Six is the New Four: Goodnight Mr. Friedman

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Objectives

• At the conclusion of this presentation the attendee will:

1. Understand current data related to the normal course of labor
2. Redefine the “beginning” of the active phase of labor
3. Understand the relationship between labor progress and BMI
4. Reconsider the diagnoses of protracted active labor and failed induction.
Conflicts of Interest

• I have no conflicts to disclose 😊
Changes in labor patterns

- Comparison of Collaborative Perinatal Project (CPP) 39,491 births from 1959-1966 and the Consortium on Safe Labor (CSL) 98,359 births from 2002-2008
- CPP was prospective study 54,390 births
- CSL was retrospective study 228,668 births
Laughon, continued

• Hypothesized that both changes in maternal characteristics AND obstetrical practice resulted in the longer labors of the modern group

• Only spontaneous, singleton labors were included in this comparison
<table>
<thead>
<tr>
<th>Parameter</th>
<th>CPP</th>
<th>CSL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Age</td>
<td>20.4</td>
<td>24.4</td>
</tr>
<tr>
<td>BMI</td>
<td>25.5</td>
<td>29.6</td>
</tr>
<tr>
<td>Epidural Use %</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>Oxytocin Augmentation</td>
<td>16</td>
<td>37</td>
</tr>
<tr>
<td>1st stage, hours (4-C/C)</td>
<td>3.9</td>
<td>6.5</td>
</tr>
<tr>
<td>1st stage, hours (5-C/C)</td>
<td>2.1</td>
<td>3.6</td>
</tr>
<tr>
<td>1st stage, hours (6-C/C)</td>
<td>1.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Operative Vag Delivery</td>
<td>66</td>
<td>10</td>
</tr>
<tr>
<td>Episiotomy</td>
<td>92</td>
<td>27</td>
</tr>
<tr>
<td>IP Cesarean Rate</td>
<td>3</td>
<td>16</td>
</tr>
</tbody>
</table>
# Laughon- Multip data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CPP</th>
<th>CSL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Age</td>
<td>28.0</td>
<td>30.1</td>
</tr>
<tr>
<td>BMI</td>
<td>27.1</td>
<td>30.4</td>
</tr>
<tr>
<td>Epidural Use %</td>
<td>4</td>
<td>48</td>
</tr>
<tr>
<td>Oxytocin Augmentation</td>
<td>9</td>
<td>27</td>
</tr>
<tr>
<td>1st stage, h(5-C/C)(m/95th)</td>
<td>1.0 (8.6)</td>
<td>2.8 (15.5)</td>
</tr>
<tr>
<td>1st stage, hours (6-C/C)</td>
<td>0.5 (5.1)</td>
<td>1.3 (8.9)</td>
</tr>
<tr>
<td>Operative Vag Delivery</td>
<td>18</td>
<td>2.5</td>
</tr>
<tr>
<td>Episiotomy</td>
<td>36</td>
<td>7</td>
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<tr>
<td>IP Cesarean Rate</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>
Contemporary Patterns of Spontaneous Labor
Reexamining Friedman..

- Retrospective cohort of 62,415 women
- Singletons, term, spontaneous labor, vertex, delivered vaginally & normal outcome
- Examined progress in labor, measured 95th%ile for elapsed time between dilation
Findings

• Nulliparas & multiparas progress at similar pace before 6cm
• From 4-5cm... may take > 6 hours
• From 5-6cm... may take > 3 hours (95th%ile)
Zhang’s Partogram

The 95th percentiles of cumulative duration of labor from admission among singleton term nulliparous women with spontaneous onset of labor, vaginal delivery, and normal neonatal outcomes.

Redefining Active Labor

• The upper limit of normal should be used in patient management
• i.e. 6cm, rather than 4cm dilation may be the more appropriate “start the clock” on the active phase of labor
• If the progress is “within normal limits” labor should be allowed to continue
Redefining active labor, cont.

