<td>3.4 (28)</td>
</tr>
<tr>
<td>5</td>
<td>3.5 (23)</td>
<td>3.2 (13)</td>
<td>4.0 (10)</td>
<td>3.4 (44)</td>
</tr>
<tr>
<td>6</td>
<td>2.9 (38)</td>
<td>2.8 (66)</td>
<td>3.6 (31)</td>
<td>2.5 (54)</td>
</tr>
<tr>
<td>7</td>
<td>2.8 (46)</td>
<td>2.2 (89)</td>
<td>2.8 (70)</td>
<td>2.6 (63)</td>
</tr>
<tr>
<td>8</td>
<td>2.0 (94)</td>
<td>2.0 (75)</td>
<td>2.8 (10)</td>
<td>2.9 (71)</td>
</tr>
<tr>
<td>9</td>
<td>2.2 (65)</td>
<td>2.3 (61)</td>
<td>2.8 (60)</td>
<td>1.7 (83)</td>
</tr>
</tbody>
</table>

2nd stage
3.8 (100) | 3.5 (100) | 2.0 (100) | 2.8 (100)

Labor Management

- Has management been improved using new curves?
  - Knowledge of the new curves demonstrated
  - Evidence of tolerating slower progress
  - No reduction in cesarean rate
  Needs more work…

Labor Management

- What clinical features do you consider when assessing labor progress?
  - Parity
  - BMI
  - Fetal size
  - Induction
Labor Management

• How do you manage the second stage?
  – Assessment of pushing efforts
  – Assessment of descent
  – Fetal position
  – Monitoring length of the second stage

WHAT ABOUT EFM?

EFM Management

• The $ is in Category II
  – Deceleration area
  – Use of scalp stim
  – Clinical factors influence a priori risk
EFM Management
- Be aware of the lack of data (and need…)
  - Maternal lateral repositioning
  - Intravenous fluid bolus
  - Decrease oxytocin and/or administer tocolytic
  - Amnioinfusion
  - Maternal oxygen administration

Cesareans Not to Prevent
- Second Stage Arrest
- Failed TOLAC
  - OCC #1 refers to the ‘first’ cesarean
  - Labor management recommendations
- Labor arrest after 7cm

Taken together…
- Apply the best evidence we have
- Challenge our own behavior
Cesarean Prevention

- Malpresentation, 17%
- Macrosomia, 4%
- Preeclampsia, 3%
- Multiple gestation, 7%
- Nonreassuring fetal heart tracing, 23%
- Arrest of labor, 16%
- Maternal-fetal, 5%
- Elective, 3%
- Others, 4%

OCC #1 Obst & Gynecol 2014

Should VBAC be dead?

- Is it too unsafe for mom and baby?
- Can we make VBAC safer by:
  - Choosing better candidates
  - Altering our labor management
- Is there a downside to eliminating VBAC’s?
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Macones GA, et al. AJOG 2004

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Macones GA, et al. AJOG 2006

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Predicting Uterine Rupture
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TOLAC…Choose wisely...

Relative Morbidity by Mode
- Successful VBAC
- Planned repeat cesarean
- Cesarean after failed TOLAC

Predicting Failure

1/24/20
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VBAC Calculator

• Maternal age, BMI, race, prior vaginal delivery, non-recurring indication for prior c/s, prior VBAC
• https://mfmunetwork.bsc.gwu.edu/PublicBSC/MFMU/VGBirthCalc/vagbirth.html
• Recently validated in a Dutch cohort
• Editorial in BJOG about the perception of risk
• Also validated for women with 2 prior cesareans

Schuurr ENC, et al. BJOG 2014

Success Rate and Morbidity

Can a prediction model for vaginal birth after cesarean also predict the probability of morbidity related to a trial of labor?

William A. Grobman, MD, MBA, Yingqii Liu, PhD, Mark B. Landon, MD; Catherine Y. Spong, MD; Kenneth J. Lewiss, MD; Dwight J. Knox, MD; Michael W. Yenner, MD; And H. Mawad, MD; Steve N. Carrin, MD; Margaret Harper, MD; Ronald J. Wagner, MD; Yoram Soekis, MD; Monarcha Macekovic, MD; Marshall Carpenter, RD; Mary J. O’Malley, MD; John M. Sbi, MD; Odell Langer, MD; John M. Thery, MD; Isaac M. Ramin, MD; Brian M. Meyer, MD for the Joint Kennedy Researcher National Institute of Child Health and Human Development Maternal-Infant Morbidity Study

• Predicted success rates and associated morbidity
• Morbidity for TOLAC no greater than ERCS if predicted success rate ≥ 70%

Grobman WA, et al. AJOG 2009

What about 2 scars?

• Landon et al
• Success: 66% (compared to 73%)
• Risk of rupture: 0.9% (compared to 0.7%)
• Macones et al
• Success: 74.6% (compared to 75.5%)
• Risk of rupture: 1.8% (compared to 0.9%)
• ACOG: 1 or 2 prior LTCS

Macones GA, et al. AJOG 2005
Twins?
- Cahill et al
  - Less likely to attempt
  - No increase in morbidity
  - No decrease in success
- Ford et al
  - 0.9% rupture rate
  - No increase in morbidity
- ACOG: twins are ok

Unknown Scar?
- Secondary analysis of MFMU prospective cohort of 15,519 with a prior c/s
- Compared known (n=13,059) to unknown uterine scar (n=2,460)

  - Uterine rupture risk 0.71 (0.37 – 1.37)
  - Also, no difference in morbidities
- ACOG: this is ok

Other Factors
- Version
- Prior cesarean for preterm delivery
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What do good candidates do?

