

BIOPHYSICAL PROFILE

FLAME LECTURE: 56

STELLER 12.31.23

LEARNING OBJECTIVES

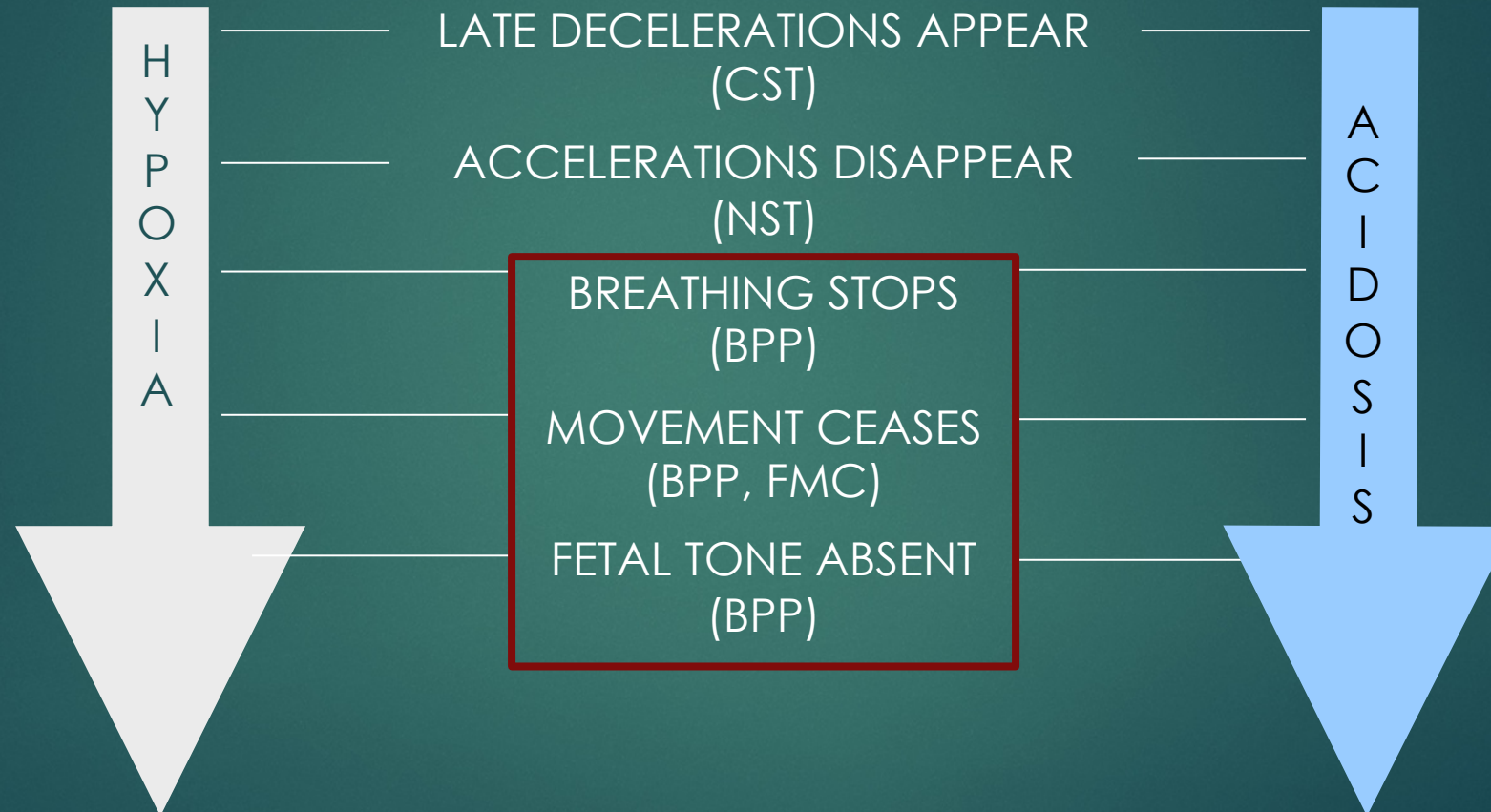
- ▶ To understand rationale for fetal assessment
- ▶ To describe approaches for assessment of fetal well being
- ▶ Prerequisite:
 - ▶ FLAME LECTURE 54: Outpatient Antenatal Testing
- ▶ See also – for closely related topics
 - ▶ FLAME LECTURE 53: Overview of Interpreting Fetal Heart Rate Tracings
 - ▶ FLAME LECTURE 54B: The Nonstress Test (NST) and Contraction Stress Test (CST)
 - ▶ FLAME LECTURE 57: Assessment of fetal movement
 - ▶ FLAME LECTURE 59: Assessment of amniotic fluid volume

