Assessment of Fetal Health

Dr F.Kaveh, Perinatologist

Assessment of Normal Fetal Physiology

- Maternal evaluation of fetal activity
- Non stress testing
- BPP
- Doppler

Fetal heart rate changes during development

- Gradual decrease in heart rate
- Increase in variability
- Increasing responsiveness to acute changes in fetal status (including accelerations and decelerations)

The ability of the fetus to accelerate its heart rate in response to movement is related to fetal oxygenation and metabolic state

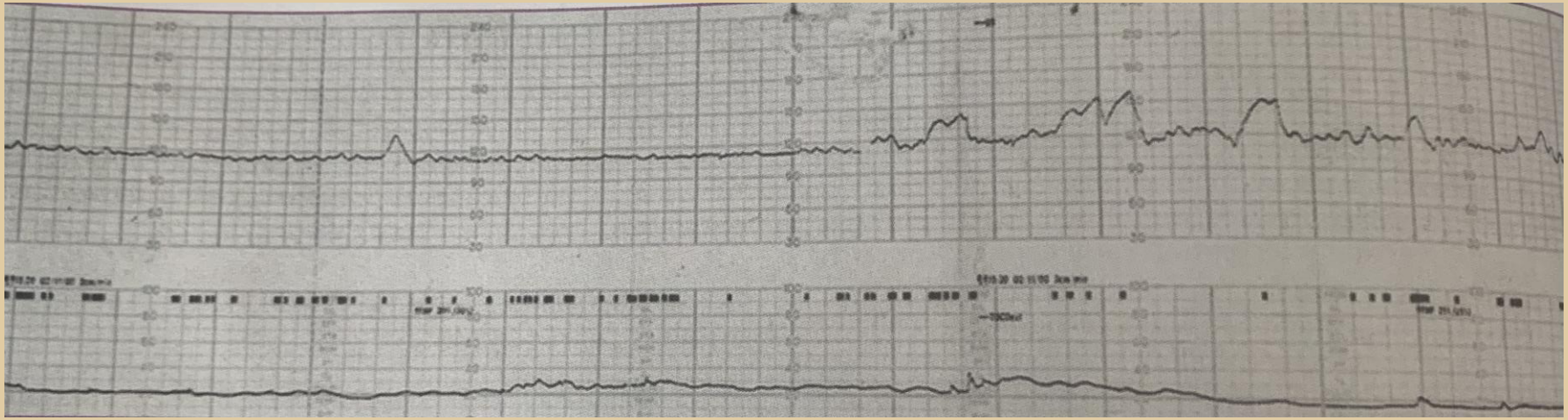
This provides the basis for nonstress testing.

Fetal Behavior

The presence of normal fetal muscle tone, gross body movements, and breathing have been reliably tied to the absence of fetal hypoxemia and academia

This is the basis for the BPP

Near term, periods of inactivity that correspond to episodes spent in the quiet sleep state, as illustrated by the nonreactive nonstress test (NST), can be confused with fetal compromise.



This illustrates the importance of using multiple modalities of fetal assessment to decrease the false positive rate of any one test.

Fetal Heart Rate Monitoring

Many studies have shown it to be the most sensitive short term predictor of worsening hypoxemia or acidosis, it has become part of fetal monitoring of labor and delivery.

However, preterm fetuses, fetuses with intrauterine growth restriction (IUGR), or fetuses exposed to maternal medication such as narcotics or magnesium sulfate frequently have paired FHR acceleration and fetal movements that do not meet these criteria. Modification of these criteria based on gestational age.

False reassuring NST results

Defined by fetal death with in one week, occurred at a rate of 1.9:1000 fetuses in the largest study.

Programs incorporating maternal counting of fetal movements and other published protocols for fetal assessment (in most cases, the addition of an assessment of amniotic fluid volume) may help to identify additional pregnancies at risk.

About 10% to 12% of fetuses in the third trimester do not meet these criteria at 30 minutes but this number falls below 6% by 40 minutes.

The most common explanation for a non reactive NST result is a sleep cycle in a normal fetus that is longer than average.

Ultrasound evaluation with a BPP should be available as the back up test. Ultrasound provides additional fetal evaluation that may help to diagnose the reason for an apparently abnormal NST result.

