Diagnosis and Management of Arrest Disorders: Duration to Wait

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Disclosure

I have nothing to disclose

Stages of Labor

- Seminal work of Emmanuel Friedman
  - First to depict a labor curve divided into several stages and phases

- Relationship between duration of labor and cervical dilation as a sigmoid curve
  - 622 consecutive primigravid women at term
    - 500 selected for analysis for sufficient detail

Preventing the First Cesarean Delivery

Stages of labor being advanced by research and the growing knowledge of the available options can be very stressful for both mothers and partners. The goal of the workshop is to provide a forum for the exchange of ideas and to foster collaboration among the participants to address the challenges of implementing evidence-based guidelines for prevention of first Cesarean delivery. The workshop will include presentations from experts from around the world, as well as interactive sessions that focus on multidisciplinary approaches to prevention and support strategies. The participants will have the opportunity to discuss the latest research findings and to develop practical solutions to improve care for patients and families.
Friedman’s Curve
Friedman EA. Obstet Gynecol 1955

- Nulliparas Limits of Normal: total population (n=500)
  - Latent phase: maximum: 20.6 hrs
  - Transition to active phase: by 4 cm
  - Maximum slope: minimum 1.2 cm/hr
  - First stage duration: maximum 28.5 hrs

Friedman’s Curve

- Limits of Normal: Multiparas (n=500)
  - Latent phase: maximum: 13.6 hrs
  - Transition to active phase: by 4 cm
  - Maximum slope: minimum 1.5 cm/hr

First Stage Labor

- Latent Phase Duration
  - Transition to active phase may occur later than described by Friedman
  - 1060 nulliparous and 639 primi- or multi-parous in spontaneous labor, intact membranes at admission
    - <50% labors active by 4cm
    - 74% active by 5 cm
    - “a patient who is not progressing in labor at 4 cm cervical dilation is not necessarily abnormal.”

  Peisner and Rosen – Obstet Gynecol 1986

Friedman EA. Labor in multiparas. A graphicostatistical analysis. 1956;8:691-703
First Stage Labor

- 1,329 nulliparous parturients - term, singleton, vertex, normal birthweight, spontaneous onset of labor, vaginal delivery
  - No perceivable change in cervical dilation for 2 hours before 7 cm not uncommon
  - No deceleration phase was detected
  - 5\textsuperscript{th} percentiles rate of cervical dilation all below 1 cm/hour

Zhang et al. Reassessing the labor curve in nulliparous women. AJOG 2002;187:824-8

First Stage Labor

- Retrospective Study from EMR in 19 hospitals across U.S.
- 62,415 parturients
  - Singleton, term, spontaneous onset of labor, vertex, vaginal delivery, normal perinatal outcome
  - Repeated measures analysis used to construct average labor curves by parity
  - Interval-censored regression used to estimate duration of labor
    - Stratified by cervical dilation at admission and centimeter by centimeter.
  - Median and 95\textsuperscript{th} percentiles calculated

First Stage of Labor

- Spontaneous labor - nulliparas
  - 65% of intrapartum cesarean deliveries for dystocia were before 2nd stage
  - 28% were before 6 cm

- Induced labor - nulliparas
  - 81% of intrapartum cesarean deliveries for dystocia were before 2nd stage
  - 53% were before 6 cm

Management Considerations

- Arrest disorder in first stage of labor
  - 1. Latent phase completed
  - 2. Uterine contraction pattern exceeds 200 Montevideo units for 2 hours without cervical change

ACOG Practice Bulletin 2003

“Our inability to reduce the cesarean delivery rate may be attributable in part to the incomplete understanding of a normal labor process, particularly in the first stage”

• Arrest disorder
  – At least 4 hours of >200 Montevideo units or
  – Minimum of 6 hours of oxytocin if pattern unattainable
  – Eventual vaginal delivery rate in group with no progress after 4 hours oxytocin
    • 56% for nulliparas
    • 88% for multiparas
  – Maternal: chorioamnionitis
    Rouse et al. Obstet Gynecol 1999,

• Extending the minimum period of oxytocin augmentation for active phase arrest
  from 2 hours to 4 hours appears effective
    ACOG Practice Bulletin 2003