RATIONALE OF PRENATAL OUTPATIENT FETAL ASSESSMENT

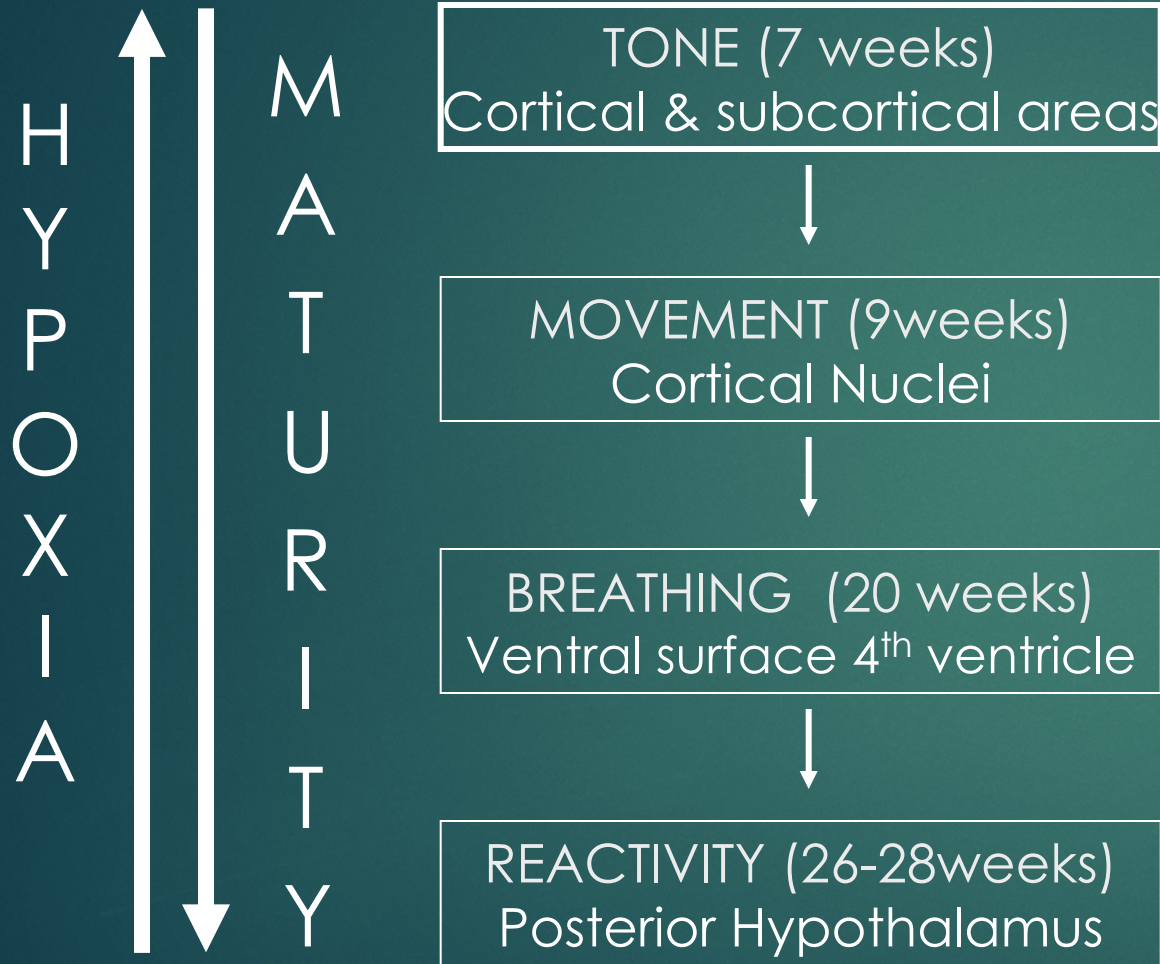
- ▶ Goals
 - ▶ Detect uteroplacental insufficiency
 - ▶ Prevent stillbirth
 - ▶ Avoid unnecessary iatrogenic preterm delivery
- ▶ Physiologic basis: The fetal brain is incredibly sensitive to changes in O_2 and pH, and under stress:
 - ▶ Chemoreceptor response to acidemia → vagally-mediated deceleration of the fetal heart rate
 - ▶ Fetal movements decrease as the fetus attempts to conserve energy¹⁻²
 - ▶ 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



