Electronic Fetal Heart Rate Monitoring – Category II

Understanding, Not Reacting

KALEIDESCOPE 2016

ECG Interpretation

- Rate
- Rhythm
- PR, QRS, QT interval
- Axis
- ST-segment …

- “only after consideration of all these factors should interpretation be considered” – Harrison’s

FHR Interpretation

- Rate
- Variability
- Periodic changes
  - Accelerations
  - Decelerations
- Uterine contraction pattern

FHR Interpretation

- Essentially perfect sensitivity for exclusion of acidemia
- Much worse positive predictive value for the detection of acidemia

- If it looks good, it is good. If it looks bad, it may or may not be bad.

Fetal Heart Rate

120-160 bpm preterm

110-150 bpm term

240 FHR
210
180
150
120
90
60
30
100 UA
75
50
25
0
240 FHR
210
180
150
120
90
60
30
100 UA
75
50
25
0

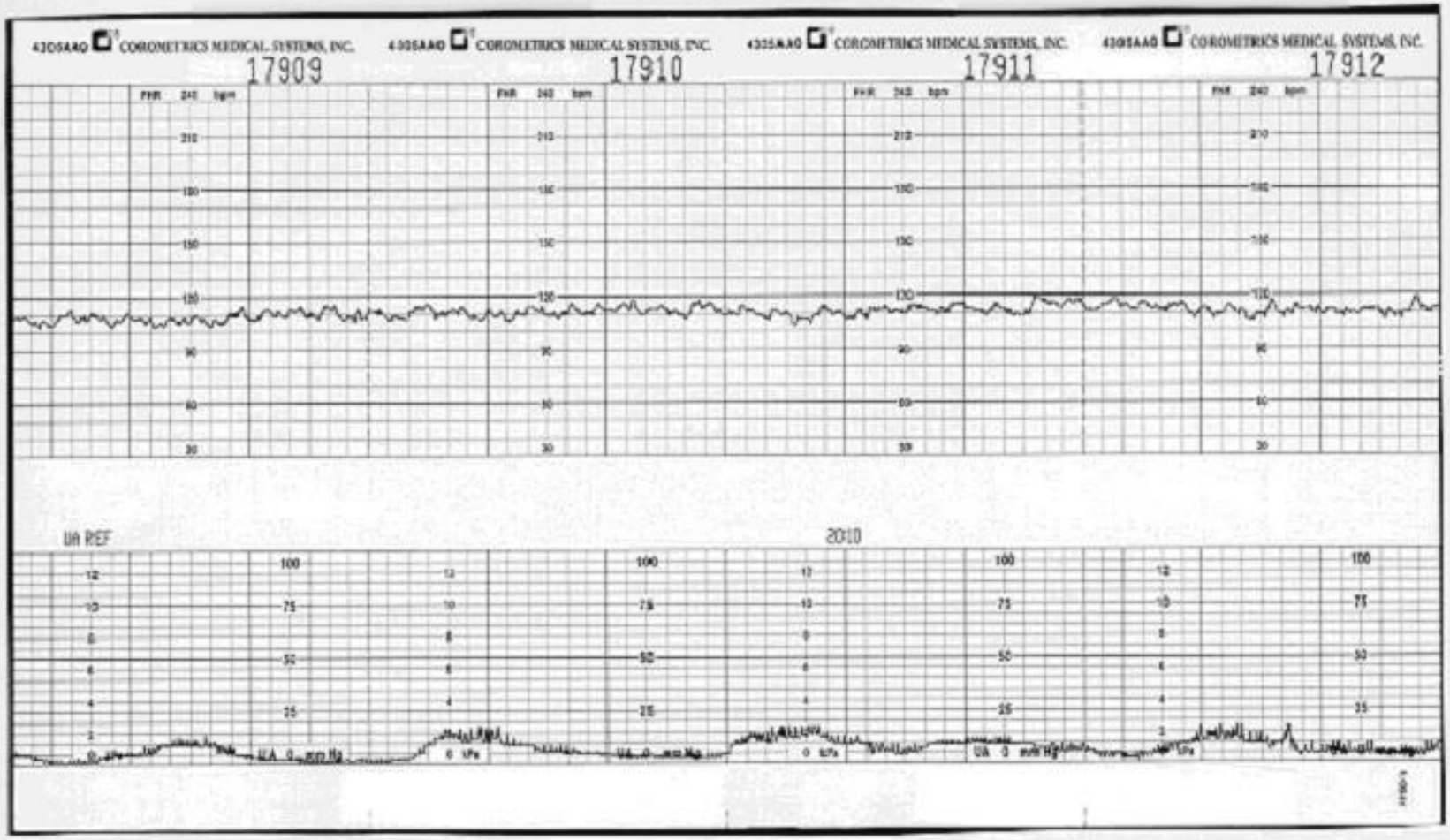
Fetal Tachycardia

Differential Diagnosis?

Fetal Tachycardia

Differential Diagnosis

- Chorioamnionitis
- Fever, regardless of source
- Drugs/medications
- Fetal hypoxia


4205AAQ CORONETRICS MEDICAL SYSTEMS, INC.
17909
17910
17911
17912
FHR bpm
UA REF
2010
UA 0 mm Hg
0 kPa

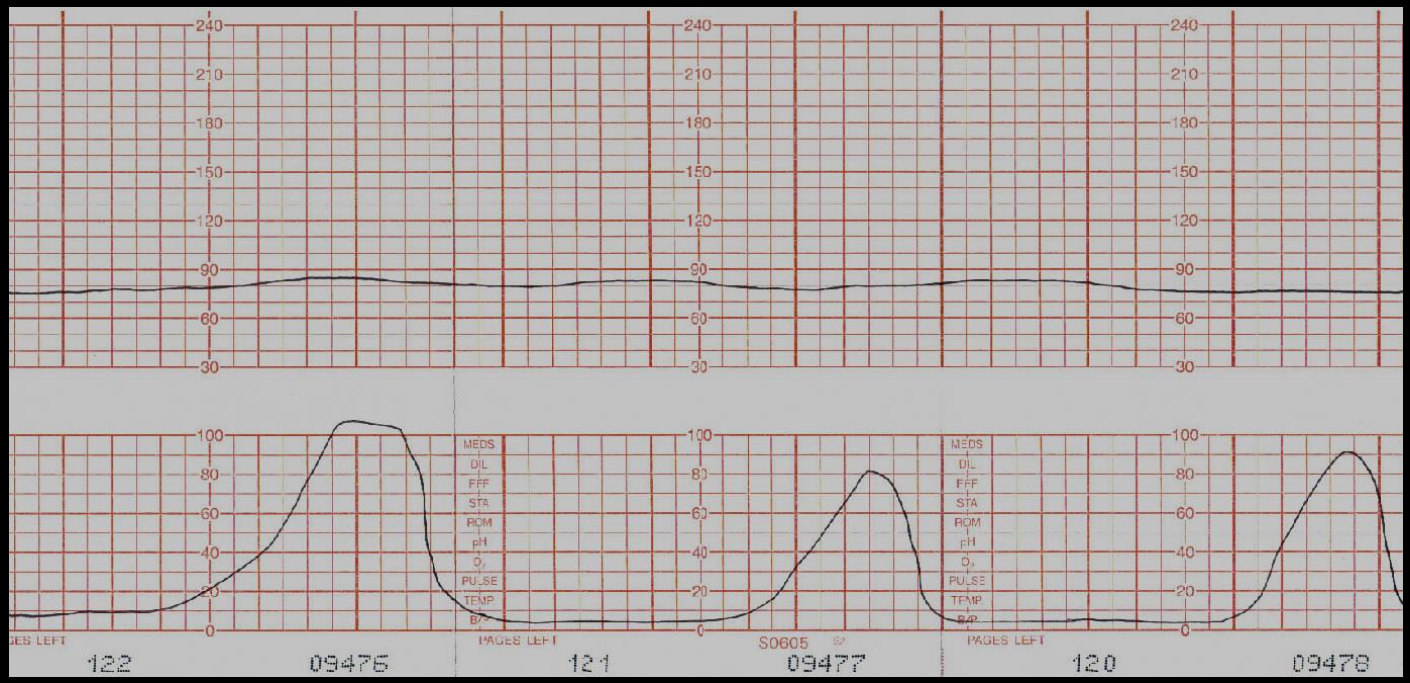
Fetal Bradycardia

Differential Diagnosis?

Fetal Bradycardia

Differential Diagnosis

- Fetal anomaly – trisomy
- Fetal Heart Block (irregular, or 50-60 bpm).
- Hypothermia
- Pre-terminal, dying fetus – fade away


240
210
180
150
120
90
60
30
100
80
60
40
20
0
MEDS
DIL
FFF
STA
ROM
pH
O_2
PULSE
TEMP
BP
PAGES LEFT
122
09476
121
09477
S0605
120
09478

Variability

What is it? What does it represent physiologically?

Variability

- Second- to- second modulation of cardiac output via heart rate to meet constantly changing oxygen demands of the fetus as efficiently as possible (≥ 6 bpm)
- Develops with maturity due to later maturation of parasympathetic nervous system in the fetus.
- This reflex is suppressed in the presence of acidemia

Reduced Variability

Differential Diagnosis

- Sleep cycle
- Drugs (narcotics, $MgSO_4$ (?))
- Prematurity
- Hypoxia/acidemia

Variability

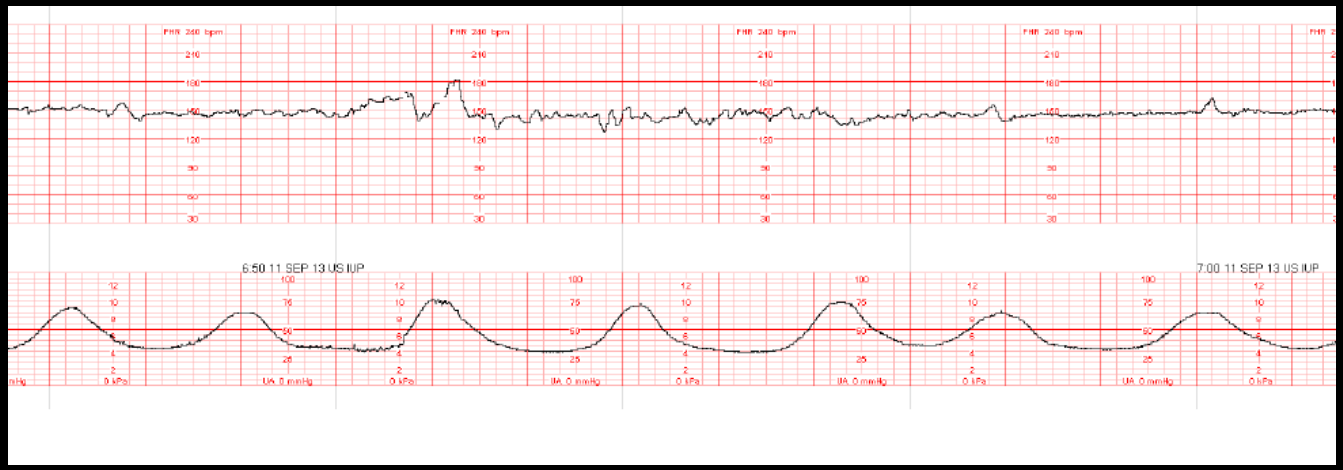
Fetal tissue needs more or less cardiac output