Bradycardia

- congenital heart block and serious fetal compromise
- Maternal hypothermia under general anesthesia
- Sustained fetal bradycardia in severe pyelonephritis
- Baseline FHR < 110 bpm

Tachycardia

- **Baseline FHR > 160 bpm**

- maternal fever from chorioamnionitis (most common) with no fetal compromise unless there are associated periodic heart rate changes or fetal sepsis
- fetal compromise
- cardiac arrhythmias
- maternal administration of parasympathetic (atropine) or sympathomimetic (terbutaline)
- maternal hypotension caused by epidural analgesia

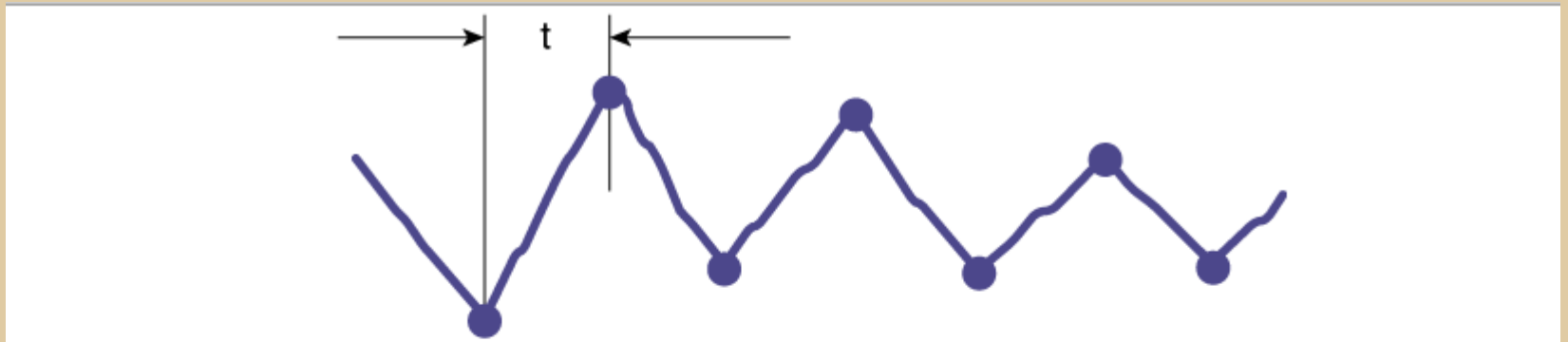
The key feature to distinguish fetal compromise in association with tachycardia seems to be concomitant heart rate decelerations (tachycardia + deceleration)

Beat-to-Beat Variability

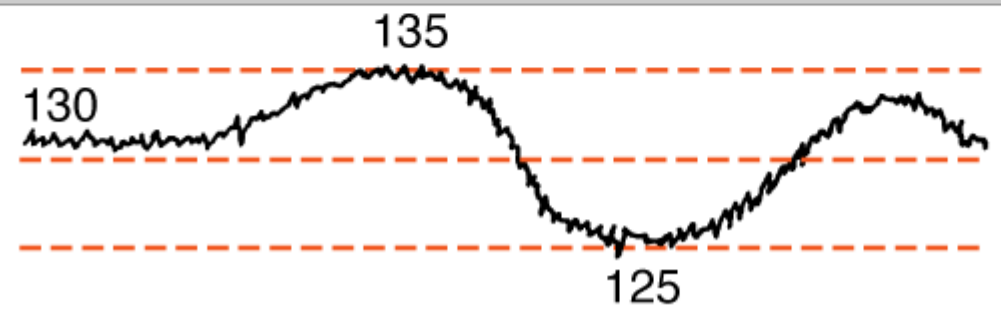
- an important index of cardiovascular function
- regulated largely by the autonomic nervous system

- *Short-term variability*
- *Long-term variability*

most clinical interpretation is based on visual analysis with subjective judgment of the smoothness or flatness of the baseline