• ....and...No change for 4 hrs may be normal in early labor but is probably too long after 6cm

<table>
<thead>
<tr>
<th>Cervical Dilation (cm)</th>
<th>Parity 0 (n=25,624)</th>
<th>Parity 1 (n=16,755)</th>
<th>Parity 2+ (n=16,219)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3–4</td>
<td>1.8 (8.1)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>4–5</td>
<td>1.3 (6.4)</td>
<td>1.4 (7.3)</td>
<td>1.4 (7.0)</td>
</tr>
<tr>
<td>5–6</td>
<td>0.8 (3.2)</td>
<td>0.8 (3.4)</td>
<td>0.8 (3.4)</td>
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<tr>
<td>6–7</td>
<td>0.6 (2.2)</td>
<td>0.5 (1.9)</td>
<td>0.5 (1.8)</td>
</tr>
<tr>
<td>7–8</td>
<td>0.5 (1.6)</td>
<td>0.4 (1.3)</td>
<td>0.4 (1.2)</td>
</tr>
<tr>
<td>8–9</td>
<td>0.5 (1.4)</td>
<td>0.3 (1.0)</td>
<td>0.3 (0.9)</td>
</tr>
<tr>
<td>9–10</td>
<td>0.5 (1.8)</td>
<td>0.3 (0.9)</td>
<td>0.3 (0.8)</td>
</tr>
<tr>
<td>Second stage with epidural analgesia</td>
<td>1.1 (3.6)</td>
<td>0.4 (2.0)</td>
<td>0.3 (1.6)</td>
</tr>
<tr>
<td>Second stage without epidural analgesia</td>
<td>0.6 (2.8)</td>
<td>0.2 (1.3)</td>
<td>0.1 (1.1)</td>
</tr>
</tbody>
</table>

Data are median (95th percentile).
Second stage- 95th %ile

- Nulliparas with epidural anesthesia:
  - 3.6 hours (that’s 3hrs, 36min)

- Nulliparas without epidural anesthesia:
  - 2.8 hours (that’s 2hrs, 48 min)
Friedman and Zhang’s labor curves
Why?
The BMI Effect: First Stage

- Norman, et al, OBGYN July 2012
- Retrospective cohort 5,204 singleton labors
- BMI < 30 OR BMI > 30 (WHO definition of obese)
- 53.6% were obese; 10.8% had BMI > 40
- Adjustments were made for parity, labor type (spont vs IOL), race, birth weight > 4000g
<table>
<thead>
<tr>
<th>Cervical Dilation (cm)</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25.0 or Less</td>
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<tr>
<td>Nulliparous</td>
<td></td>
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<tr>
<td>4–10</td>
<td>366</td>
</tr>
<tr>
<td>Referent</td>
<td>4.6 (1.5, 14.4)</td>
</tr>
<tr>
<td></td>
<td>.18</td>
</tr>
<tr>
<td>4–6</td>
<td>2.3 (0.6, 8.9)</td>
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<tr>
<td>Referent</td>
<td>0.75</td>
</tr>
<tr>
<td>6–8</td>
<td>0.7 (0.1, 5.1)</td>
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<tr>
<td>Referent</td>
<td>.38</td>
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<td>8–10</td>
<td>0.5 (0.1, 3.5)</td>
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<tr>
<td>Referent</td>
<td>.02</td>
</tr>
<tr>
<td>Multiparous</td>
<td></td>
</tr>
<tr>
<td>4–10</td>
<td>419</td>
</tr>
<tr>
<td>Referent</td>
<td>3.3 (0.8, 12.6)</td>
</tr>
<tr>
<td></td>
<td>.04</td>
</tr>
<tr>
<td>4–6</td>
<td>1.8 (0.3, 9.2)</td>
</tr>
<tr>
<td>Referent</td>
<td>.42</td>
</tr>
<tr>
<td>6–8</td>
<td>0.4 (0.1, 3.9)</td>
</tr>
<tr>
<td>Referent</td>
<td>.53</td>
</tr>
<tr>
<td>8–10</td>
<td>0.2 (0.02, 2.1)</td>
</tr>
<tr>
<td>Referent</td>
<td>.06</td>
</tr>
</tbody>
</table>

BMI, body mass index.

