THE NONSTRESS TEST (NST) AND CONTRACTION STRESS TEST (CST)

FLAME LECTURE: 54B

STELLER 12.31.23

LEARNING OBJECTIVES

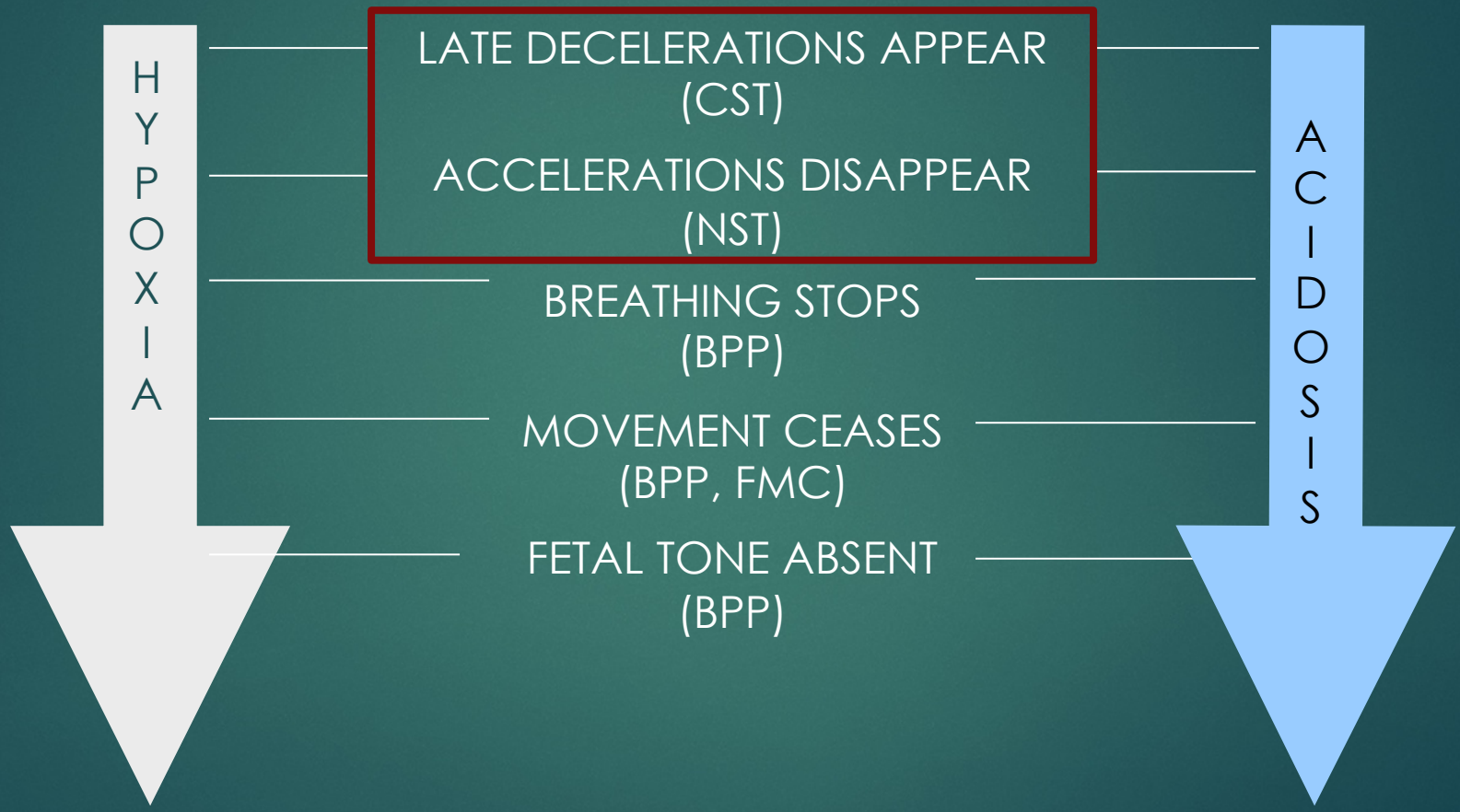
- Understand the rationale for fetal assessment
- Describe approaches for assessment of fetal well being
- Prerequisites:
  - FLAME LECTURE 53: Overview of Interpreting Fetal Heart Rate Tracings
  - FLAME LECTURE 54: Outpatient Antenatal Testing
- See also – for closely related topics
  - FLAME LECTURE 56: The Biophysical profile
  - FLAME LECTURE 57: Assessment of fetal movement
  - FLAME LECTURE 59: Assessment of amniotic fluid volume

