Fetal Heart Rate Monitoring Myths and Misperceptions

Tekoa L. King CNM, MPH
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Objectives

- FHR Monitoring in the 21st Century
  - History of FHR monitoring in the US
  - Evidence for the efficacy of FHR monitoring since the NICHD terminology started being used in FHR research (1997 ....)

- Myths and Misperceptions about FHR patterns

Can FHR Monitoring Prevent Hypoxic-Ischemic Encephalopathy in the Newborn?

1. Yes
2. No

1970’s: Electronic Fetal Heart Rate Monitoring (EFM): Baseline Assumptions

1. Cerebral palsy is the result of intrapartum asphyxia or birth trauma
2. Variant FHR patterns reflect fetal asphyxia
3. FHR monitoring will identify fetal asphyxia early enough to intervene in time to avoid brain damage in the newborn

1970’s: “3 late decelerations = Cesarean section”
1990’s Meta-Analysis of RCTs of EFM

- EFM associated with:
  1. ↑ C/S
  2. ↑ operative deliveries

- No change in incidence of:
  1. Cerebral palsy
  2. Neonatal neurologic impairment in newborns whose mothers had continuous EFM during labor
  3. No ↓ in perinatal death rates


1990’s: The Decade of Reanalysis:

Three major problems in the randomized trials:

1. The independent variable: The FHR pattern(s) that were being observed
   - one persons’ “late” was another persons’ “variable”
   - Intra-observer and inter-observer reliability was poor

2. The dependent variables: Apgar scores, cerebral palsy, and perinatal mortality
   - Apgar scores are affected by many variables other than the FHR pattern
   - Only ~ 7-10% of CP is secondary to intrapartum asphyxia

3. Variation in management
   - Large variation in definitions of “fetal distress”
   - Variation in the treatment for “fetal distress”

1995-1996 NICHD Conference

- Group of nationally recognized FHR experts and researchers
- Goal was to standardize terminology and management so FHR research could:
  - Use standardized terminology for FHR patterns and
  - Identify which FHR patterns reflect fetal acidemia

- They crafted the terminology used today but did not make a great deal of progress on interpretation of specific patterns or recommending management
- Chaired by UCSF’s Julian T. Parer MD, PhD

Standard FHR Terminology: 2005-2006:

AWHONN, ACOG, and ACNM Endorse NICHD

- JCAHO Sentinel Event Alert issue 30 July 21, 2004 concludes:
  “Educate nurses, residents, nurse-midwives, and physicians to use standardized terminology to communicate abnormal fetal heart rate tracings”

- 2005-2006: AWHONN, ACOG, and ACNM endorsed use of NICHD terminology for clinical description of FHR characteristics

How Many Infants with Metabolic Acidosis at Birth Have Adverse Neurologic Outcomes?
Apgar scores and neonatal seizures are not great reflections of intrapartum asphyxia

Umbilical cord blood gases are a good reflection of fetal acidemia and a good predictor of newborn outcome

UA pH < 7.0 occurs in approx. 3/1000 births
- 39% admitted to special care nursery
- 13.8% intubated
- 12% seizures
- 8% result in neonatal death

Goldabar KG 1991, Goodwin TM 1992

The Goal of FHR Monitoring Today
1. To use standard terminology for FHR patterns to improve team communication and FHR interpretation to help a woman give birth to a baby who does NOT have significant acidemia defined as:

   CUA:
   - pH ≥ 7.1
   - BE ≥ -12 mEq L

   Apgar score:
   - ≥ 7 at 5 minutes

But...we still have huge variation in management of fetal heart rate patterns, some of which is based on "myths and misperceptions" about what FHR patterns reflect a risk for newborn acidemia

Relationship Between UA pH and Hypoxic Ischemic Encephalopathy (HIE)

Acidemia at birth and encephalopathy

% with HIE

6.61-6.70 6.71-6.79 6.80-6.89 6.90-6.99

pH range

Goodwin TM, 1992
What Have We Learned Since 1997 About Interpreting FHR Patterns?

1. Moderate variability and accelerations are strongly predictive of neonatal vigor independent of the presence of variant patterns. This pattern has a negative predictive value of 98%-99% for a term fetus.

Myth: Recurrent late decelerations in the presence of moderate variability indicates a significant risk for neonatal acidemia.

Sameshima H 2005, Parer et al 2006

2. Absent variability and late or severe variable decelerations have a 10%-30% positive predictive value for newborn acidosis.

1. Recurrent late decelerations with minimal or absent variability
2. Recurrent variable decelerations with minimal or absent variability
3. Tachycardia and absent variability
4. Bradycardia (< 80 bpm) and absent variability
5. Sinusoidal pattern

Myth: Any bradycardia < 110 bpm is a significant risk for neonatal acidemia.

Parer et al 2006
3. Pattern evolution over time in relation to the presence or absence of variability is an indicator of developing acidemia

- Recurrent variable or late decelerations
- The variability goes from moderate to minimal to absent
- Compensatory tachycardia
- Decelerations get deeper and possibly more frequent
- Ultimately a terminal bradycardia


4. Severity of decelerations is more prognostic than the type of variant pattern present

- Subtle late decelerations
- Deep late decelerations

Myths: 1. Subtle late decelerations are worse than severe late decelerations
2. Lates are worse than variables

Parer JT et al. 2006

How Long Does it Take to Develop Fetal Acidosis?

It takes approximately one hour from the start of absent or minimal variability with late or variable decelerations to the development of significant fetal acidemia in a previously healthy fetus


What are the Most Common Incorrect Assumptions about Interpreting FHR Patterns in 2007?

- FHR tracing must have accelerations present to be reassuring during labor
  - Accelerations are necessary in antenatal NST testing but are not necessary for prediction of a well-oxygenated fetus in labor.
  - Conversely an acceleration if elicited, regardless of other FHR characteristics, does predict a fetal pH of ≥ 7.20
- Short-term variability and long-term variability are different and have different clinical significance
  - STV/LTV work in concert and are assessed as “ONE”
  - -STV and +LTV = sinusoidal
  - +STV and –LTV = minimal variability
What are the Most Common **Incorrect** Assumptions about Interpreting FHR Patterns in 2007? cont.

- Variability within a variable deceleration “counts” as variability
  - Variability with a deceleration is the result of sympathetic discharge that stimulates tachycardia in response to hypoxia

What are the Most Common **Incorrect** Assumptions about Interpreting FHR Patterns in 2007? cont.

- Late decelerations with variability predict fetal acidosis
  - In the presence of moderate variability, late decelerations are not associated with fetal acidosis, rather…
  - Late decelerations with variability reflect a normal fetal compensatory response to a transient decrease in oxygen tension noted by the chemoreceptors in the fetal aortic arch

What are the Most Common **Incorrect** Assumptions about Interpreting FHR Patterns in 2007? cont.

- Subtle late decelerations are worse than obvious ones
  - Subtle late decelerations are not more predictive of acidemia in the newborn than more obvious late decelerations

- You must have an internal scalp ECG to accurately determine the variability
  - Current FM monitors use auto-correlation with the Doppler and the variability is virtually the same when comparing external and internal recordings.

What are the Most Common **Incorrect** Assumptions about Interpreting FHR Patterns in 2007? cont.

- Scalp stimulation can be used during a deceleration to help the FHR return to baseline
  - Scalp stimulation is a screening test. An acceleration in response to scalp stimulation predicts a fetal pH > 7.20
  - Use of intrapartum resuscitation can delay appropriate intervention

- A physician/surgeon must come to the room to evaluate a tracing before going to the OR

**NICHD 1997, Parer et al 2006**
Thank you