BRAIN

+

−

Heart



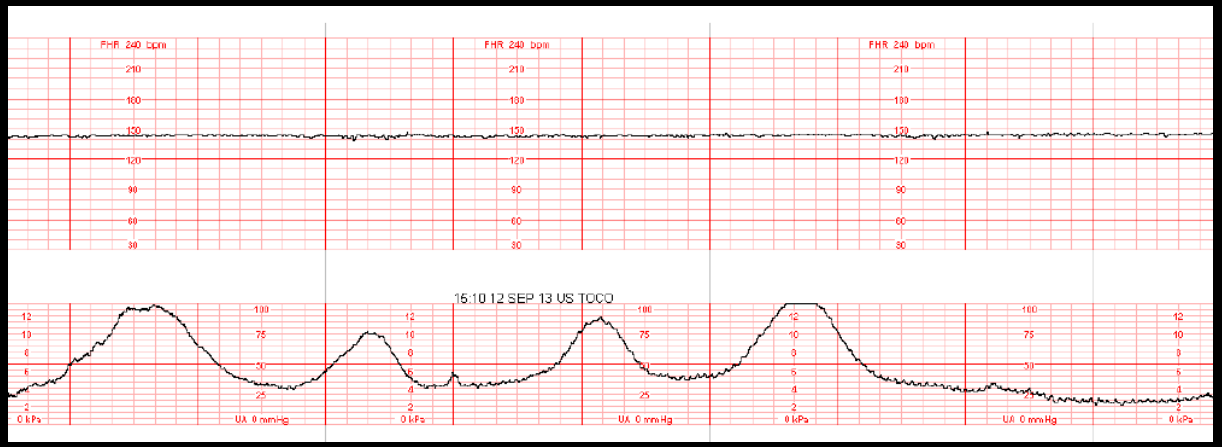
Reduced Variability

Hypoxia/acidemia

Fetal tissue needs more or less cardiac output

BRAIN

Heart



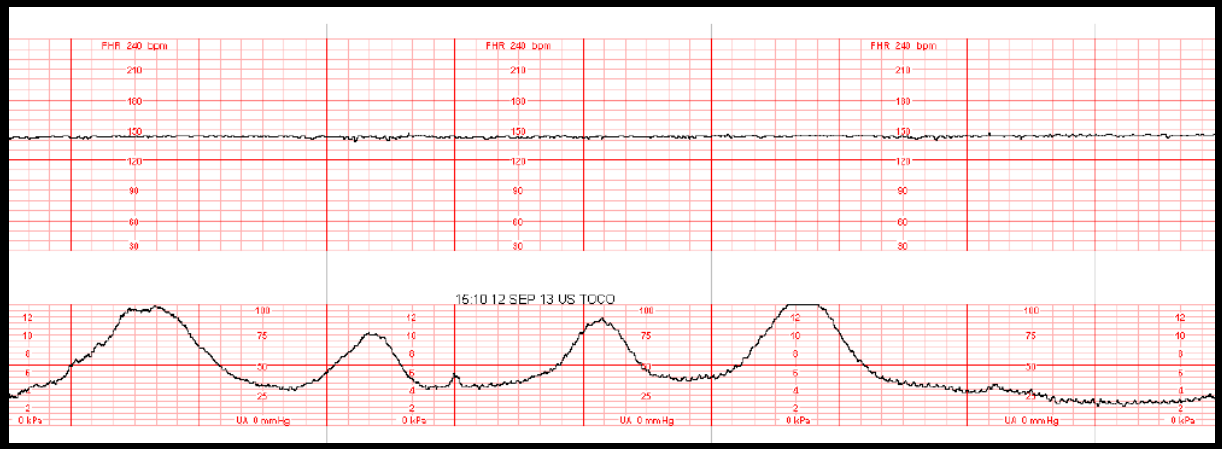
Reduced Variability

Fetal tissue needs more or less cardiac output

BRAIN

Heart

Fetal sleep cycle (< 60 min)



Variability

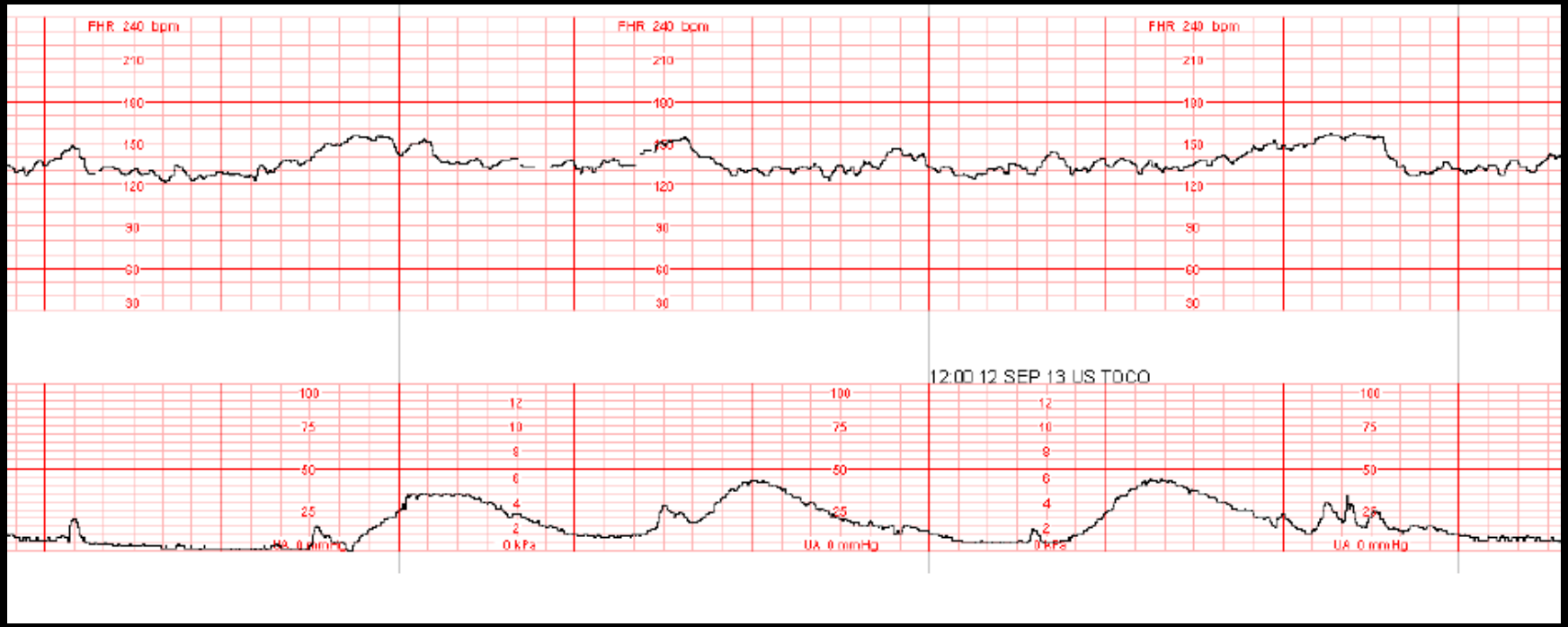
- For practical purposes, consider diminished = absent
- Ignore increased variability
- This is a feature of FHR baseline, not of internal deceleration structure

- Variability, along with presence of accelerations, are the most reliable of all FHR features for exclusion of acidemia

Accelerations

Your Best Friend

Acceleration



Accelerations

- 15 bpm (apex) x 15 sec (baseline to baseline)
- 10 x 10 ≤ 32 weeks - be careful!
- Excludes metabolic acidemia (pH < 7.2)
- Spontaneous or induced : equivalent
- A feature of variation from baseline, not within a deceleration

Decelerations

- Early
- Variable
- Late
- Prolonged

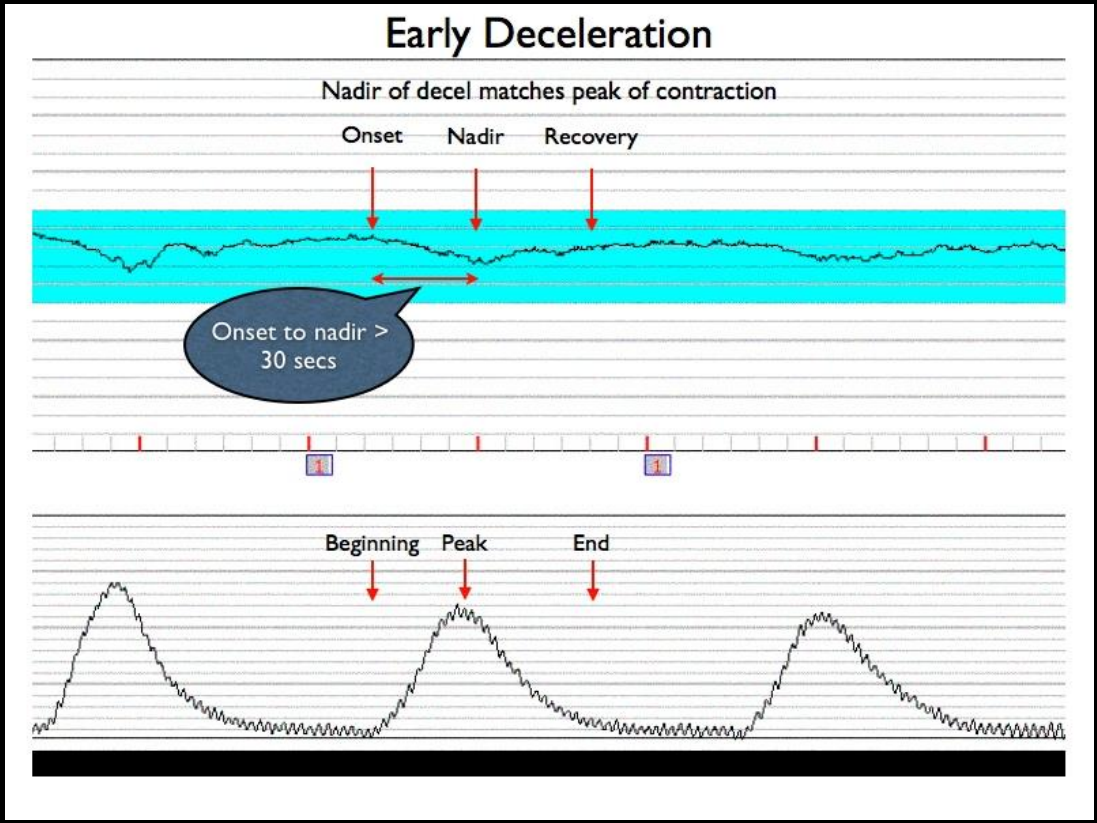
- Nature of deceleration is determined by timing of onset relative to a contraction, duration, and shape.