RATIONALE OF PRENATAL OUTPATIENT FETAL ASSESSMENT

- Goals
  - Detect uteroplacental insufficiency
  - Prevent stillbirth
  - Avoid unnecessary iatrogenic preterm delivery
- Physiologic basis: The fetal brain is incredibly sensitive to changes in O_2 and pH, and under stress:
  - Chemoreceptor response to acidemia → vagally-mediated deceleration of the fetal heart rate
  - Fetal movements decrease as the fetus attempts to conserve energy[1-2]
  - Blood flow is directed to the brain, heart and adrenals and away from the kidneys → a decrease in renal perfusion → a decrease in fetal urine production → oligohydramnios

1. Olesen AG. Acta Obstet Gynecol Scand. 2004.
2. Manning FA. AJOG 1993

Antepartum Fetal Distress Cascade



Porto M. Clin Ob Gyn.1987

NONSTRESS TEST (NST)

- A fetus that has moderate variability and accelerations in FHR is reassuring that a fetus that is NOT acidotic or neurologically depressed
  - REACTIVE: ≥2 accelerations within 20 minutes
    - Accelerations ≥ 32 weeks: 15 BPM above baseline + lasting ≥ 15s[4-5]
    - Accelerations < 32 weeks: 10 BPM above baseline + lasting ≥ 10s
  - NONREACTIVE: <2 accelerations in 40 minutes
- Commonly, there can be decreased variability or # of accelerations in the setting of fetal sleep cycles
  - Vibroacoustic stimulation can be performed to wake up the baby. The presence of accelerations after "stimming" = reassuring FWB[6-9]
    - Advantages: doesn't require an IV, oxytocin, or contractions
    - No contraindications

4. Cousins LM. AJOG 2012
5. Glantz JC. Obstet Gynecol 2011
6. Clark SL. Obstet Gynecol 1989
7. Miller DA. AJOG 1996
8. Smith CV. AJOG 1986
9. Tan KH. Cochrane Review 2013

NONSTRESS TEST: SIGNIFICANCE[10-13]

- Nonreactivity is associated with:
  - Fetal distress in labor (5x)
  - Low 5 min. Apgar scores (6x)
  - Increased Fetal Death Rate (7-12x)
- Decelerations during a Reactive NST:
  - Increased distress in labor (2 – 3X)
  - Likelihood of FGR (8 – 12X) [*so consider reassessing growth*]
  - Increased Fetal Death (5X)

10. Bishop EH. AJOG. 1981
11. Macones GA. Obstet Gynecol. 2008
12. Lavin JP. Obstet Gynecol. 1984
13. Druzin ML. AJOG 1985