*P* values are adjusted for labor type, race, birth weight more than 4,000 g. *P* < .01 is considered significant (adjustment for multiple comparisons).

BMI is calculated as weight (kg)/(height (m))^2.
Nulliparous Women

Multiparous Women
The BMI Effect: More First Stage

- Kominiarek, et al (AJOG, September 2011)
- Retrospective cohort 118,978 gravidas (CSL)
- Multips enter active labor by 6cm
- Labor proceeds more slowly as BMI increases
- Need to allow more time during labor management
Kominiarek (CSL), cont.

Nulliparas

Labor Curves in Nulliparas by Body Mass Index Category

Multiparas

Labor Curves in Multiparas by Body Mass Index Category
Induction of Labor

• Laughon et al., AJOG June 2012
• Retrospective cohort 208,695 labor records from 2002-2008. 19 hospitals.
• Induction rate was 42.9% Nullips & 31.8% Multips;
• 35.5% of nullips & 44.1% of multips were induced electively
• Induction were categorized as “indicated,” “elective,” and “no recorded indication.”

• If the indication was “postdates” but the EGA was < 41 weeks, it was coded as elective.

• Induction more prevalent with increasing maternal age, higher BMI & postdates.
Laughon, induction, cont.

- Preterm: medical/OB problems were most likely precursor (hypertensive dz #1)

- Term: fetal/maternal precursors more common. “Elective” was most common.
Laughon, induction, cont.

- Success of IOL in nullips:
  - Indicated IOL had lowest VD rate (62.8% preterm/63.7% term)
  - Elective IOL VD rate (76.2% term) (yes, there were preterm...)

- Success of IOL in multips:
  - Indicated IOL VD rate (80.3% preterm/85.5% term)
  - Elective IOL VD rate (97% term)
Normal Progress of Induced Labor

• Harper, et al. June 2012 *Obstetrics & Gynecology*
• Retrospective Cohort 5388 women
• > 37wks EGA
• Compared spontaneous labor to induced or augmented labor; stratified by parity
Induced labor, cont.

- 5388 total women: 2021 spontaneous labor, 1720 augmented & 1647 induced
- \(\geq 37\)wks EGA, singleton, vertex & had an umbilical cord gas obtained at delivery
- Induced women were more likely white, \(\geq 35\) years old, nulliparous, diabetic, hypertensive, obese, have a macrosomic neonate & have a Bishop score < 5.
Harper, et al. Results

• Time to progress from 4-10cm longer in induced labor (5.5 hrs vs 3.8 hrs median)
• 95th %ile was 16.8 hrs vs. 11.8 hrs
• After 6 cm, women in induced and spontaneous labor spend similar amounts of time advancing 1 cm in dilation
• Both multips & nullips who are induced can spend (95th%ile) > 17 hrs after 4cm
• Induced women may require > 8hrs from 3 to 4cm
Average labor curves by parity & type of labor onset

Harper et al. *Normal Progress of Induced Labor*
Conclusions, Harper et al.

• Both multiparous & primiparous women spent much longer times (> 17hrs) during induced labor after 4cm of dilation.

• Prior to 6cm, each centimeter of dilation may take up to 10 hours.

• After 6cm, each centimeter of dilation generally takes 1-2 hours.