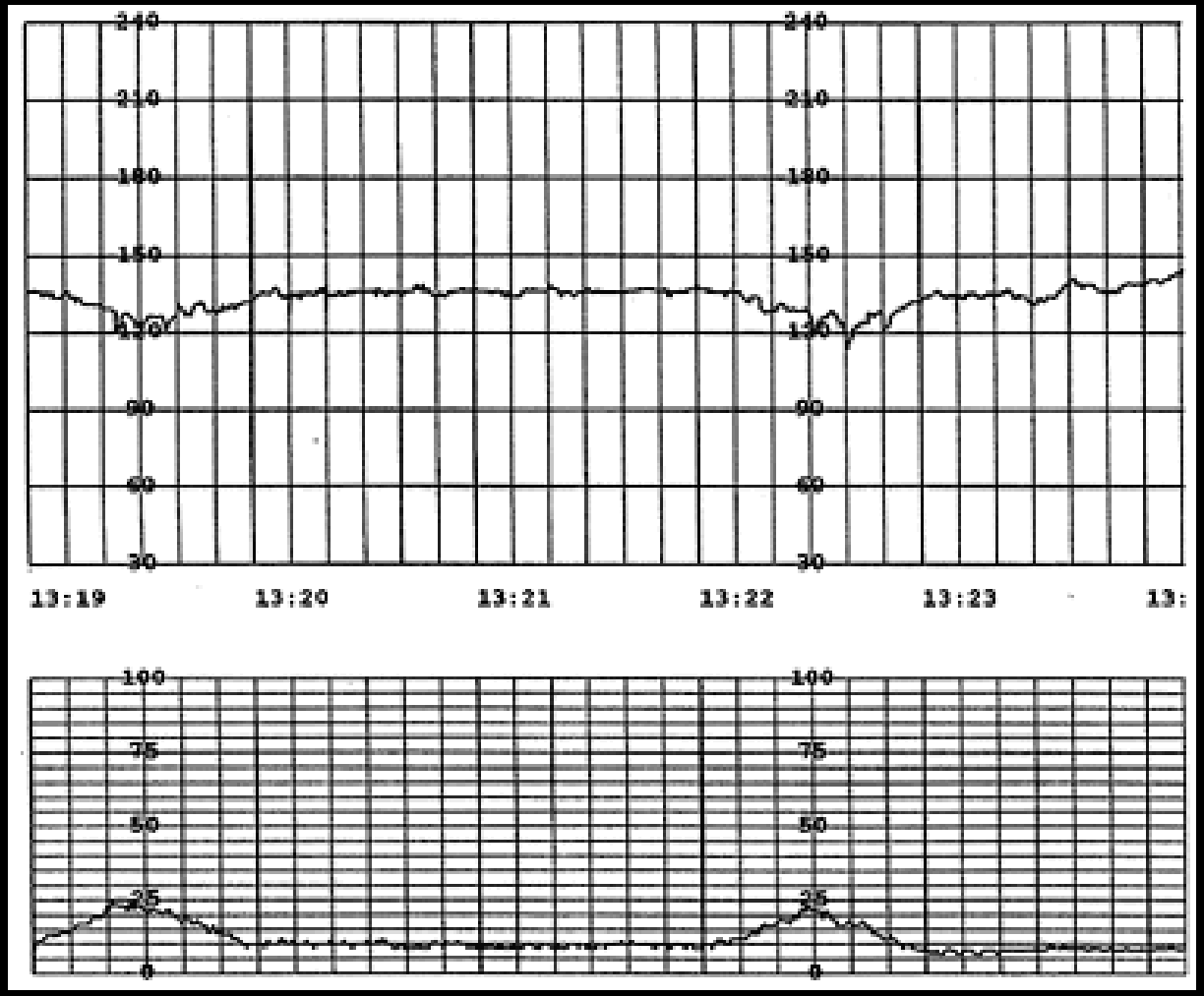
Decelerations

- Early – uniform (mirrors shape of contraction)
- Variable – non-uniform in shape and onset
- Late – uniform (mirrors shape of contraction)
- Prolonged – non-uniform in shape and onset.

Early Deceleration

- Vagal stimulation due to head compression



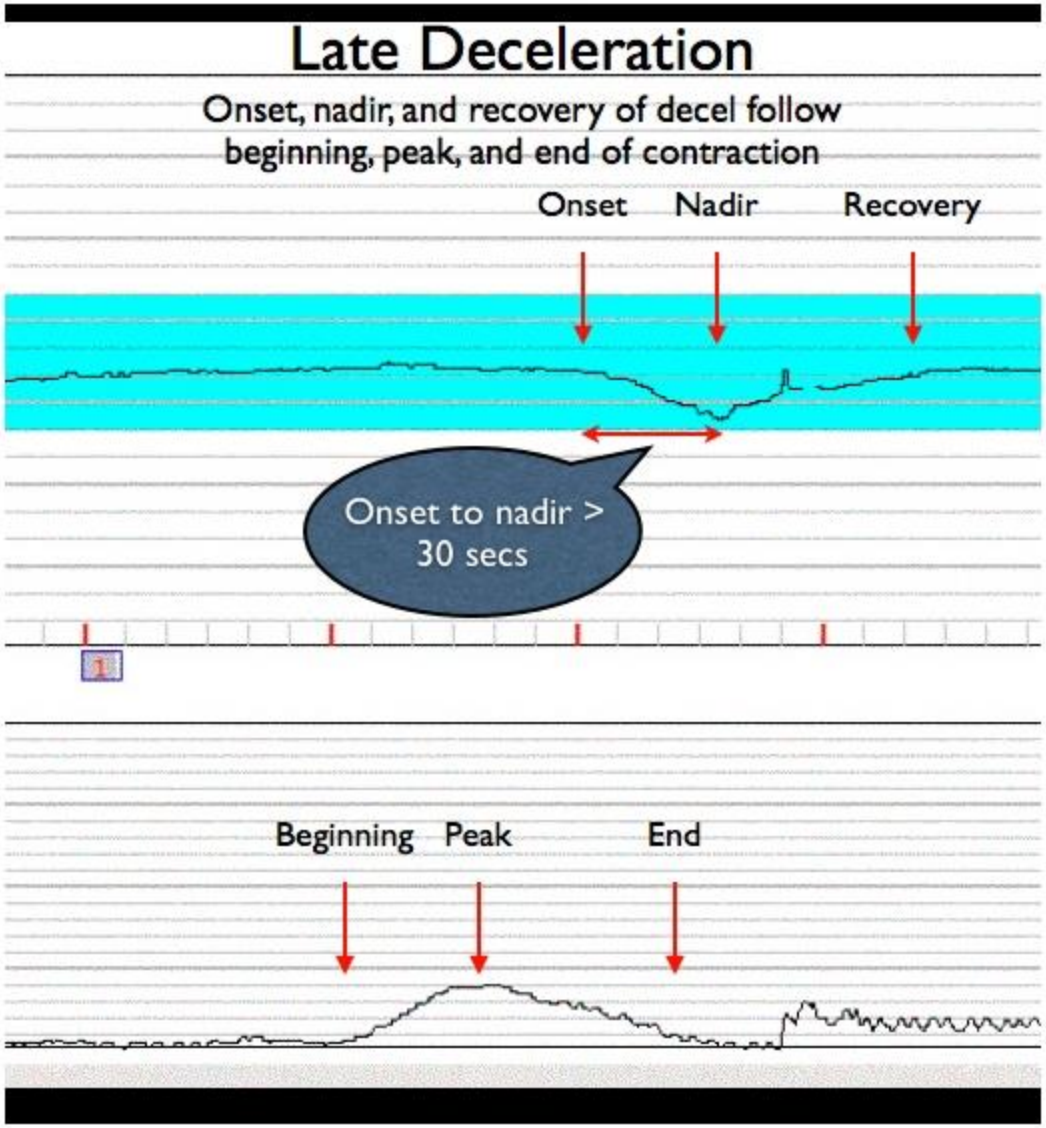

240
210
180
150
120
90
60
30
13:19
13:20
13:21
13:22
13:23
13:
100
75
50
25
0

Early Deceleration

- Often mistaken for small variables
- Are equally innocuous
- More common in breech fetuses in labor, and in marked prematurity
- Of no clinical significance