FETAL CNS CONTROL



▶ Looking at variables derived from CNS centers is ideal

- ▶ Tone
- ▶ Body movements
- ▶ Breathing movements
- ▶ Cardiac activity
- ▶ Eye movements
- ▶ Swallowing
- ▶ Micturition

BIOPHYSICAL PROFILE (BPP)

- ▶ Combines the NST, AFI, and assessments of fetal breathing & body/limb movements
 - ▶ Carried out for at least 30min (optional extension to 60m)
- ▶ The risk of fetal death within one week of a normal BPP is estimated to be 1/1300⁴
- ▶ Can be performed from viability til delivery
- ▶ BPP correlates over 90% with the current fetal pH, and a normal score predicts a pH >7.25 with 100% PPV; an abnormal score on the other hand predicts current fetal acidemia with similar certainty⁵⁻⁹

4. Manning FA. Am J Obstet Gynec 1987
5. Manning FA. Am J Obstet Gynec 1993
6. Mangesi L. Cochrane Database Syst Rev 2007

7. Freeman RK. Am J Obstet Gynecol 1982
8. Baschat AA. Ultrasound Obstet Gynecol. 2006
9. Baschat AA. AJOG. 2022.

RATIONALE OF INCLUDING ASSESSMENT OF AMNIOTIC FLUID VOLUME IN THE BPP

- ▶ In fetal hypoxia, fetal autoregulation of vascular tone preserves essential organs
 - ▶ Blood flow is directed to the brain, heart, and adrenals and away from the kidneys
 - ▶ OVER TIME (days to weeks), a decrease in renal perfusion → a decrease in fetal urine production → oligohydramnios
 - ▶ Therefore, a low AVF is a marker of **CHRONIC** uteroplacental insufficiency
- ▶ The other, CNS-derived, ultrasound markers previously described are **ACUTE** indicators of fetal acidemia

FETAL BREATHING MOVEMENTS

- ▶ Fetal breathing can start to be observed by 20-21 weeks
- ▶ More frequent movement during REM sleep and in setting of hyperglycemia
- ▶ Decreased with hypoxia, smoking, narcotics, labor
- ▶ On US, in the sagittal view, you can see downward movement of the diaphragm
- ▶ On US, in the axial view, you can see inward chest wall movement

BIOPHYSICAL PROFILE – SCORING⁹⁻¹²

- ▶ FIVE components:
 - ▶ Reactive NST
 - ▶ **Maximum vertical pocket > 2 cm** (or AFI > 5)
 - ▶ ≥ 1 episode of breathing lasting ≥ 30s (including hiccups)
 - ▶ ≥ 3 discrete body or limb movements
 - ▶ ≥ 1 episode of limb extension with return to flexion, or opening/closing of hand
- ▶ Each component is worth TWO points (no partial credit)
 - ▶ Normal: ≥ 8/10 (or 8/8 without NST)
 - ▶ Equivocal: 8/10 (if DVP <2cm) or 6/10 (if DVP >2cm)
 - ▶ Abnormal: 6/10 (if DVP <2cm) or 4/10 (if DVP >2cm)
- ▶ NST may be omitted without compromising test validity if the other 4 components = 8/8

BPP MANAGEMENT

Interpretation	Findings	IUFD w/in 7 Days	Management
Normal	10/10 8/10 (DVP >2)	1/1000 1/1000	Continue current
Equivocal	8/10 (DVP <2) 6/10 (DVP >2)	89/1000 Variable	Repeat BPP w/in 24 hrs
Abnormal	6/10 (DVP <2) 4/10 (DVP >2)	89/1000 91/1000	Evaluate for delivery
Severely Abnormal	2/10 0/10	125/1000 600/1000	Deliver

IMPORTANT LINKS & REFERENCES

- ▶ [PRACTICE BULLETIN 145 – Antepartum Fetal Surveillance](#)
- ▶ Olesen AG. Acta Obstet Gynecol Scand. 2004
- ▶ Manning FA. AJOG. 1993
- ▶ Porto M. Clin Ob Gyn. 1987
- ▶ Manning FA. Am J Obstet Gynec 1993
- ▶ Manning FA. Am J Obstet Gynec 1987
- ▶ Mangesi L. Cochrane Database Syst Rev 2007
- ▶ Freeman RK. Am J Obstet Gynecol 1982
- ▶ Baschat AA. Ultrasound Obstet Gynecol. 2006
- ▶ Chamberlain PF AJOG 1984
- ▶ Manning FA. AJOG 1990
- ▶ Nabhan AF. Cochrane 2008
- ▶ Manning FA. AJOG 1987
- ▶ Baschat AA. AJOG 2022.