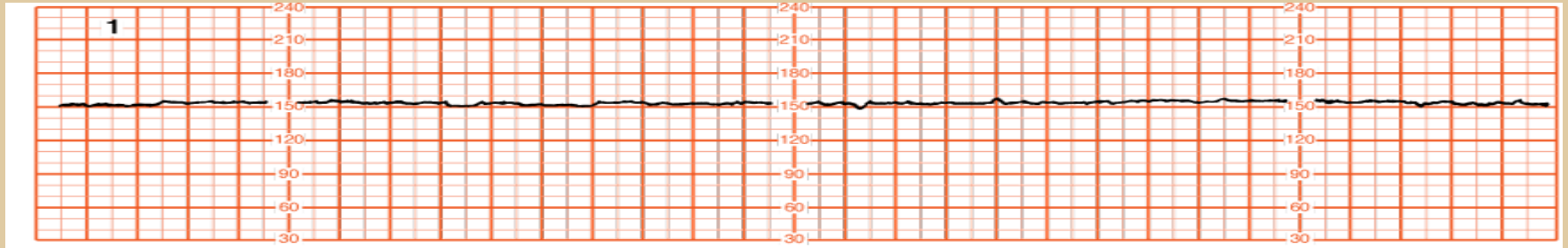
of short-term beat-to-beat variability measured by a fetal scalp electrode. (t = time interval between successive fetal R waves.) (Adapted from

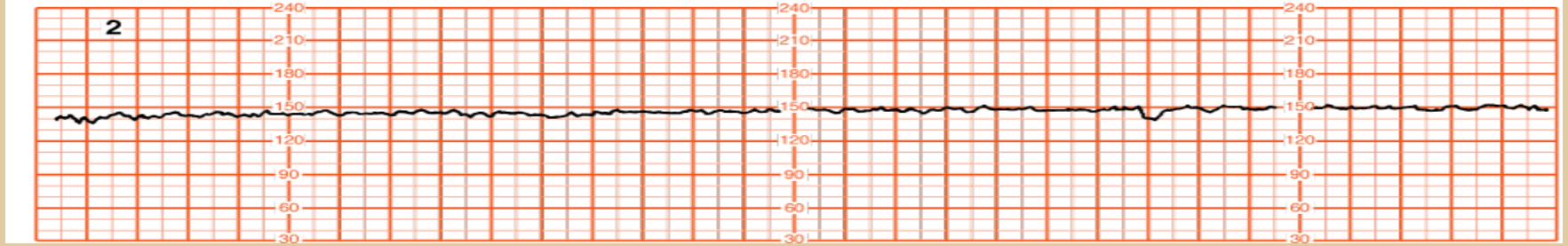


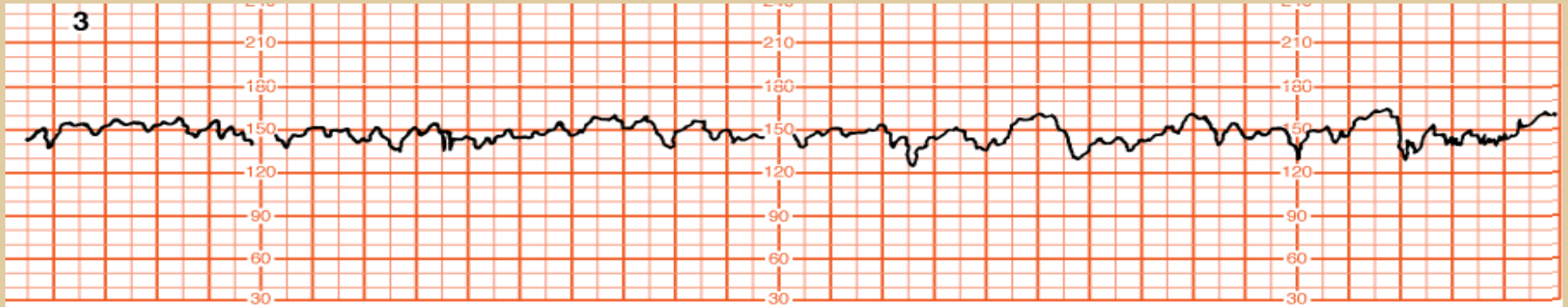
The normal frequency of such waves is 3-5 cycles per minute

