Validity of the 5-Tier System for Fetal Heart Rate Pattern Interpretation Proposed by JSOG

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Electronic fetal heart rate monitoring (EFM) is the most widely used procedure to assess fetal states during labor. Despite that, rates of cerebral palsy have not been decreased and several problems is known such as poor inter-observer and intra-observer reliability, and a high false-positive rate. Japan Society of Obstetricians and Gynecologists (JSOG) recently proposed a guideline for management based on EFM pattern interpretation to standardize clinical decisions more specifically and to decrease unnecessary cesarean sections. The purpose of this study is to evaluate the validity of this JSOG’s guideline practically.

**Objectives**

- Subject: Women with vaginal delivery at our hospital from January through June 2009. Multiple gestations, preterm birth, breech presentations were excluded.
- All EFM tracings during labor were assessed according to the JSOG’s guideline (below five-tier classification) retrospectively.
- We checked umbilical artery blood gas analyses as an index of fetal acidosis and assessed the association between the classification levels.
- Another four obstetricians interpreted the tracings as same to assess intra-observer variability.

**Methods**

<table>
<thead>
<tr>
<th>Decelerations</th>
<th>None</th>
<th>ED</th>
<th>VD</th>
<th>LD</th>
<th>PD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td></td>
<td></td>
<td>Mild</td>
<td>Sever</td>
<td>Mild</td>
</tr>
<tr>
<td>Normal</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Bradycardia(50)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Addition: This guideline presents baseline variability is important. Minimal variability: Add 1 to the scores/ absent variability: Scored 5 regardless any other factor. All definitions are according to the NICHD statement.

**Results**

- Women with delivery = 547
- Excluded = 206 (preterm birth or/and multiple birth or/and breech presentation or/and elective CS n=187)
- no or insufficient EFM tracings n=8
- uncollected umbilical blood n=11

Women eligible = 341
- VD = 333
eCS = 8
- NVD = 311
- VE = 22

VD: vaginal delivery
ND: normal vaginal delivery
eCS: emergency cesarean section
VE: vacuum extraction

**Obstetric characteristics (n=341)**

- Maternal age: 31.2±5.0
- Nulliparous: number 215 (63.0%)
- Gestational age 39 (36-42) weeks
- Induction of labor: 58 (17.0%)
- Augmentation of labor: 50 (14.7%)
- Birth weight: 2990±403g
- Umbilical artery pH: 7.25±0.07
- Umbilical artery BE: 5.37±3.19mmol/L

Most cases were categorized Level 1 at the first stage, and Level 2 at the second stage of labor. The former level was statistically lower than the latter (p<0.001).

No case demonstrated Level 5.

**Intervention for abnormal pattern: Level 2**

- CS: cesarean section
- VE: vacuum extraction
- NVD: normal vaginal delivery

1st stage: 7 8 13 (48%)
2nd stage: 0 20 20 (16%)

Many abnormal pattern cases needed obstetrical intervention at the first stage, but most cases could deliver normally if that appeared at the second stage.

**Umbilical artery gas values in each Levels**

<table>
<thead>
<tr>
<th>Level</th>
<th>pH</th>
<th>p&lt;0.0078</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st stage</td>
<td>1</td>
<td>7.60</td>
</tr>
<tr>
<td>2nd stage</td>
<td>2</td>
<td>7.25</td>
</tr>
</tbody>
</table>

**Intraobserver variability**

- 1st stage vs Reviewer 2: 0.20 (0.14-0.26)
- vs Reviewer 3: 0.39 (0.25-0.52)
- vs Reviewer 4: 0.29 (0.19-0.39)
- vs Reviewer 5: 0.29 (0.19-0.39)
- 2nd stage vs Reviewer 2: 0.08 (0.00-0.12)
- vs Reviewer 3: 0.24 (0.13-0.35)
- vs Reviewer 4: 0.18 (0.08-0.27)
- vs Reviewer 5: 0.16 (0.09-0.25)

*Weighted kappa statistics between reviewer 1 and other four reviewers

Kappa is a index of coincidence. 0~0.2: Slight. 0.2~0.4: Fair. 0.4~0.6: Moderate. 0.6~0.8: Substantial. 0.8~1:0: Perfect

**Conclusions**

5-tier system for EFM interpretation proposed by JSOG correlated with the fetal acid-base balance well. Unfortunately, fine categorization wasn’t useful to decrease observer variability. However, interpretation of EFM and therapeutic strategy might be standardized in the future by having common recognitions with obstetrical staff.

References: