In The Name of God
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Fetal health evaluation  

Fetal heart rate pattern

Antepartum testing

NST  CST

Primary goal  
Identify fetuses at risk hypoxic injury

Secondary goal  
Identify normally oxygenated
<table>
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<th>Pattern</th>
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| Baseline | • The mean FHR rounded to increments of 5 bpm during a 10-minute segment, excluding periodic or episodic changes; periods of marked FHR variability; segments of baseline that differ by more than 25 bpm  
• The baseline must be for a minimum of 2 minutes in any 10-minute segment, or the baseline for that time period is indeterminate. In this case, one may refer to the prior 10-minute window for determination of baseline  
• Normal FHR baseline: 110–160 bpm  
• Tachycardia: FHR baseline is greater than 160 bpm  
• Bradycardia: FHR baseline is less than 110 bpm |
| Baseline variability | • Fluctuations in the baseline FHR that are irregular in amplitude and frequency  
• Variability is visually quantitated as the amplitude of peak to trough in bpm: absent, amplitude range undetectable; minimal, amplitude range detectable but 5 bpm or fewer; moderate (normal), amplitude range 6–25 bpm; marked, amplitude range greater than 25 bpm |
| Acceleration | A visually apparent abrupt increase (onset to peak in less than 30 seconds) in the FHR  
|             | At 32 weeks gestation and beyond, an acceleration has a peak of 15 bpm or more above baseline, with a duration of 15 seconds or more but less than 2 minutes from onset to return  
|             | Before 32 weeks gestation, an acceleration has a peak of 10 bpm or more above baseline, with a duration of 10 seconds or more but less than 2 minutes from onset to return  
|             | Prolonged acceleration lasts 2 minutes or more but less than 10 minutes in duration  
|             | If an acceleration lasts 10 minutes or longer, it is a baseline change |
| Early deceleration | • Visually apparent usually symmetrical gradual decrease and return of the FHR associated with a uterine contraction  
• A gradual FHR decrease is defined as from the onset to the FHR nadir of 30 seconds or more  
• The decrease in FHR is calculated from the onset to the nadir of the deceleration  
• The nadir of the deceleration occurs at the same time as the peak of the contraction  
• In most cases, the onset, nadir, and recovery of the deceleration are coincident with the beginning, peak, and ending of the contraction, respectively |
| Late deceleration | - Visually apparent usually symmetrical gradual decrease and return of the FHR associated with a uterine contraction  
- A gradual FHR decrease is defined as from the onset to the FHR nadir of 30 seconds or more  
- The decrease in FHR is calculated from the onset to the nadir of the deceleration  
- The deceleration is delayed in timing, with the nadir of the deceleration occurring after the peak of the contraction  
- In most cases, the onset, nadir, and recovery of the deceleration occur after the beginning, peak, and ending of the contraction, |
| Variable deceleration | • Visually apparent abrupt decrease in FHR  
• An abrupt FHR decrease is defined as from the onset of the deceleration to the beginning of the FHR nadir of less than 30 seconds  
• The decrease in FHR is calculated from the onset to the nadir of the deceleration  
• The decrease in FHR is 15 bpm or greater, lasting 15 seconds or greater, and less than 2 minutes in duration  
• When variable decelerations are associated with uterine contractions, their onset, depth, and duration commonly vary with successive uterine contractions |
|-----------------------|------------------------------------------------------------------------------------------|
| Prolonged deceleration | • Visually apparent decrease in the FHR below the baseline  
• Decrease in FHR from the baseline that is 15 bpm or more, lasting 2 minutes or more but less than 10 minutes in duration  
• If a deceleration lasts 10 minutes or longer, it is a baseline change |
| Sinusoidal pattern     | • Visually apparent, smooth, sine wave–like undulating pattern in FHR baseline with a cycle frequency of 3–5 per minute which persists for 20 minutes or more |
Category I
Category I fetal heart rate (FHR) tracings include all of the following:
- Baseline rate: 110 to 160 bpm
- Baseline FHR variability: moderate
- Late or variable decelerations: absent
- Early decelerations: present or absent
- Accelerations: present or absent

Category II
Category II FHR tracings include all FHR tracings not categorized as category I or category III. Category II tracings may represent an appreciable fraction of those encountered in clinical care. Examples of
category II FHR tracings include any of the following:

**Baseline Rate**
- Bradycardia not accompanied by absent baseline variability
- Tachycardia

**Baseline FHR Variability**
- Minimal baseline variability
- Absent baseline variability not accompanied by recurrent decelerations
- Marked baseline variability

**Accelerations**
- Absence of induced accelerations after fetal stimulation

**Periodic or Episodic Decelerations**
- Recurrent variable decelerations accompanied by minimal or moderate baseline variability
- Prolonged deceleration ≥2 minutes but <10 minutes
- Recurrent late decelerations with moderate baseline variability
- Variable decelerations with other characteristics, such as slow return to baseline, “overshoots,” and “shoulders”

**Category III**
Category III FHR tracings include either:
- Absent baseline FHR variability and any of the following:
  - Recurrent late decelerations
  - Recurrent variable decelerations
  - Bradycardia
  - Sinusoidal pattern
The goal of FHR monitoring is to detect signs of fetal jeopardy in time to intervene before irreversible damage occurs.

False positive rate is high.
Physiologic pattern according Gestational age

- Input chemoreceptors
- Input baroreceptors
- CNS activities {arousal, sleep}
- Catecholamines
- Blood volume

Moment to moment autonomic modulation
Cardiovascular response to hypoxemia

- FHR response to interrupted oxygenation

- Transient fetal hypoxemia
- Transient interruption of fetal oxygenations
- Acute ongoing interruption of fetal oxygenation
CST

- Lower incidence of fetal death among high risk pregnancies

Stillbirth rates after negative test......0.3 /1000
Reactive positive Cst ....0
Nonreactive positive CST .....88/1000
CST

- is less convient to perform than the NST
- Tend to be more time consuming
- Has some Contraindication:
  - Placenta previa, vasa previa
  - classic c/s –uterin surgery
  - PROM
  - Preterm labor
CST

- Spontaneously 3 contractions /10 min more than 40 seconds
- Oxy rate 0.5 milli unit /min and double every 20 minutes
- Nipple stimulation rubbing one nipple 2 mins
Rise of AF with uterin contractions

\[ \downarrow \]

Lowers blood flow of intervillous space

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Impaired oxygen exchange
In uteroplacental pathology

- Late fetal heart decelerations

Cord compression oligohydamnios

- Variable decelerations

Placental insufficiency
For interpreting:

- Gestational age

- Results of prior fetal assessment

- Maternal conditions: medications

- Fetal condition: IUGR, Anemia, Arrhythmia
Indications:

- Diabetes
- Hypertensive disorder
- Fetal growth restriction
- Twin pregnancy
- Postterm pregnancy
- Decreased fetal activity
- Systemic lupus erythematos
- Antiphospholipid syndrome
- Sickle cell disease
- Alloimmunization
- Oligohydramnios or polyhydramnios
- Prior fetal demise
- Preterm prelabor rupture of membrane
- Other: nonimmune hydrops, maternal cyanotic heart disease, poorly controlled maternal hyperthyroidism, maternal vascular disease
Possible indication for antenatal testing

- Advanced maternal age
- Obesity
- Major fetal structural anomalies
- Abnormality in first and second trimester maternal biochemical down syndrome screening results
Timing and frequency

- Don’t have high quality evidence
- Determine optimal frequency of testing
  - Once Weekly
  - twice Weekly
  - 7 days Weekly

Maternal or fetal deterioration require reevaluation with normal test.
Criteria for Interpretation of the Contraction Stress Test

- **Positive** *(abnormal)*: late deceleration following $\geq 50\%$ of contraction. (the test is positive even if the contraction frequency $< 3 \text{C}/10\text{m}$)

- **Negative** *(normal)*: No late deceleration OR significant variable decelerations

- **Equivocal** *(suspicious)*: intermittent late decelerations OR significant variable decelerations

- **Unsatisfactory**: fewer than 3 contractions in 10 minutes (and is not positive as defined above) or is uninterpretable for other reasons.

The presence or absence of acceleration is also generally noted.

Example: a reactive positive CST meets criteria for both reactive NST and a positive CST.
Evaluation of pregnancies with positive CSTs

- May indication for delivery depending on the clinical scenario
- Further evaluation {BPP, DOPPLER VELOCITOMETRY}
- CST variable deceleration {cord compression}

- Reactive positive test... 50% false positive
- Non reactive positive CST... 100% true positive test
Follow up of pregnancy with normal test results

- **Negative predictive value of a normal test result**: The negative predictive value for stillbirth within one week of a normal test ranges from 99.8 to 100 percent.

- **Follow up pregnancies with a normal result and a transient condition as indication for testing**: A single normal test result without follow up testing is adequate if the test was performed for nonrecurring indication in a otherwise low risk pregnancy.

- **Follow up pregnancies with a normal result and a chronic condition as indication for testing**:
  - If a change in pregnancy status occurs
  - In clinical setting considered to be very high risk for fetal demise
  - At 36 weeks of gestation
management of pregnancies with abnormal test result

- transient condition as cause of abnormal test
- chronic condition as cause of abnormal result:
  - gestational age severity of maternal and fetal disease
  - progression of disease
  - other available information
Rout of delivery
Thank You