Late Deceleration

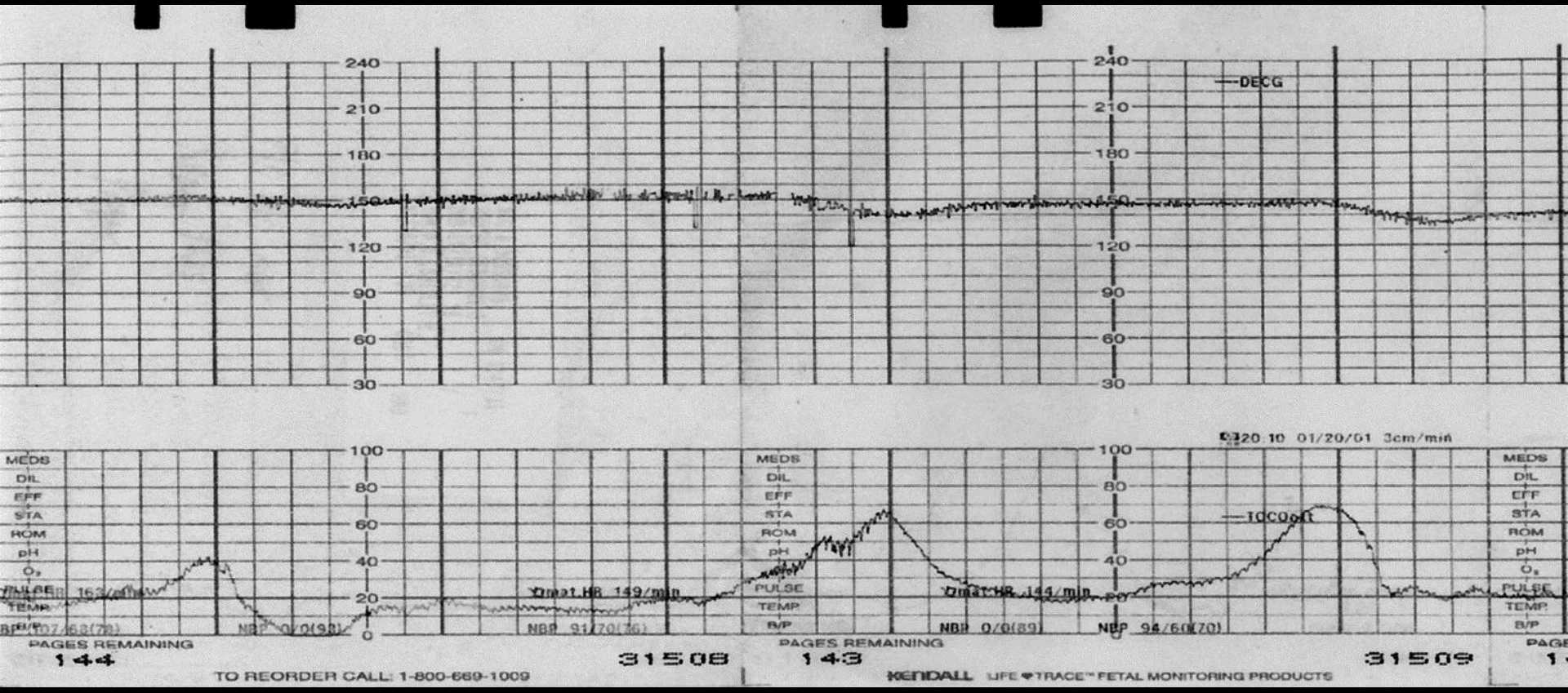
Onset, nadir, and recovery of decel follow beginning, peak, and end of contraction

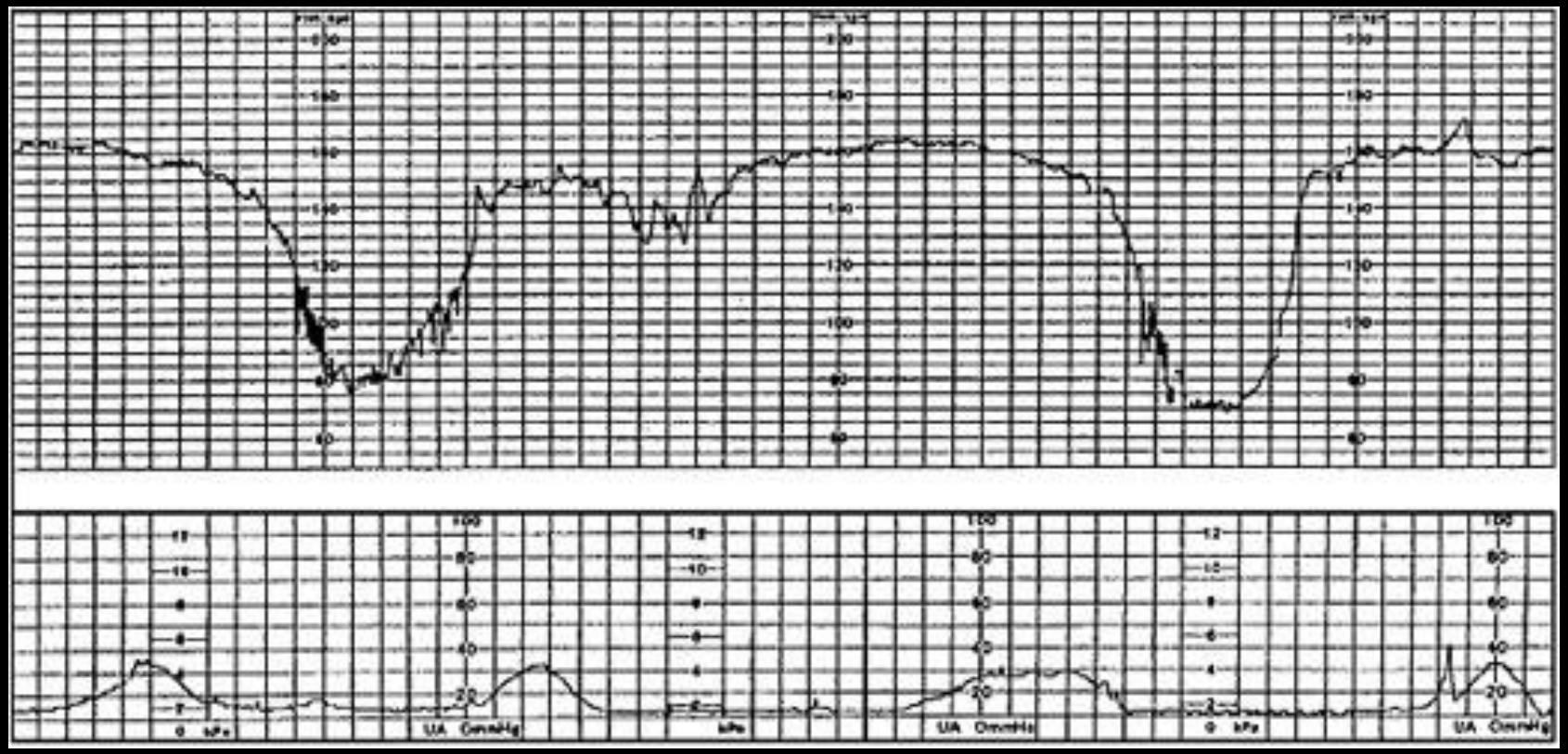


Late Decelerations

- All fetuses are anoxic with a contraction > 40 mmHg in strength
- A protective response to contraction-induced hypoxia in the marginally compensated fetus
- “Diving seal” reflex
- Lost in adults – may be revived

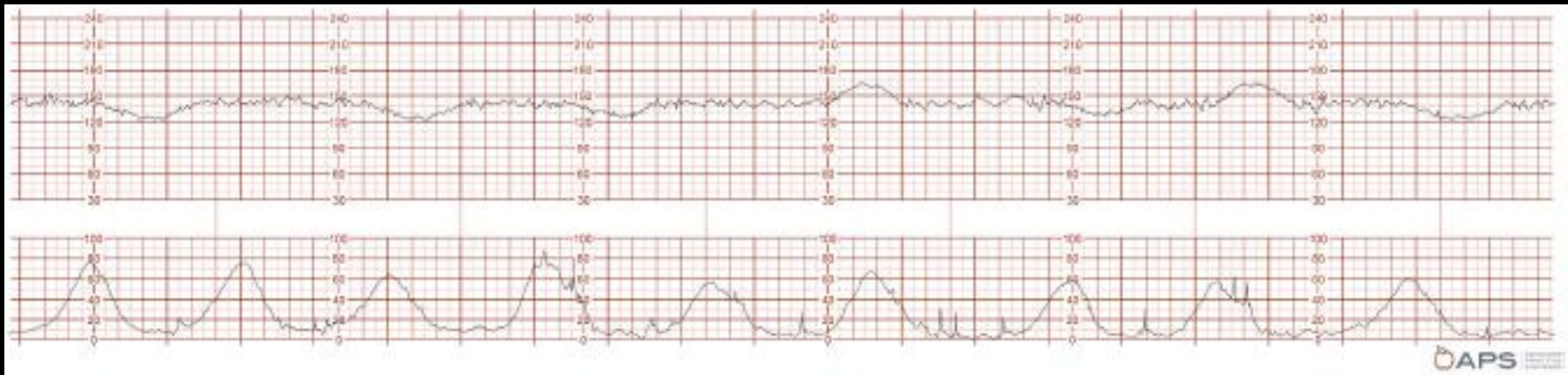
- May also involve direct myocardial depression in late stages


240
210
180
150
120
90
60
30
—DECG
MEDS
DIL
EFF
STA
ROM
pH
O_2
PULSE
TEMP
B/P
100
80
60
40
20
0
Dmat HR 149/min
NBP 91/70(76)
—TOCO
Dmat HR 144/min
NBP 0/0(89)
NBP 94/60(70)
PAGES REMAINING
144
31508
143
31509
TO REORDER CALL: 1-800-669-1009
KENDALL LIFE TRACE™ FETAL MONITORING PRODUCTS



Late Decelerations

- Appear before loss of accelerations/variability (hypoxia precedes acidemia)
- A contraction of equal magnitude will produce a late of equal magnitude (in labor, an "occasional late" is usually a variable)
- Management depends upon clinical context: Do I know why the baby is hypoxic? Can I fix the hypoxia? Is the baby acidemic? How long until delivery?



Late decelerations represent protective cardiovascular response to contraction-induced reductions in fetal oxygenation. Per algorithm, if labor is progressing normally in active phase or second stage, careful observation would be appropriate. If the fetus is remote from delivery, delivery would be appropriate.

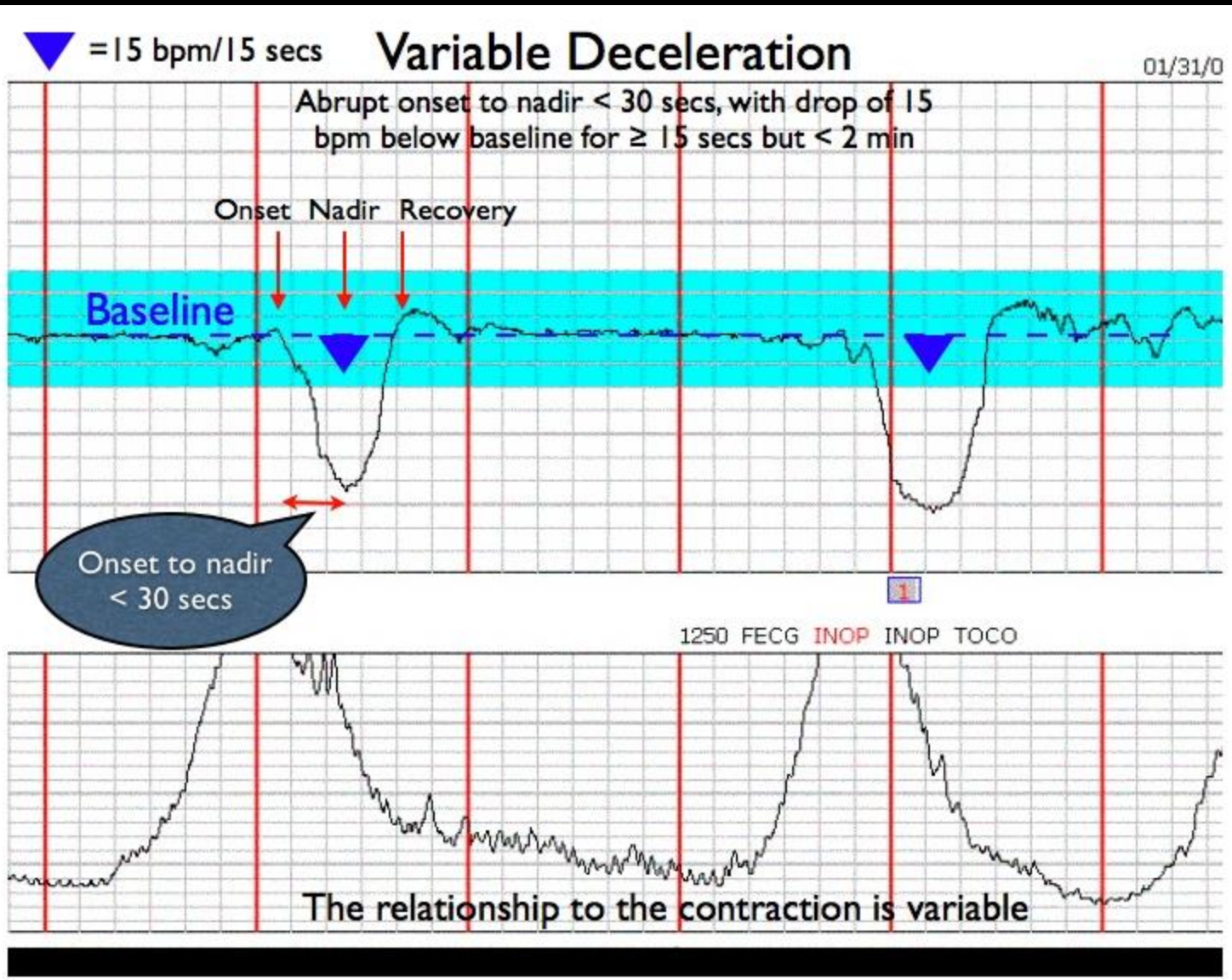
Clark. Category II FHRT. Am J Obstet Gynecol 2013.

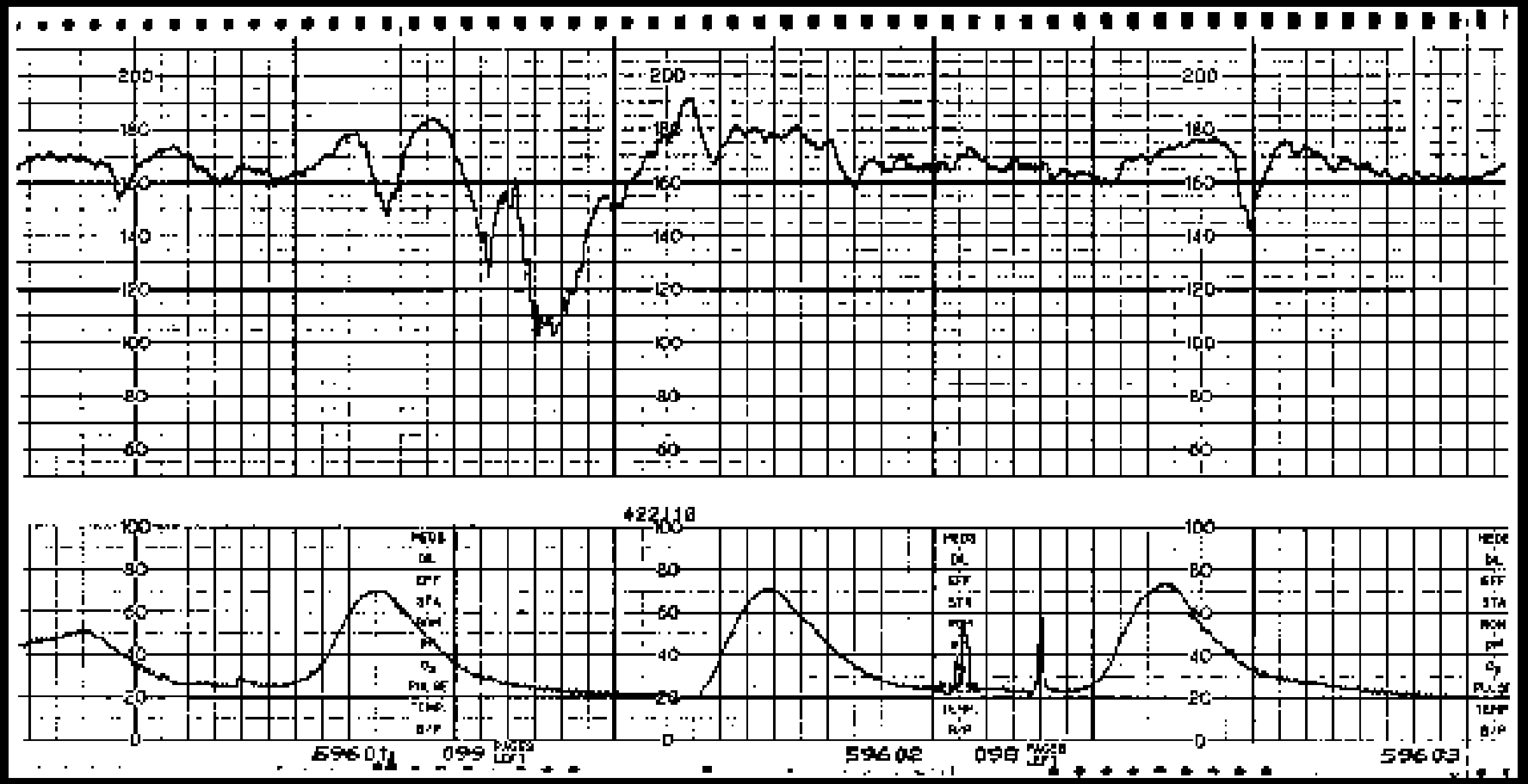
Per algorithm, expedited delivery is indicated regardless of labor progress.

Clark. Category II FHRT. Am J Obstet Gynecol 2013.

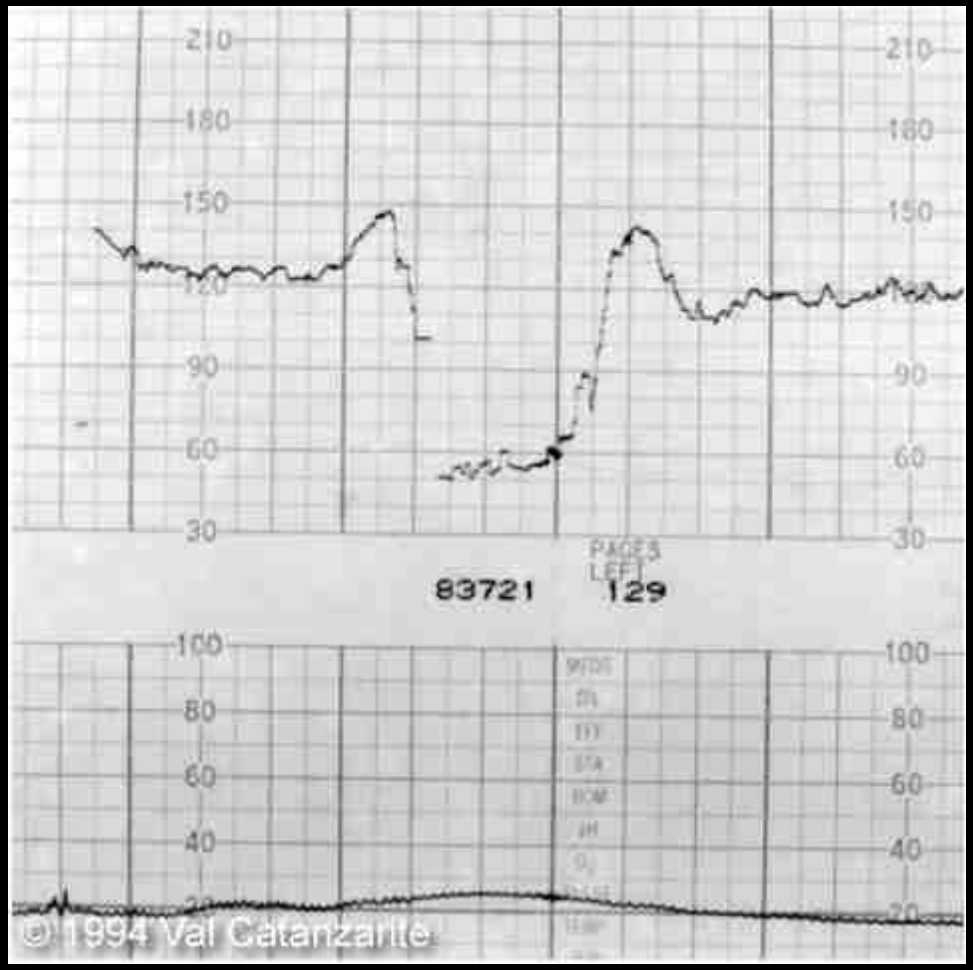
Fixing Late Decelerations

- Oxygen – rarely, only if mother is hypoxic
- Fix hypotension – yes
- Hydration – almost never
- Position change – yes (venacaval compression)
- Reduction in oxytocin – yes
- Amnioinfusion - no