First Stage - Duration to Wait

Conclusions

• Labor appears to progress more slowly now than before

• More measured, nuanced approach to diagnosis of first stage arrest:
  – Adjust management to account for gradual active phase curve in
    nulliparas
  – Adjust management to account for later inflection point in multiparas
  – 6 cm is a better landmark for start of active phase
  – One size does not fit all - The Connected Staircase
    • Labor curve based on both parity and admission dilation

The Second Stage of Labor

• Merriman – 1820
  – “The forceps shall never be applied until the ear of the child has
    been within the reach of the operator’s fingers for at least six
    hours.”

• Hamilton – 1861
  – “Whenever the os become fully dilated, so that an ear can be
    felt, I hold that the danger to the child becomes imminent if
    allowed to remain undelivered much more than 2 hours.”

Hamilton G. Classical observations and suggestions in obstetrics. Edinburgh Med J. 1861
**How Long Is Too Long?**

- Increase in infant mortality when second stage exceeded 150 minutes
  
  *Hellman and Prystowsky AJOG 1952*

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**The Second Stage of Labor**

**Friedman’s Curve**

- Limits of Normal: total population* (n=500)
  
  - Mean: 0.95 hr.
  
  - Median 0.8 hr.
  
  - Statistical maximum: 2.5 hours
  
  2.0 hours (ideal population)

  *55% incidence of low or mid-forceps

  *Friedman EA. Primigravid Labor: a graphicostatistical analysis. Obstet Gynecol 1955*

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**The Second Stage of Labor**

- Duration of the second stage of labor
  
  - Nulliparas:
    
    - Mean - 54 minutes
    
    - 95th %ile - 132 minutes
    
    - 95th %ile with conduction anesthesia – 185 minutes
  
  - Multiparas:
    
    - Mean - 19 minutes
    
    - 95th %ile - 61 minutes
    
    - 95th %ile with conduction anesthesia – 131 minutes


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**The Second Stage of Labor**

- ACOG: Prolonged second stage of labor
  
  - Nulliparas: 2 hours without regional anesthesia
    
    - 3 hours with regional anesthesia
  
  - Multiparas: 1 hour without regional anesthesia
    
    - 2 hours with regional anesthesia

  *ACOG Practice bulletin. Dystocia and augmentation of labor. No 49; Obstet Gynecol 2003*
The Second Stage of Labor

- 95th percentile for nulliparous women (normal perinatal outcome)
  - 2.8 hours (168 minutes) without regional anesthesia
  - 3.6 hours (216 minutes) with regional anesthesia


Second Stage of Labor: How long is too long?

- 6791 nulliparas reached second stage (1996-99)
  - Increased maternal morbidity with prolonged 2nd stage
  - No differences neonatal outcomes


The Second Stage of Labor

- 95th percentile for nulliparous women (normal perinatal outcome)
  - 3.2 hours (190 min) without regional anesthesia
  - 5 hours (302 min) with regional anesthesia

Cheng et al. Second stage of Labor and epidural use: a larger effect than previously suggested. Obstet Gynecol 2014

Second Stage: How long is too long?

<table>
<thead>
<tr>
<th>Outcome</th>
<th>&gt;3 Hours of second-stage labora</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds ratio</td>
</tr>
<tr>
<td>Endometritis</td>
<td>1.03</td>
</tr>
<tr>
<td>Chorioamnitis</td>
<td>2.16</td>
</tr>
<tr>
<td>3/4-Degree lacerations</td>
<td>1.16</td>
</tr>
<tr>
<td>Postpartum hemorrhage</td>
<td>1.48</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>5.84</td>
</tr>
<tr>
<td>Operative vaginal delivery</td>
<td>4.38</td>
</tr>
<tr>
<td>Meconium</td>
<td>1.15</td>
</tr>
<tr>
<td>5-min Apgar &lt;7</td>
<td>0.73</td>
</tr>
<tr>
<td>Umbilical artery pH &lt;7</td>
<td>1.21</td>
</tr>
<tr>
<td>Base excess &lt;-12</td>
<td>0.61</td>
</tr>
<tr>
<td>Neonatal Intensive care unit</td>
<td>1.07</td>
</tr>
</tbody>
</table>

Second Stage: How long is too long?


