UTERINE TACHYSYSTOLE AND ITS EFFECT ON EFM

BEST USE OF OXYTOCIN
UTERINE ACTIVITY

- **Frequency:** beginning of one contraction to beginning of next (minutes)

- **Duration:** beginning to end of one contraction (seconds) Must be at least 40 seconds to quantify as a contraction.

- **Intensity:** strength (mild, moderate, strong) with external monitor, determined by palpation

- **Resting Tone:** relaxed or not relaxed (determined by palpation with external monitor)
UTERINE ACTIVITY

- Uterine irritability may be caused from dehydration, infection, abruption or be a precursor to labor contractions.
UTERINE ACTIVITY

- **Normal uterine activity**: \(\leq 5\) contractions in 10 minutes averaged over 30 minutes.
- **Tachysystole**: \(> 5\) contractions in 10 minutes averaged over 30 minutes.
- **Tachysystole with uterine hypertonia**: incomplete relaxation between frequently occurring contractions.
- **Tetanic contraction**: Sustained uterine activity with incomplete relaxation. Absent O2 exchange at intervillous space.
specific FHR patterns and to make recommendations about a system for use in the United States; and 3) to make recommendations for research priorities for EFM. Thus, while goals 1 and 3 are similar to the prior workshop, a new emphasis on interpretative systems (goal 2) was part of the recent workshop.

As was true in the prior publication, before presenting actual definitions and interpretation, it is necessary to state a number of assumptions and factors common to FHR interpretation in the United States. These were defined in the initial publication and were affirmed and/or updated by the panel:

A. The definitions are primarily developed for visual interpretation of FHR patterns. However, it is recognized that computerized interpretation is being developed and the definitions must also be adaptable to such applications.

B. The definitions apply to the interpretations of patterns produced from either a direct fetal electrode detecting the fetal electrocardiogram or an external Doppler device detecting the fetal heart rate events with use of the autocorrelation technique.

C. The record of both the FHR and uterine activity should be of adequate quality for visual interpretation.

D. The prime emphasis in this report is on intrapartum patterns. The definitions may also be applicable to antepartum observations.

E. Periodic patterns are those associated with uterine contractions, and episodic patterns are those not associated with uterine contractions.

F. The periodic patterns are distinguished on the basis of waveform, currently accepted as either "abrupt" or "gradual" onset.

G. Accelerations and decelarations are generally determined in reference to the adjacent baseline FHR.

H. No distinction is made between short-term variability (or beat-to-beat variability or R-R wave period differences in the electrocardiogram) and long-term variability, because in practical practice they are visually determined as a unit. Hence, the definition of variability is based visually on the amplitude of the complexes, with exclusion of the sinusoidal pattern.

I. There is good evidence that a number of characteristics of FHR patterns are dependent upon fetal gestational age and physiologic status as well as maternal physiologic status. Thus, FHR tracings should be evaluated in the context of many clinical conditions including gestational age, prior results of fetal assessment, medications, maternal medical conditions, and fetal conditions (e.g., congenital anomalies, fetal anemia, arrhythmia, etc).

J. The individual components of defined FHR patterns do not occur independently and generally evolve over time.

K. Periodic or episodic decelerations.

L. Changes or trends of FHR patterns over time.

Uterine contractions are quantified as the number of contractions present in a 10-minute window, averaged over 30 minutes. Uterine contraction frequency alone is a partial assessment of uterine activity. Other factors such as duration, intensity, and relaxation time between contractions are equally important in clinical practice.

The following represents terminology to describe uterine activity:

A. Normal ≤5 contractions in 10 minutes, averaged over a 30-minute window.

B. Tachysystole >5 contractions in 10 minutes, averaged over a 30-minute window.

C. Characteristics of uterine contractions:
   - Tachysystole should always be qualified as to the presence or absence of associated FHR decelerations.
   - The term tachysystole applies to both spontaneous or stimulated labor. The clinical response to tachysystole may differ depending on whether contractions are spontaneous or stimulated.
   - The terms hyperstimulation and hypercontractility are not defined and should be abandoned.

Fetal heart rate patterns are defined by the characteristics of baseline, variability, accelerations, and decelerations.