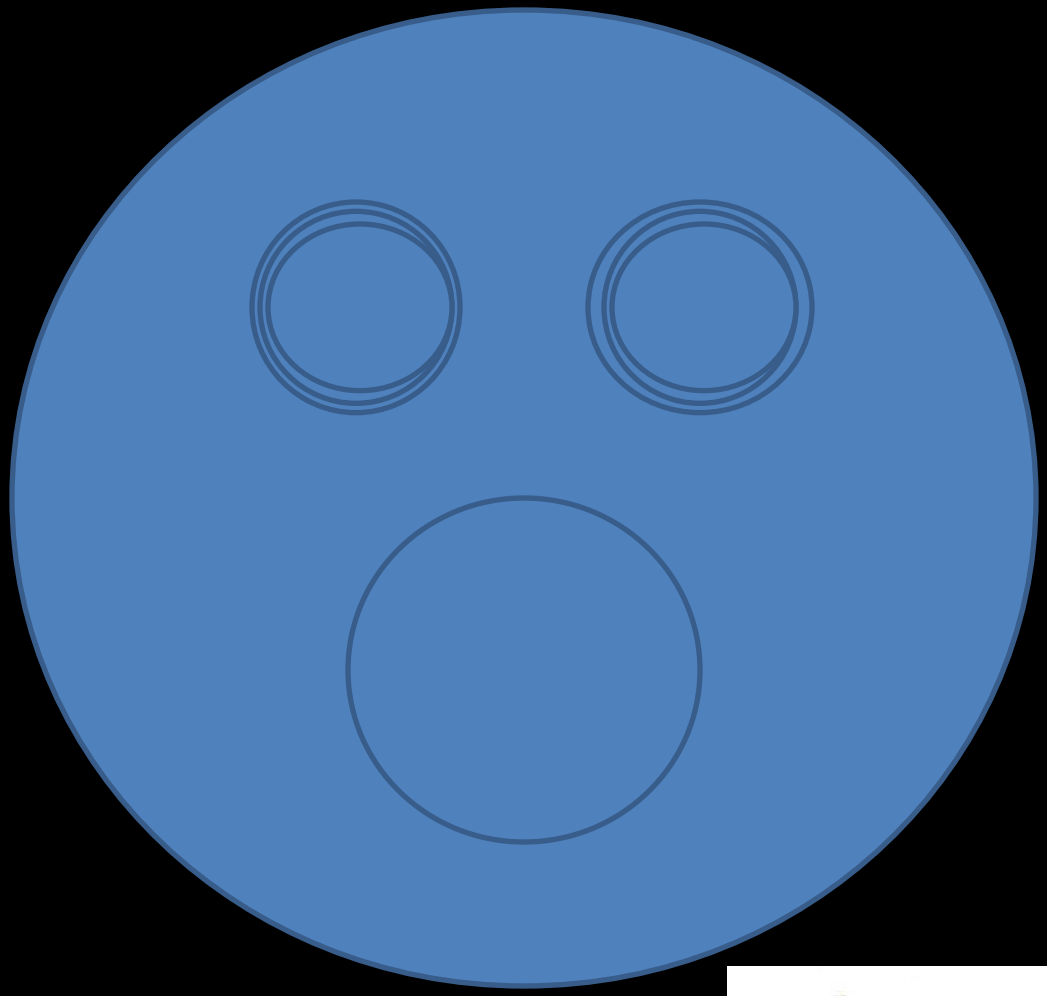

=15 bpm/15 secs
Variable Deceleration
01/31/0
Abrupt onset to nadir < 30 secs, with drop of 15 bpm below baseline for ≥ 15 secs but < 2 min
Onset
Nadir
Recovery
Baseline
Onset to nadir < 30 secs
1250 FECG INOP INOP TOCO
The relationship to the contraction is variable