Second Stage - How long is too long?

If progress is being made, duration of the second stage alone does not mandate intervention by operative delivery

- ACOG Practice bulletin. Dystocia and augmentation of labor. No 49; Obstet Gynecol 2003

Second Stage - How long is too long?

Evidence Mixed
- Maternal outcomes worse
  - Would earlier cesarean improve?
  - Association versus causation
- Neonatal outcomes – more clarity?
Second Stage - How long is too long?

• Chorioamnionitis
• Is it that simply longer labor leads to more infections?
  OR
• Women with pre-chorio / chorio have longer labors?

Second Stage: How long is too long?

• Systematic review:
  • Recurrent limitations included:
    – oversimplified categorization of second stage
    – inconsistency in study population characteristics, and lack of control of confounding factors.
  • Conclusions:
    “The primary findings of our review indicated that most of the studies are flawed and do not answer the important questions for maternity caregivers to safely manage prolonged second stage.”


Second Stage - How long is too long?

• PPH / Perineal lacerations
• Is it that simply longer labor leads to more bleeding / injury?
  OR
• Women with longer second stages eventually are delivered via cesarean / op vag delivery leading to complications?

Second Stage - How long is too long?

• >4 hours second stage
  – Cesarean delivery rate – 32.8%
  – Operative vaginal delivery rate – 48.4%
  – Spontaneous vaginal delivery rate – 18.8%

• > 6 hour second stage
  – Cesarean delivery rate - 48.4%
  – Operative vaginal delivery rate - 35.2%
  – Spontaneous vaginal delivery rate - 16.4 %

Second Stage – Duration to Wait

Conclusions

• Executive Summary SMFM, NICHD, ACOG Workshop. *Obstet Gynecol* 2012.
  • 4 hours in a nulliparous woman with epidural
  • 3 hours in a nulliparous woman without an epidural
  • 3 hours in a multiparous woman with epidural
  • 2 hours in a multiparous women without epidural

• Cheng et al. Second stage of Labor and epidural use. *Obstet Gynecol* 2014
  • 5 hours in a nulliparous woman with regional anesthesia
  • 3 hours in a nulliparous woman without regional anesthesia
  • 3.6 hours in a multiparous woman with epidural
  • 1.3 hours in a multiparous women without epidural

• Need prospective studies and long term outcomes to address second stage management
  – 3 hours versus 4 or 5 or 6 hours

• >4 hours in nulliparous woman
  • Precise determination of actual descent and fetal status
  • Balanced consideration of maternal and neonatal complications
  • Diminished likelihood of spontaneous vaginal delivery
  • Patient informed preference

THANK YOU
Delayed Pushing - PEOPLE

• Maternal Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Delayed Push (n=926)</th>
<th>Early Push (n=936)</th>
<th>RR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd/4th degree lac</td>
<td>9.3%</td>
<td>9.5%</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Fever (38° C)</td>
<td>8.5%</td>
<td>4.5%</td>
<td>1.88 (1.31-2.71)</td>
<td></td>
</tr>
<tr>
<td>EBL&gt;500ml</td>
<td>17.6%</td>
<td>16.8%</td>
<td>NS</td>
<td></td>
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Delayed Pushing - PEOPLE

• Neonatal Outcomes

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<tbody>
<tr>
<td>Abnormal uAPH (&lt;7.10)</td>
<td>4.5%</td>
<td>1.6%</td>
<td>2.45 (1.35-4.43)</td>
<td></td>
</tr>
<tr>
<td>Ventilation</td>
<td>6.9%</td>
<td>6.3%</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>uAPH (&lt;7.0)</td>
<td>1.98 (0.36-10.80)</td>
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</tr>
</tbody>
</table>

• No difference – Respiratory, blood cultures, fractures, Apgars

Second Stage of Labor

- 5158 multiparas reached second stage (1991-2001)
  - Increased maternal complications
  - Increased neonatal morbidity