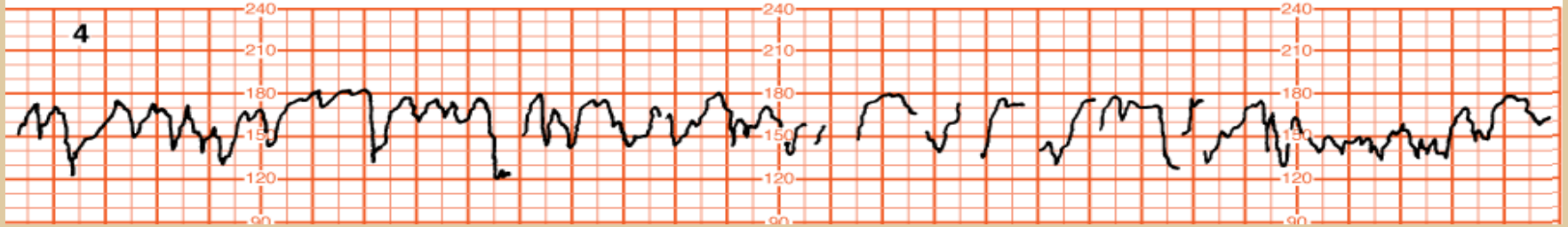
Causes of decreased variability

- Prematurity
- Fetal metabolic acidosis
- CNS depressants
- Fetal sleep cycles (after 30 wk)
- Fetal tachycardia
- Neurologic abnormality
- Betamethasone
- Analgesic
- Mgso4







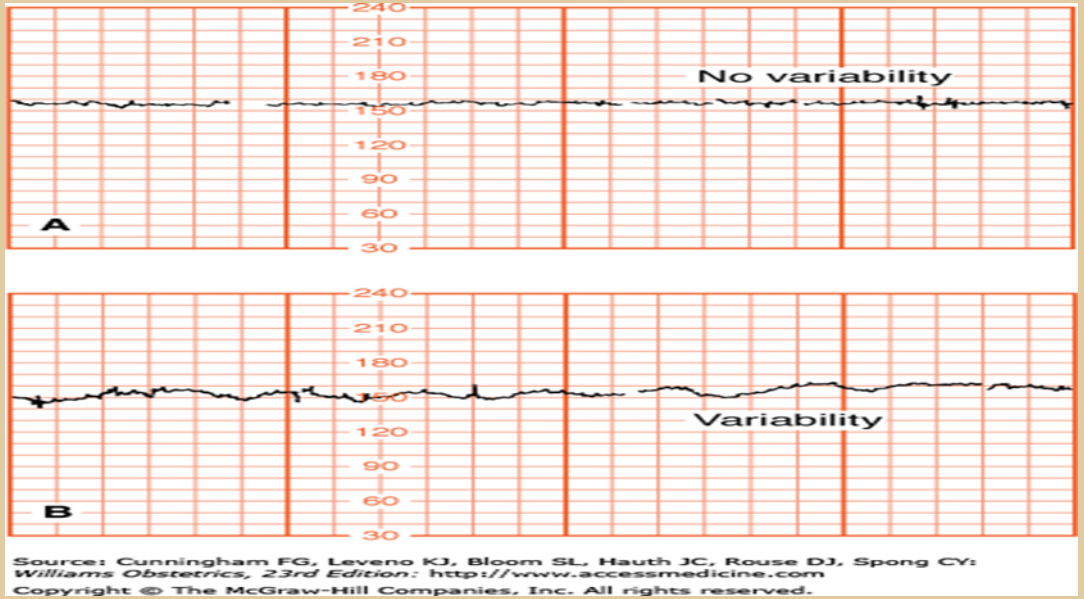


Decreased Variability

- Diminished beat-to-beat variability can be an ominous sign indicating a seriously compromised fetus

- loss of variability + decelerations *fetal acidemia*

Cause:
Maternal acidemia



- beat-to-beat variability is affected by a variety of pathological and physiological mechanisms
- Variability has considerably different meaning depending on the clinical setting
- The development of decreased variability in the absence of decelerations is *unlikely to be due to fetal hypoxia*
- persistently flat fetal heart rate baseline—absent variability—within the normal baseline rate range and *without decelerations* may reflect a previous insult to the fetus that has resulted in neurological damage

Biophysical Profile

The BPP relies on the premise that multiple parameters of well being are better predictors of outcome than any single parameter.

Amniotic fluid measurement

Fetal breathing movements
Rhythmic fetal diaphragm contractions or hiccups lasting more than 30 seconds.