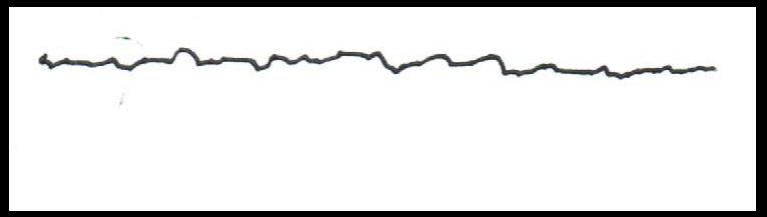

200
180
160
140
120
100
80
60
422/10
40
20
0
596 01
099
596 02
098
596 03

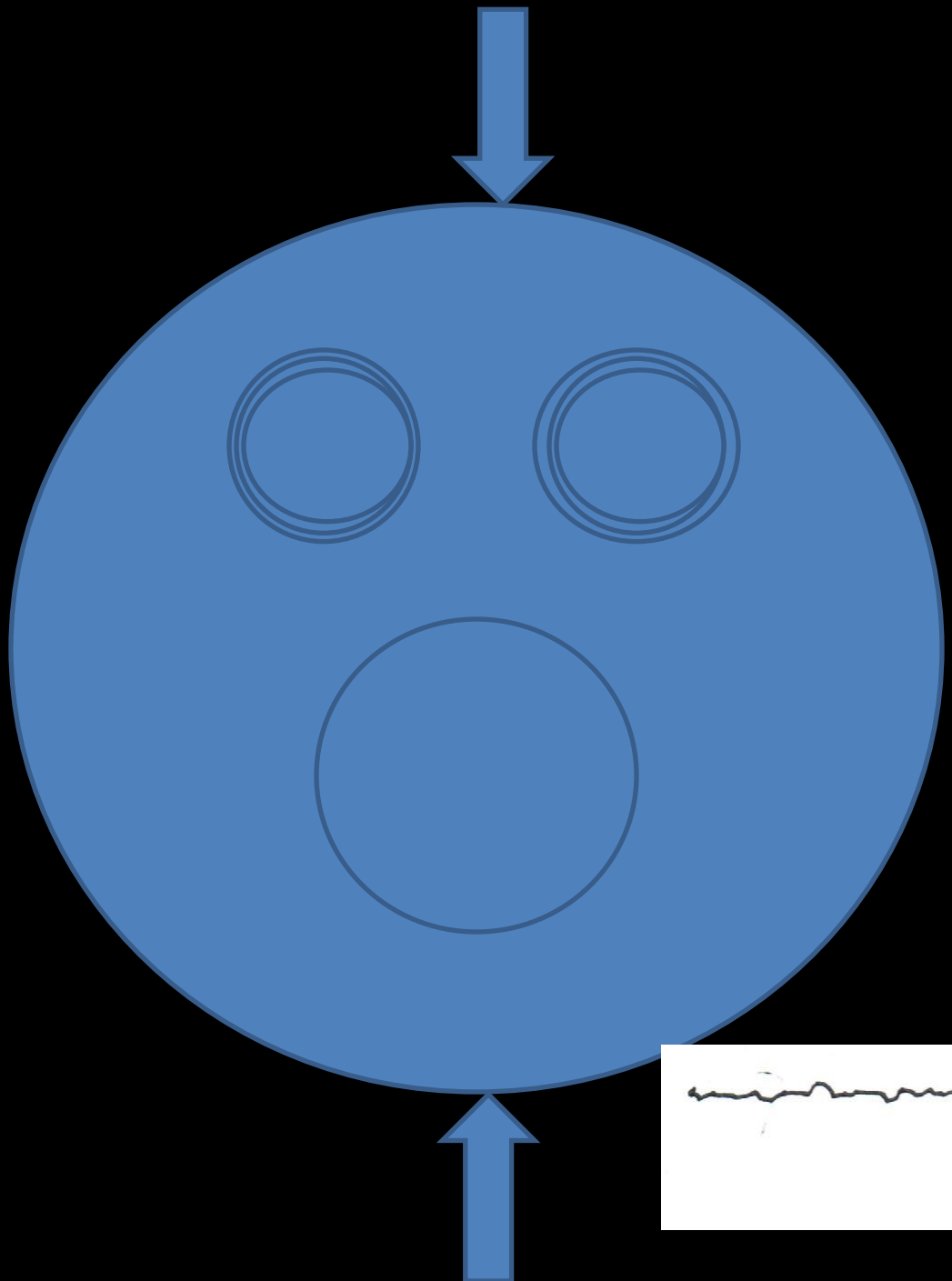
Variable Deceleration

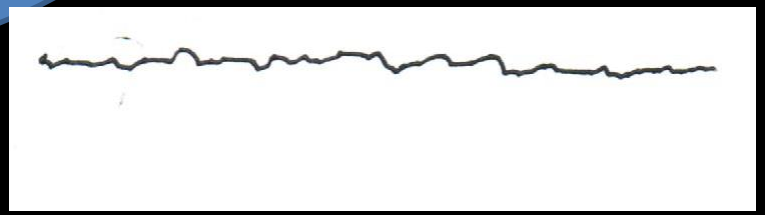


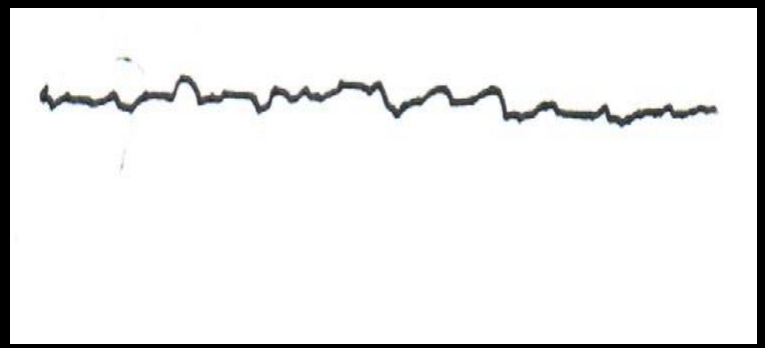
Umbilical Cord

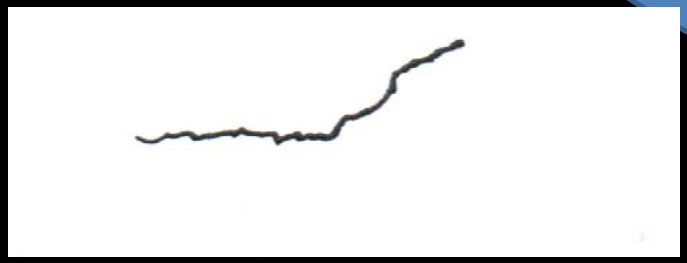


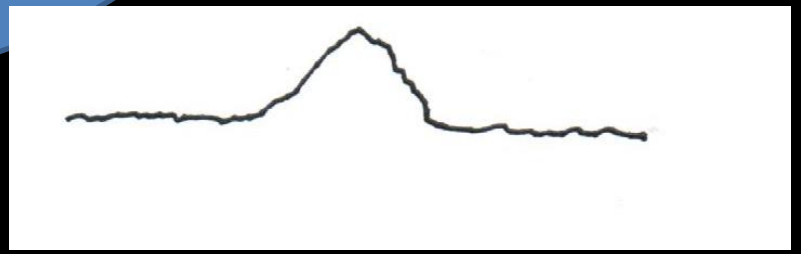


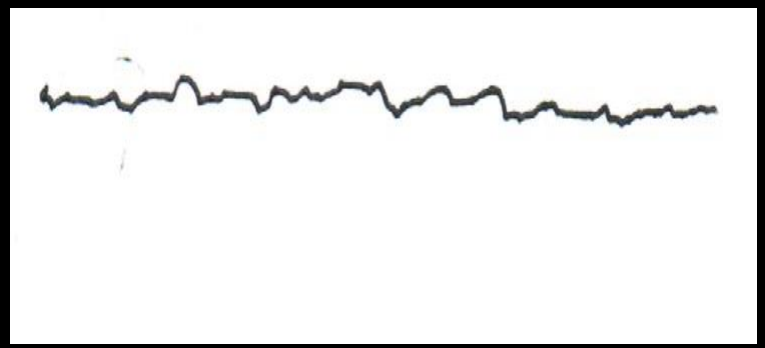


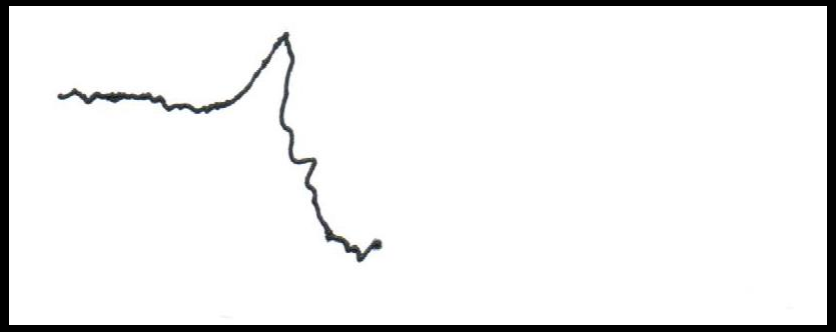


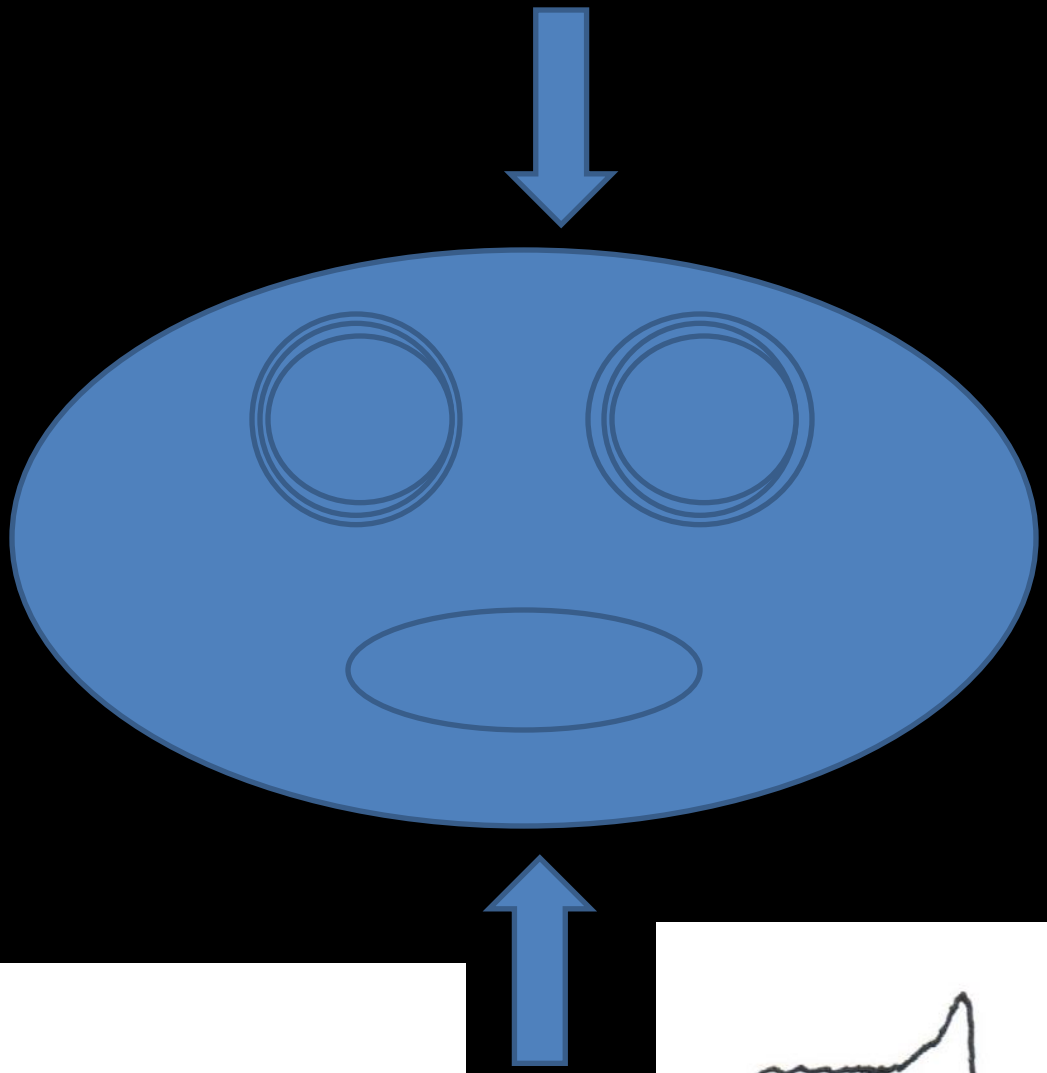


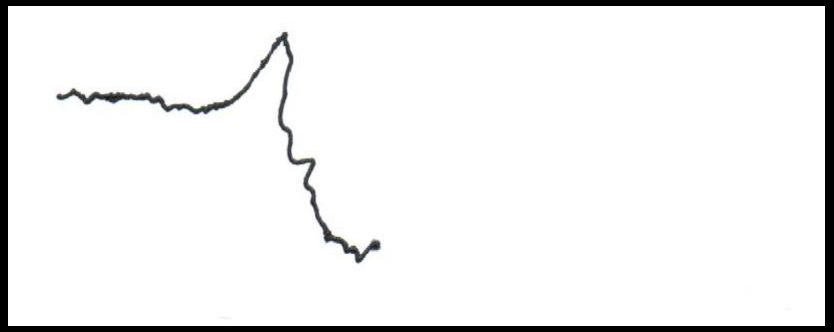


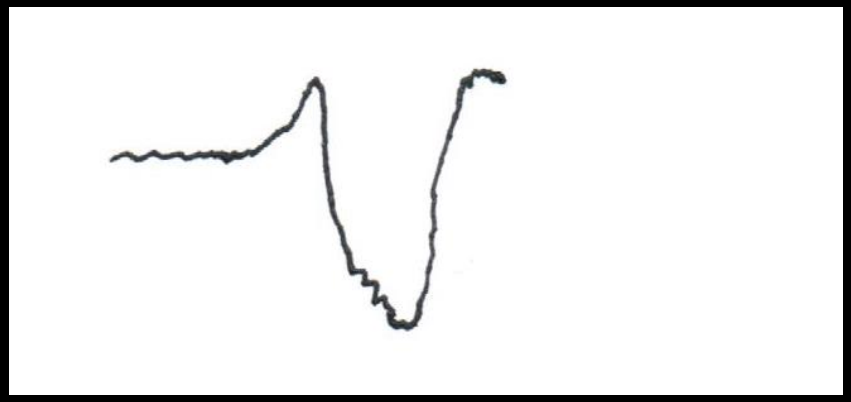


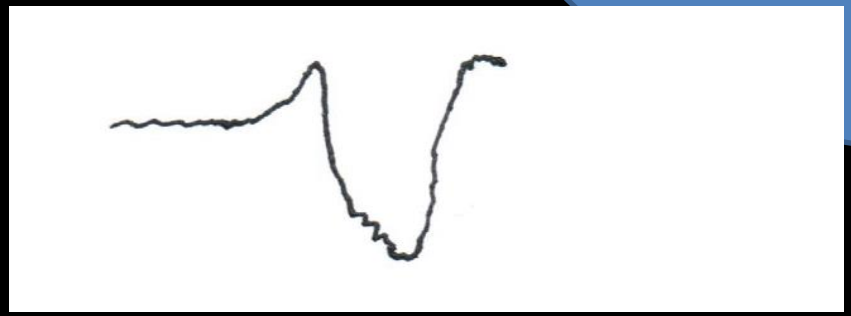




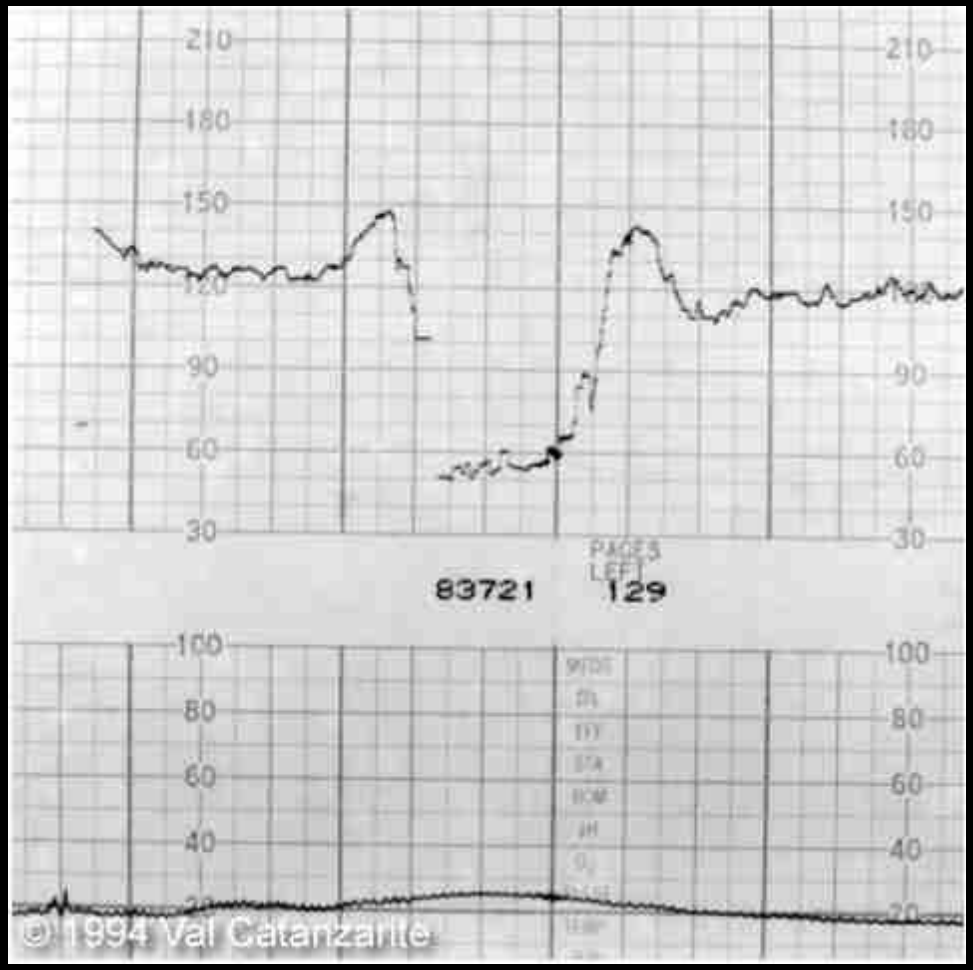