• Rethink the diagnosis of arrest of labor prior to 6cm dilation in induced labor
Diagnosing “failed labor”

- Rouse, et al (OBGYN/Feb 2011)
- Secondary analysis of RCT
- 1347 women; nulliparas > 36wks, induction w/ cervix ≤ 2cm, < fully effaced
- Latent phase = 4cm/90% OR 5cm/any %
Failed labor, cont

• 1219 began with intact membranes
• Approximately 47% had cervical ripening (Prostaglandin, Foley bulb or both)
• Within 6hrs of receiving oxytocin & ROM, 69.7% had entered the active phase
• Cesarean rate rose with duration of oxytocin use in the latent phase increased
Failed labor, cont

- 39.4% of women who were in the latent phase after 12hrs of oxytocin with ROM delivered vaginally

- Also higher rates of chorioamnionitis & endometritis as well as uterine atony

- Neonatal morbidity was not associated with duration of the latent phase
Failed labor, cont

- Failure to exit the latent phase after 12 hours of oxytocin & ROM was uncommon - 5% (or 71/1347)

The holy grail...active labor...
Implications

• Support for new definition of *failed labor*

• Data supports requiring as least 12 hours of oxytocin after ruptured membranes before declaring an *failed induction in the latent phase*....

Remind me...when does the latent phase end???

😊
Preventing the First Cesarean Delivery

Summary of a Joint Eunice Kennedy Shriver National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, and American College of Obstetricians and Gynecologists Workshop

Catherine Y. Spong, MD, Vincenzo Berghella, MD, Katharine D. Wenstrom, MD, Brian M. Mercer, MD, and George R. Saade, MD

With more than one third of pregnancies in the United States being delivered by cesarean and the growing concern points were identified to assist with reduction in cesarean delivery rates including that labor induction should
Preventing the 1st Cesarean- Key Points

• Labor induction should be performed only for medical indication.

• Use label of “NonIndicated” rather than “Elective.”

• If done for non-medical reasons, EGA should be \( \geq 39 \) weeks and the cervix should be favorable (Bishop \( >8 \)) regardless of parity.
Preventing the 1st Cesarean - Key Points

• Redefining Failed Induction in Latent Phase:
  – For patients in the latent phase (< 6cm dilation) a diagnosis of failed induction should be reserved for those who have not achieved regular (q 3min) contractions or cervical change after at least 24 hours of oxytocin administration or for 12 hours after membrane rupture. Prostaglandins/mechanical dilation procedures do not count toward induction time.
Preventing the 1st Cesarean- Key Points

• Redefining Arrest of Labor in the Active Phase:
  – Reserved for those patients who have achieved at least 6cm dilation with membrane rupture and failed to demonstrate cervical change over 4 or more hours of adequate (> 200 MVUs) contractions or 6 or more hours of inadequate contractions.
Preventing the 1st Cesarean- Key Points

• Redefining Second Stage Arrest:
  – Reserved for patients in the second stage who have failed to demonstrate fetal descent or rotation for:
    • \( \geq 4 \) hours in a nullipara \textbf{with} an epidural
    • \( \geq 3 \) hours in a nullipara \textbf{without} an epidural
    • \( \geq 3 \) hours in a multipara \textbf{with} an epidural
    • \( \geq 2 \) hours in a multipara without an epidural
Preventing the 1st Cesarean- Key Points

• Intermittent auscultation is acceptable in low-risk patients

• In patients with moderate FHR variability, other findings (decel, mec) have little association with neurologic damage or acidosis.

• Indicated operative vaginal delivery is acceptable; training and experience should be augmented and encouraged
Summaries

• Contemporary studies suggest that the active phase of labor does not begin until 6cm dilation. Diagnosing arrest at 4hrs without cervical change prior to 6cm may be premature.

• After 6cm, waiting 4 hours or more to diagnose arrest is probably too long

• BMI slows progress in the first stage of labor & should be considered prior to diagnosing an arrest
Summaries, continued

• 95th %ile for second stage labor in nulliparas is 3hrs 36min with epidural, 2hrs 48min without

• Current evidence supports allowing at least 12 hours after rupture of membranes for a patient to exit the latent phase of labor

• Avoid elective inductions in nulliparas, especially with an unripe cervix
Citations


Harper 2012