Fetal movement and tone

Factors that influence Biophysical Profile scoring performance

TABLE 34.3 Factors That Influence Biophysical Profile Scoring Performance

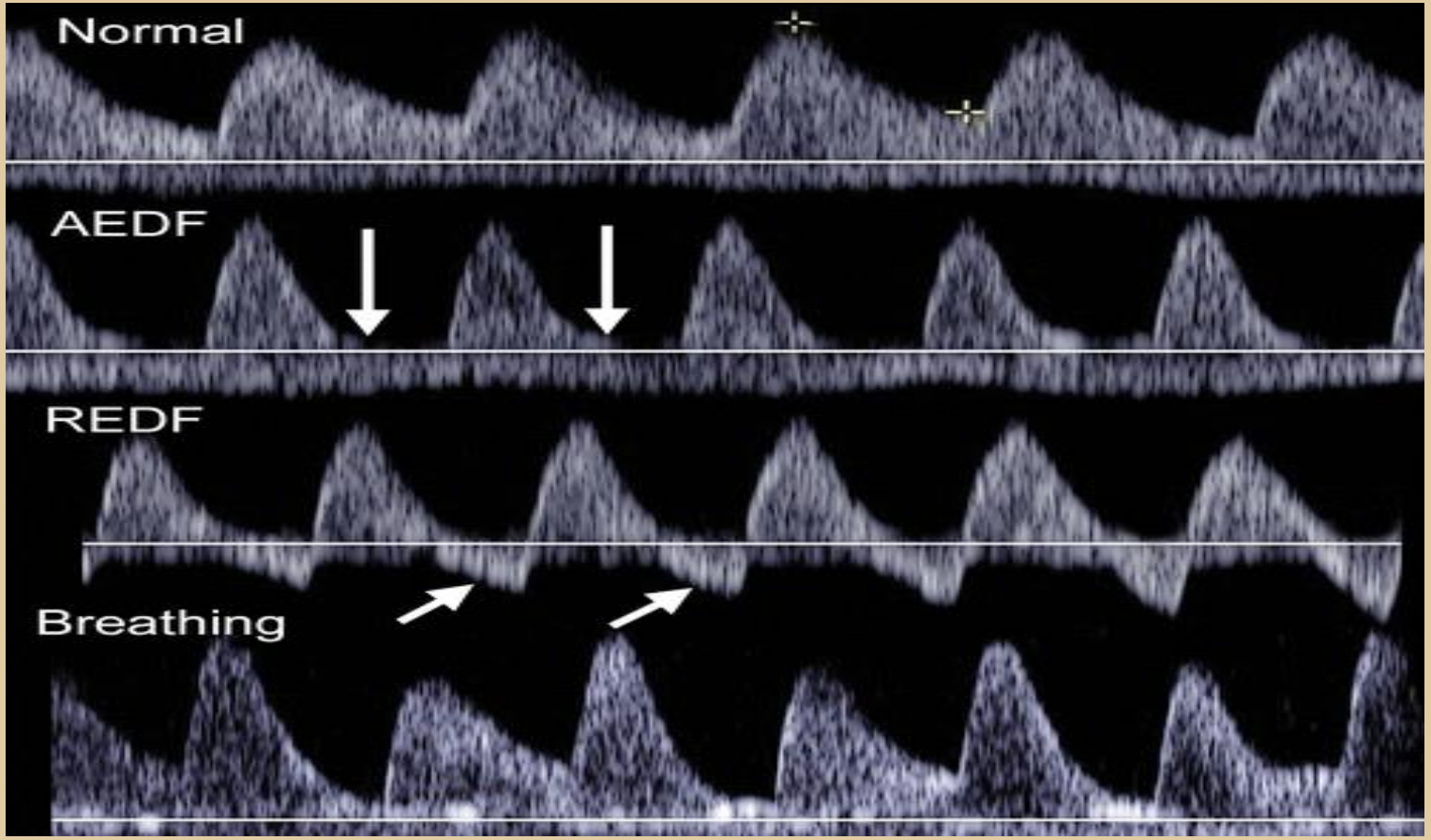
Agent	Fetal Effect
Drugs	
Sedatives or sedative side effects (e.g., Aldomet)	Diminished activity of all varieties; abolition of none
Excitatory (e.g., theophylline)	Continuous, "picket fence" FBMs
Street drugs (e.g., crack cocaine)	Rachitic, rigid, furious, bizarre FMs
Indomethacin	Oligohydramnios
Maternal cigarette smoking	Various observations; FBMs abolished or attenuated but some report no change; FMs reduced
Maternal hyperglycemia (iatrogenic or unregulated)	Sustained FBMs or acidosis, diminution or abolition of FMs or FT or NST reactivity
Maternal hypoglycemia (e.g., poor nutrition, insulin excess)	Abnormal paucity of all behaviors, normal AFV
Single parameter removed by perinatal condition	
Persistent fetal arrhythmia	Uninterpretable NST
Spontaneous premature rupture of membranes	Obligatory oligohydramnios
Acute change in status (e.g., eclampsia, abruptio placentae, ketoacidosis)	May invalidate predictive accuracy
Corticosteroids	Transient decrease in FBMs