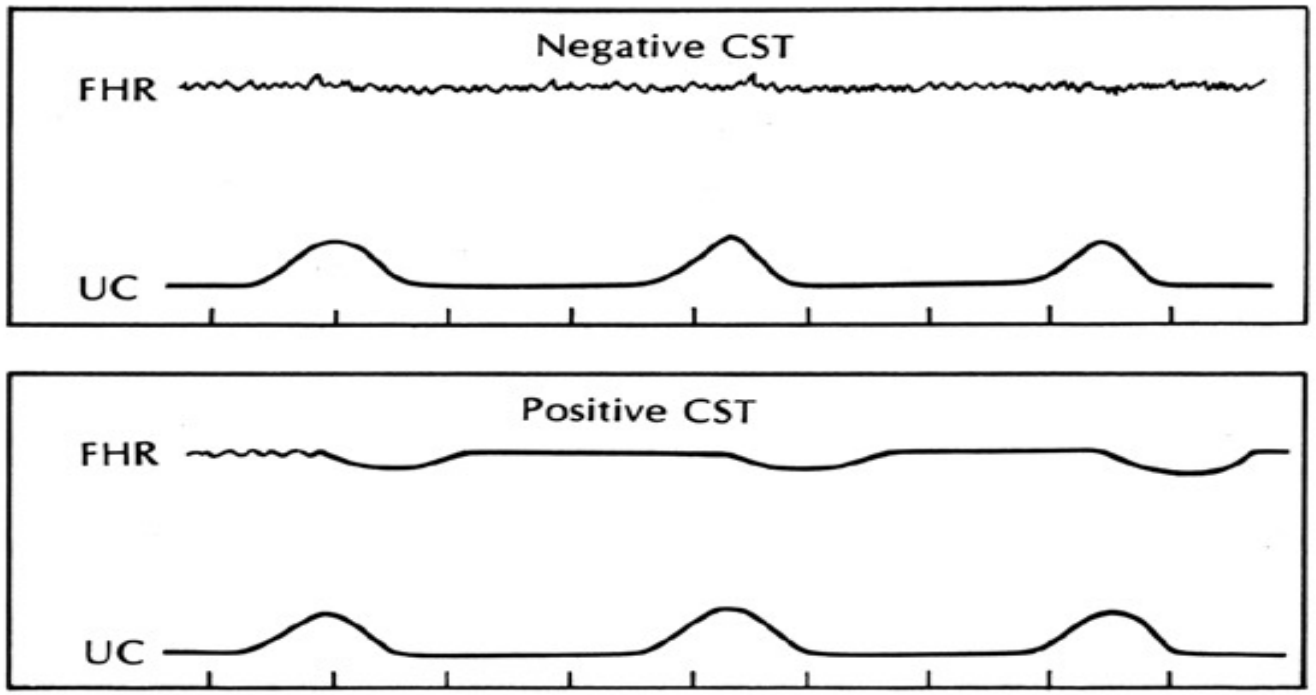
CONTRACTION STRESS TEST (CST)

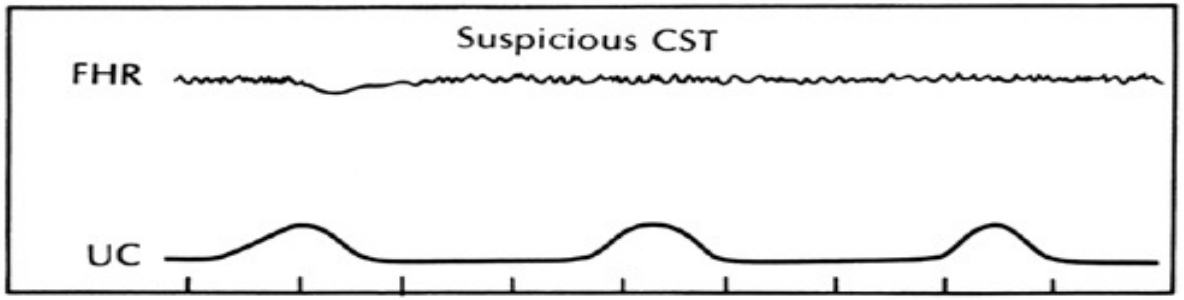
- Is based on the premise that uterine contractions transiently restrict O_2 delivery to the fetus → chemoreceptor-mediated recurrent late decelerations
- Can be instituted via nipple stimulation (works ½ of the time) or by titrating IV oxytocin
  - OCT = oxytocin challenge test