The baseline FHR is determined by approximating the mean FHR
NORMAL UTERINE ACTIVITY
NORMAL UTERINE ACTIVITY
UTERINE IRRITABILITY WITH CONTRACTIONS
TACHYSYSTOLE
TACHYSYSTOLE
TACHYSYSTOLE WITH HYPERTONIA

11:30
CALCULATING NORMAL UTERINE ACTIVITY WITH IUPC

- Internal uterine pressure catheter (IUPC)

- Montevideo Units: Calculated by subtracting resting tone from peak uterine activity for each contraction in 10 minutes. (Caldeyro-Barcia)
  - Labor found to begin clinically when MVU’s rose to 80-120 with contraction strength of ≥ 40 mm Hg. This equates to 2-3 contractions every 10 min.
  - First stage: MVU’s- 100-250, frequency of 3-5 every 10 min
  - Second stage: MVU’s 300-400; ctx frequency of 5-6 every 10 min.
NORMAL UTERINE ACTIVITY

• Caldeyro-Barcia:
  • Uterine contractions that palpate as moderate or stronger are likely to have peaks of $\geq 50$ mm
  
  • First stage of labor: ctx intensity is 40-70 mm
  
  • Second stage of labor: ctx intensity is 80mm or more

• Relaxation time: $\geq 60$ seconds in first stage
  $\geq 45$ seconds in second stage
WHAT ABOUT INTER-CONTRACTION INTERVAL?

FHR 240 bpm

FHR 240 bpm

FHR 240 bpm

FHR 240 bpm

FHR 240 bpm

FHR 240 bpm

FHR 240 bpm

FHR 240 bpm

FHR 240 bpm
OXYTOCIN

• ISMP 2011 List of High Alert Medications: These medications bear a heightened risk of patient harm when used in error.

• colchicine injection***
• epoprostenol (Flolan), IV
• insulin, subcutaneous and IV
• magnesium sulfate injection
• methotrexate, oral, non-oncologic use
• opium tincture
• oxytocin, IV
• nitroprusside sodium for injection
• potassium chloride for injection concentrate
• potassium phosphates injection
• promethazine, IV
• sodium chloride for injection, hypertonic (greater than 0.9% concentration)
• sterile water for injection, inhalation, and irrigation
• (excluding pour bottles) in containers of 100 mL or more
ENDOGENOUS OXYTOCIN

- First stage of Labor:
  - Maternal circulating concentrations approximately 2-4 mu/min
  - Fetal contribution similar to 3 mu/min
  - Combined effect: 5-7 mu/min
EXOGENOUS OXYTOCIN

• Half life is 10-12 minutes
• 3-5 half-lives to achieve a steady state concentration
  • Therefore: uterine response would be notable within 30-60 min

• Physologic dosing is best:
  • Initial dose: 1-2 mu/min
  • Increase by 1-2 mu/min every 30-60 min
UMBILICAL ARTERY PH (MEANS) IN RELATION TO CONTRACTION PARAMETERS

• **Last hour of first stage of labor**
  Avg. relaxation time (seconds):
  
  pH $\leq 7.11$ (51)
  pH $\geq 7.12$ (63)

• **Second stage of labor**
  Avg. relaxation time (seconds):
  
  pH $\leq 7.11$ (36)
  pH $\geq 7.12$ (47)
Fetal O$_2$ Saturation

- Initially rises at the beginning of a contraction
- After initial increase, O$_2$ saturation declines which persists until the contraction has ceased.
- Ideal contraction interval in which fetal cerebral O$_2$ saturation remains stable or even increases is 2.3 minutes or longer

FETAL O2 SATURATION
FETAL O2 SATURATION
OXYTOCIN DOSAGE

• Physiologic dose is best:
  Most women requiring oxytocin induction achieve adequate contractions and deliver with an infusion at no more than 11-13 mu/min. (Clark et al, 2009)

  There is no advantage in continuing oxytocin infusion after the onset of active labor. (Daniel-Spiegel et al, 2004)

• No evidence that increasing dosage of oxytocin will improve dysfunctional labor. (More oxytocin will cause further desensitization- a rest period of 1-2 hrs is recommended)
CASE PRESENTATIONS