Vibroacoustic Stimulation

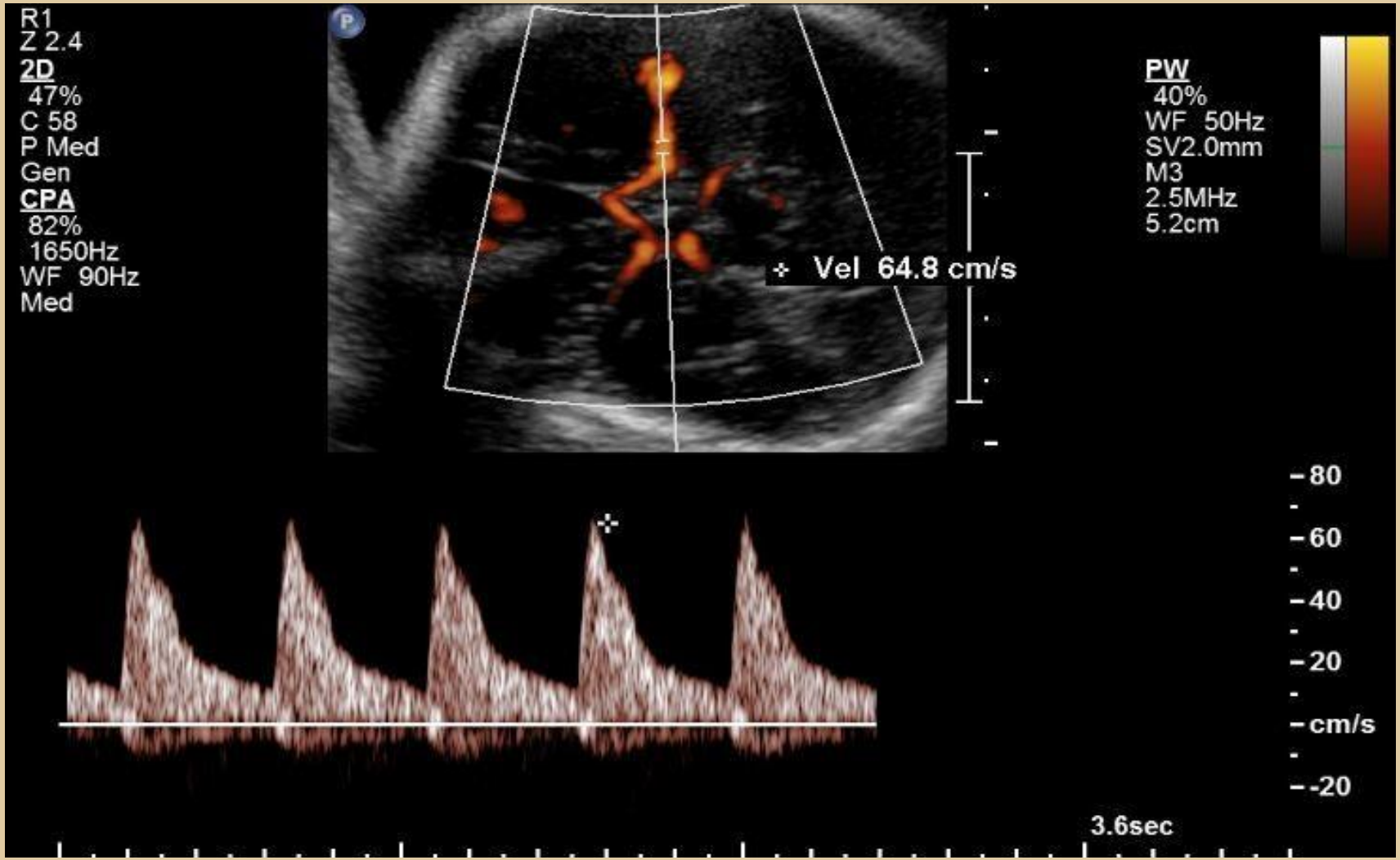
Contraction stress test and oxytocin challenge test