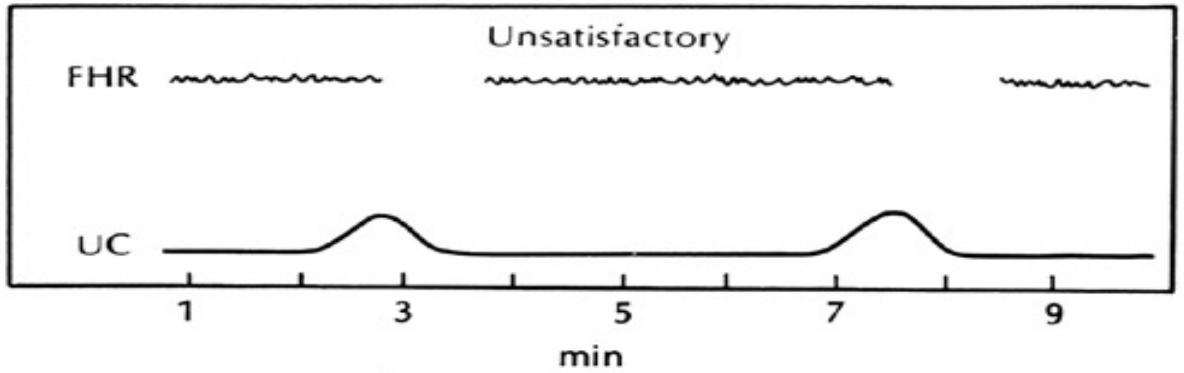
CONTRACTION STRESS TEST (CONT'D)

- Must have visualization of 3+ contractions of >40s duration within 10 mins for assessment to be valid
- Results/scoring
  - Negative = no late or significant variable decels
  - Positive = late decels following >50% contractions (even if <3 contractions in ten minutes)
  - Equivocal-suspicious: intermittent late decels or significant variable decels
  - Equivocal-hyperstimulatory: decels with contractions occurring more frequently than q2mins or lasting >90 seconds
  - Unsatisfactory: <3 CTX in 10min or non-interpretable FHR tracing

CONTRACTION STRESS TEST







REASSURANCE?

- Incidence of stillbirth within 1 week after a normal fetal assessment[3-5]
  - 1.9/1000 NSTs - NPR of 99.8%
  - 0.3/1000 CSTs – NPR of 99.9%
  - 0.8/1000 BPPs – NPR of 99.9%
  - 0.8/1000 mBPPs – NPR of 99.9%
  - 0/214 Dopplers in FGR fetuses – NPR of 100%[6]
- Antenatal testing does NOT predict stillbirths related to acute changes in maternal-fetal status (i.e., Abruptio placentae, Umbilical cord accident)
- Achilles heel is high false positive rate (approx 35% CST, 55% NST)
- Thus, we use the NPR to reassure ourselves by ruling out acidemia, rather than ruling it in.