- 14 Hospital system, 8445 women with 1 prior LTCS
- Examined planned MOD among those with estimated 70% success or more
- Subgroup of 2 hospitals to examine effect of providers

- Less than 1/3 of good candidates underwent TOLAC
- One physician group in the sub-analysis had a 63% TOLAC rate

Metz TD, et al. AJOG 2013

TOLAC Management

- Not contra-indicated in the setting of TOLAC
- Limited tools
- Higher risk TOLACs

Labor Induction
Effect of Prostaglandins on Odds of Utx Rupture

  - Prostaglandins alone: 15.6 (8.1–30.0)
- Macones GA, et al.
  - Prostaglandins alone: 0.76 (0.22 – 2.58)
  - Oxytocin alone: 1.25 (0.81 – 1.92)
  - Prostaglandins followed by oxytocin: 7.47 (4.61 – 12.93)

Expected labor progress

<table>
<thead>
<tr>
<th>Dilation (cm)</th>
<th>TOLAC</th>
<th>Non-TOLAC</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 to 5</td>
<td>10.6%</td>
<td>11.5%</td>
<td>0.3</td>
</tr>
<tr>
<td>6 to 7</td>
<td>22.8%</td>
<td>24.8%</td>
<td>0.3</td>
</tr>
<tr>
<td>8 to 9</td>
<td>53.1%</td>
<td>50.9%</td>
<td>0.3</td>
</tr>
<tr>
<td>10</td>
<td>13.4%</td>
<td>12.6%</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Expected labor progress

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.6%</td>
<td>22.8%</td>
<td>53.1%</td>
<td>13.4%</td>
<td>4.6%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>


Grantz KL, et al. AJOG 2015
Induction methods

- Retrospective cohort study
- 214 TOLAC inductions, simplified Bishop ≤ 3
- Oxytocin compared to the Cook balloon (followed by oxytocin)
  - Odds of cesarean higher in the Cook balloon group
    - OR 2.09 (1.05-4.18)
  - Longer labor in Cook balloon group (21.9 v. 16.3 hrs, p<0.01)

Shah U, et al. JMFNM 2017
Elective induction v. expectant management

- Secondary analysis of MFMU cesarean registry
- ≥ 39 weeks, 1 prior LTCS
- Induction at 39 0/7 – 39 6/7 weeks associated with:
  - Increase in VBAC success, aOR 1.31 (1.03 – 1.67)
  - Increase in risk of uterine rupture, aOR 2.73 (1.22 – 6.12)

Palatnik A, et al. AJOG 2015

Induction and risk of uterine rupture

- Retrospective cohort study of TOLACs after 1 LTCS
- 4 years of deliveries in the California Kaiser system
- Compared induced to spontaneous labor
- No difference in the rate of uterine rupture (1.0% v 1.4%, p=0.51)

Ouzounian JG, et al. AJP 2011

Induction and risk of rupture

- Nested case-control study, 25,000 with a prior LTCS
- Compared rupture to no rupture
- Used time-dependent analysis to account for length of labor
- No increase in risk of rupture once length of labor was accounted for
  - HR 1.24 (0.78 – 1.99)

Oxytocin use

- Nested case-control study, 25,000 with prior LTCS
- Exposure to oxytocin (max dose) and risk of uterine rupture

Cahill AG, et al. AJOG 2008

IUPC use

- Systematic review
- Very low quality evidence; only hyperstimulation could be analyzed
- No MVU features or those of uterine tone indicated rupture
- Not recommended by ACOG, RCOG, or in Canada


Signs and symptoms of uterine rupture

- Category II or III tracing
  - Recurrent decelerations or bradycardia
- Abdominal pain
- Vaginal bleeding
- Loss of fetal station
- Vital sign abnormalities
  - Tachycardia
  - Hypotension
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Epidural dosing

- Nested case-control study within 25,000 cohort with prior LTCS

<table>
<thead>
<tr>
<th>Anesthesia dose (mg)</th>
<th>Patients, N</th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>102</td>
<td>1.00</td>
<td>0.81-1.28</td>
<td>0.82</td>
</tr>
<tr>
<td>1</td>
<td>53</td>
<td>2.62</td>
<td>1.28-4.94</td>
<td>0.01</td>
</tr>
<tr>
<td>2</td>
<td>33</td>
<td>2.69</td>
<td>1.28-5.58</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Cahill AG, et al. AJOG 2010

Dynamic counseling

- Antepartum counseling
  - Complete review of benefits, risks, and alternatives
  - Individual factors that influence candidacy

- Idea that things could change, i.e.
  - Presents in labor
  - Needs induction for pre-eclampsia at 27 weeks
  - Is post dates and closed/L/high
Summary of labor management

- Have a good understanding of expected, normal labor progress
- Induction is reasonable, but consider the context
- Long labors are the enemy
- IUPCs for normal obstetric indications
- Vigilance for evidence of uterine rupture; in the setting of epidural, additional dosing can be a surrogate

Trends in TOLAC location

OBSTETRICS
Vaginal birth after cesarean: neonatal outcomes and United States birth setting
Ellen L. Tilden, PhD; Melissa Chayney, PhD; CPM, LDM; Joanne-Maria Guise, MD, MPH; Cathy Erwais, PhD, CMA; Joel Lapidus, PhD; Frances M. Bie, MPH; MS; Jack Wiedoeft, MS; Jonathan M. Bronken, PhD

VBAC in 2018

- Not dead
- Continue to resuscitate TOLAC
- Choosing great candidates
- Careful intrapartum care and decision-making
Other ways to reduce cesarean?