Doppler ultrasound

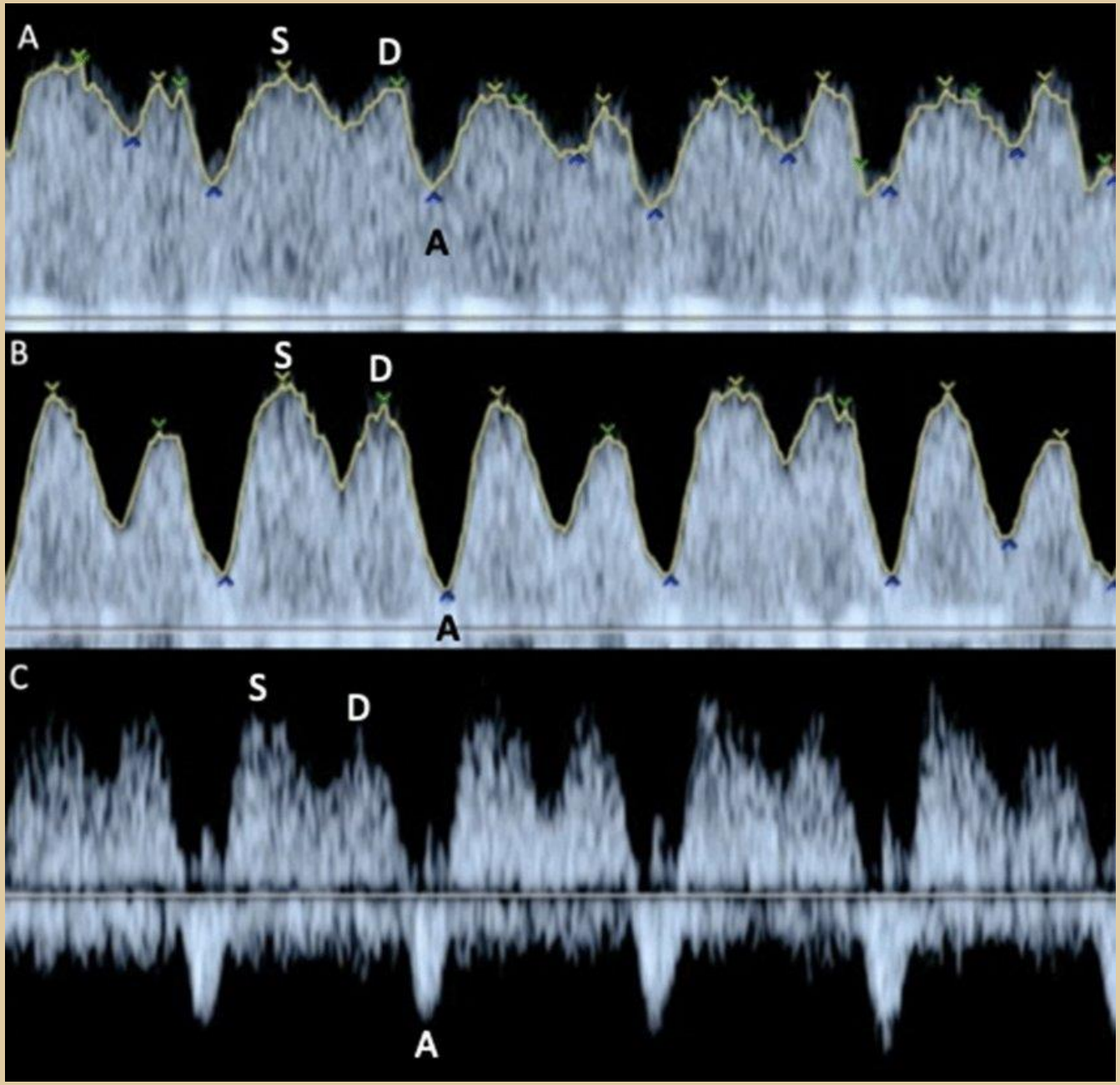
Umbilical artery



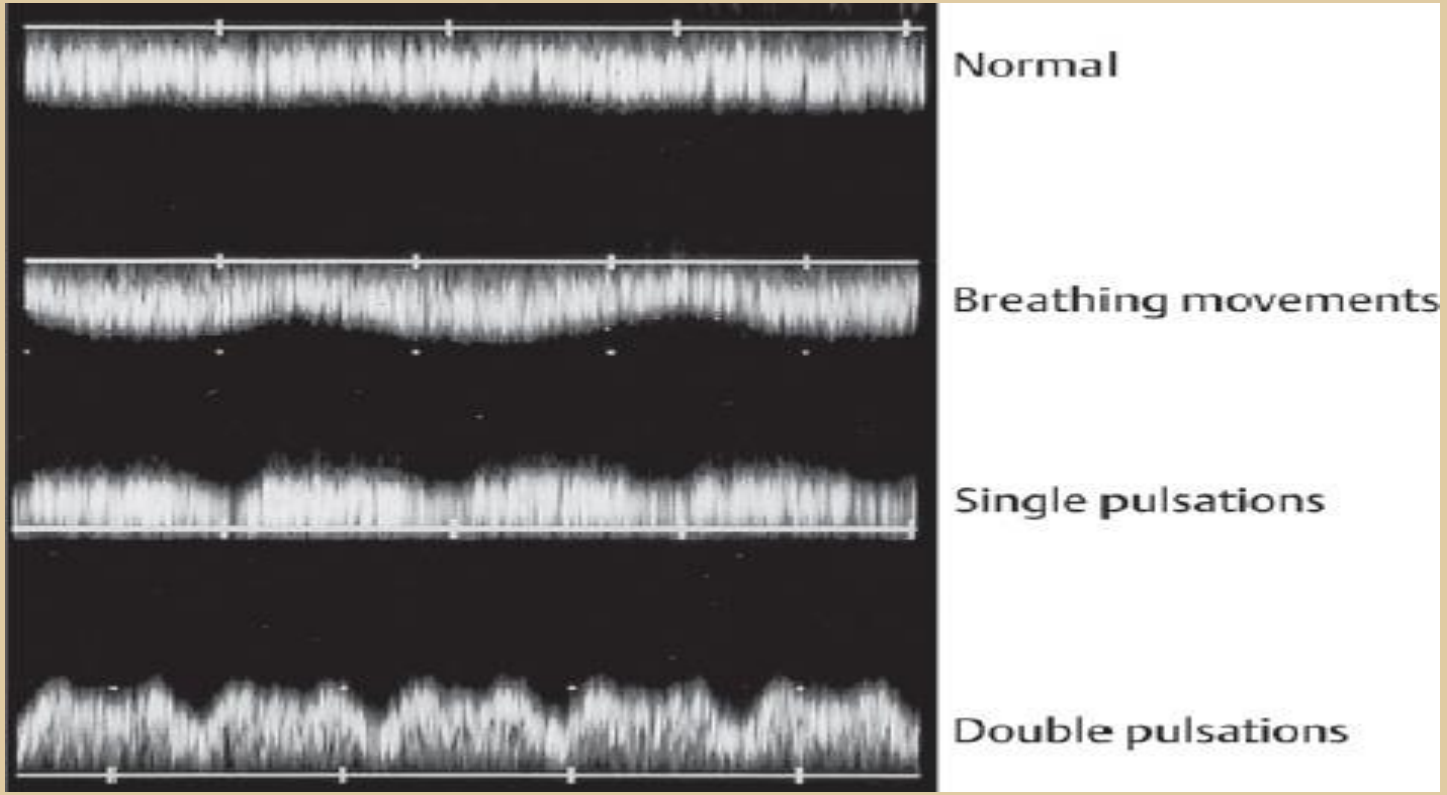
Middle Cerebral artery



Ductus venosus



Umbilical Vein



- Practical Aspects of fetal testing
- Impacts of monitoring on perinatal mortality and long term outcomes


THANK
YOU!