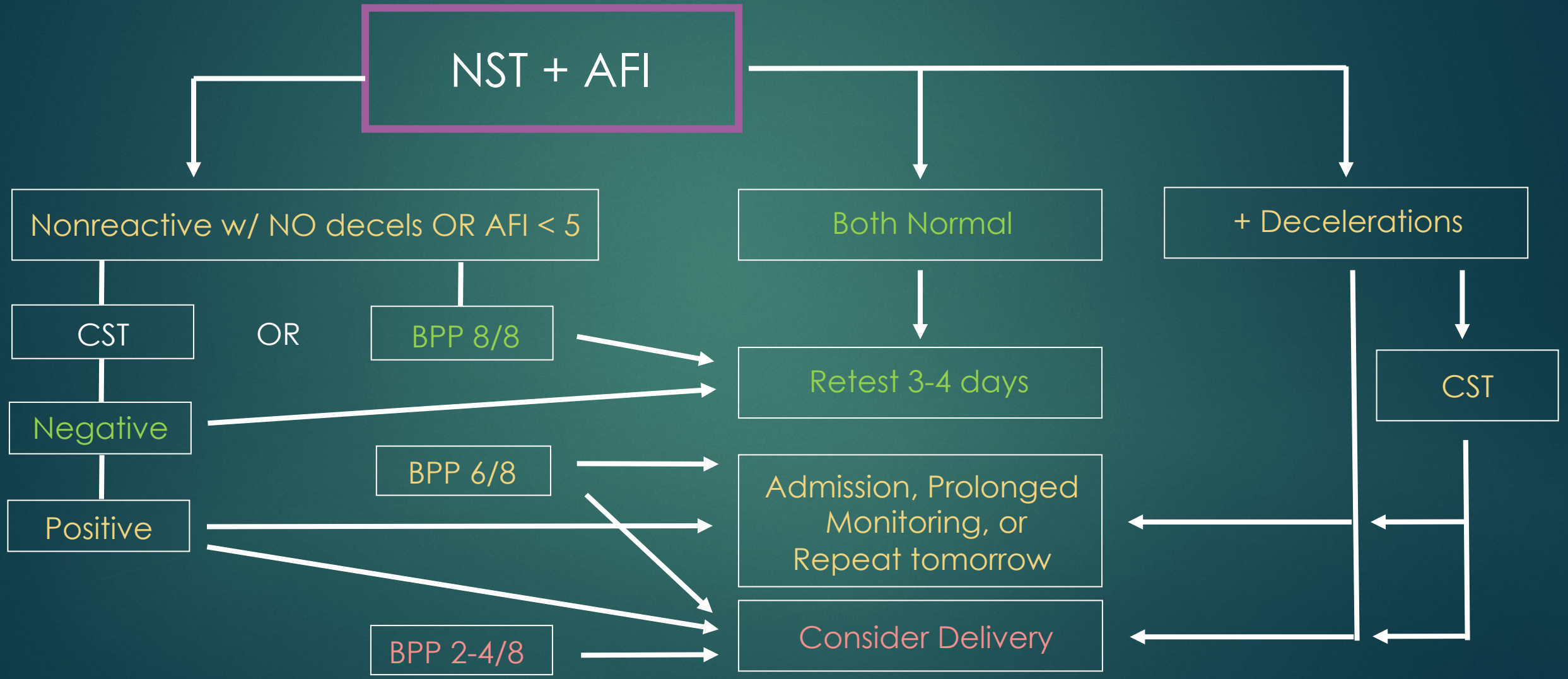
DDX FOR ABNORMALITIES UPON SURVEILLANCE

- Placental insufficiency / Cord Compression / Head Compression
- Sleep (especially deep sleep)
  - However, since the sensitivity to depth and duration of sleep varies by a discrete regulatory center, it is unusual to observe abnormalities of more than one variable 2/2 to sleep
- Fetal immaturity
- Maternal smoking in close proximity to test
- Maternal medication/elicit drug exposure
- Fetal central nervous system abnormalities

ABNORMAL TESTING… NOW WHAT?

- Fix the offending disease process if possible (i.e., DKA, PNA)
- Consider a 'back-up' test (CST, BPP) or prolonged monitoring)
- Consider admission for observation with continuous fetal monitoring (CFM) vs. repeat testing in short intervals[7]
- Consider expediting delivery after weighing the risks and benefits of fetal prematurity (depending upon gestational age) and the condition/disease state

ONE PRACTICAL APPROACH



IMPORTANT LINKS

- PRACTICE BULLETIN 145 – Antepartum Fetal Surveillance
- Olesen AG. Acta Obstet Gynecol Scand. 2004.
- Manning FA. AJOG 1993
- Porto M. Clin Ob Gyn.1987
- Cousins LM. AJOG 2012
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- Lavin JP. Obstet Gynecol. 1984
- Druzin ML. AJOG 1985.
- Manning FA. AJOG. 1990.
- Freeman RK. AJOG 1982
- Miller DA. AJOG 1996.
- Manning FA. AJOG. 1987.
- Almstrom H. Lancet. 1992