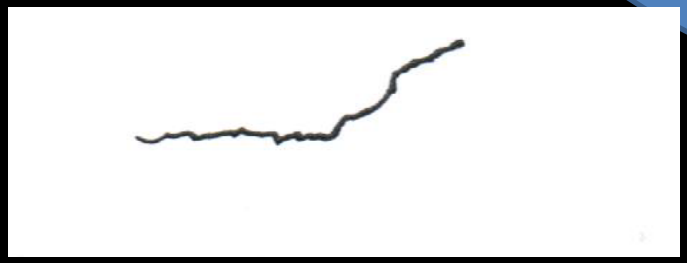


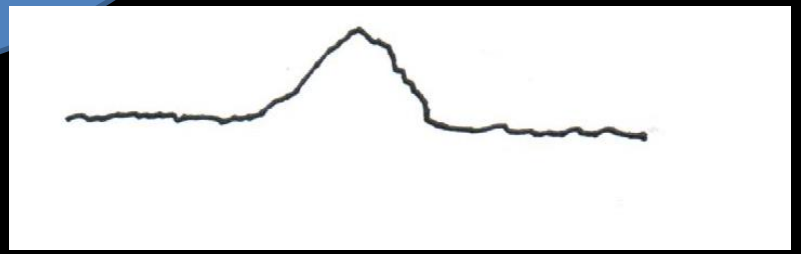




Variable Deceleration







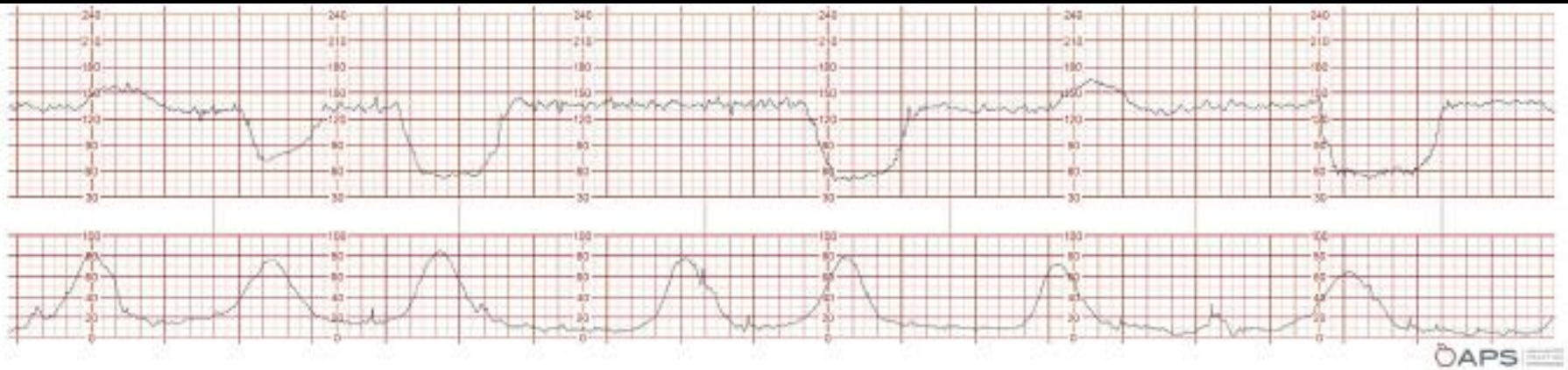
Variable Deceleration

Variable Decelerations

- May occur before, during or after a contraction
- Variable shape and duration
- Cause is cord compression
- Management depends upon depth and duration, associated variability/accelerations, and predicted length of labor.

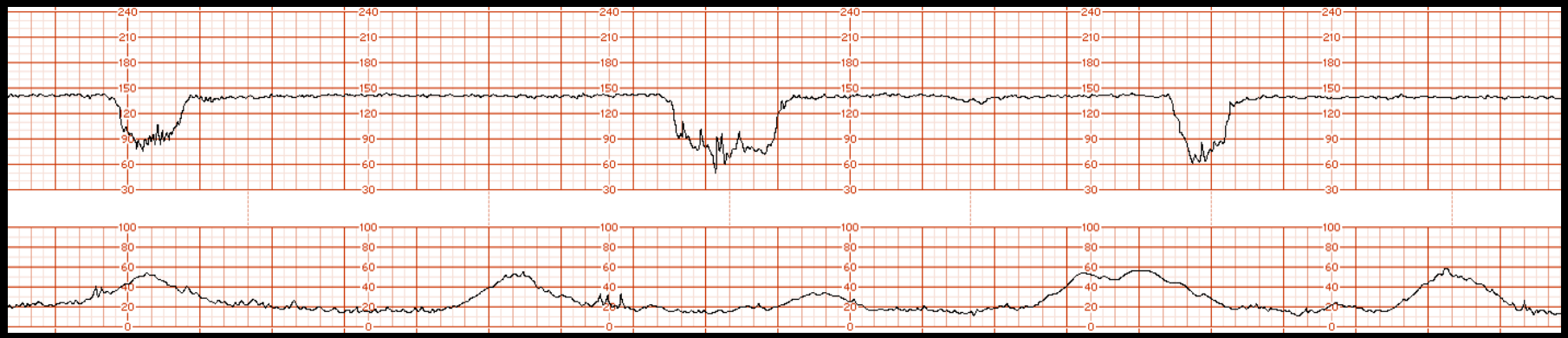
Fixing Variable Decelerations

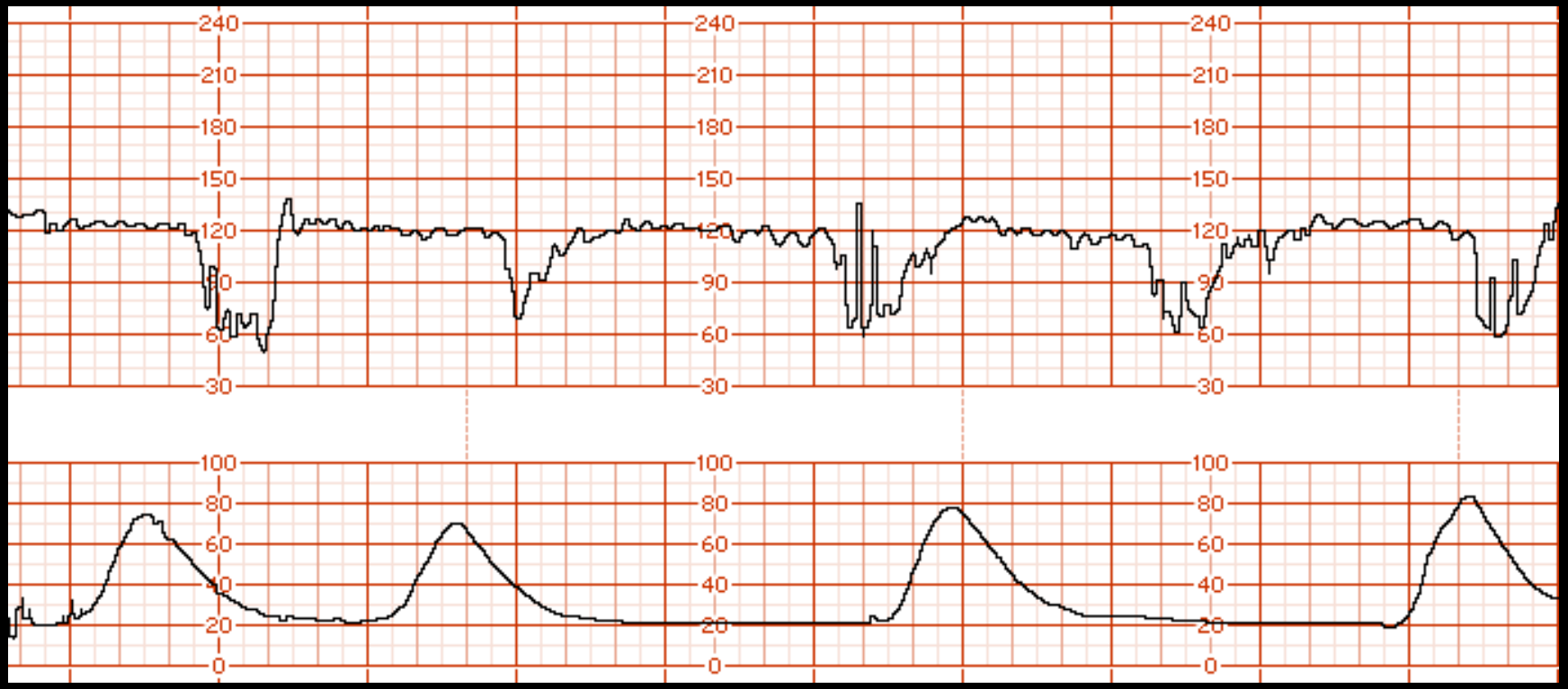
- Oxygen – No
- Hydration – No
- Position change – yes (relieve cord compression)
- Reduction in oxytocin – yes
- Amnioinfusion - yes

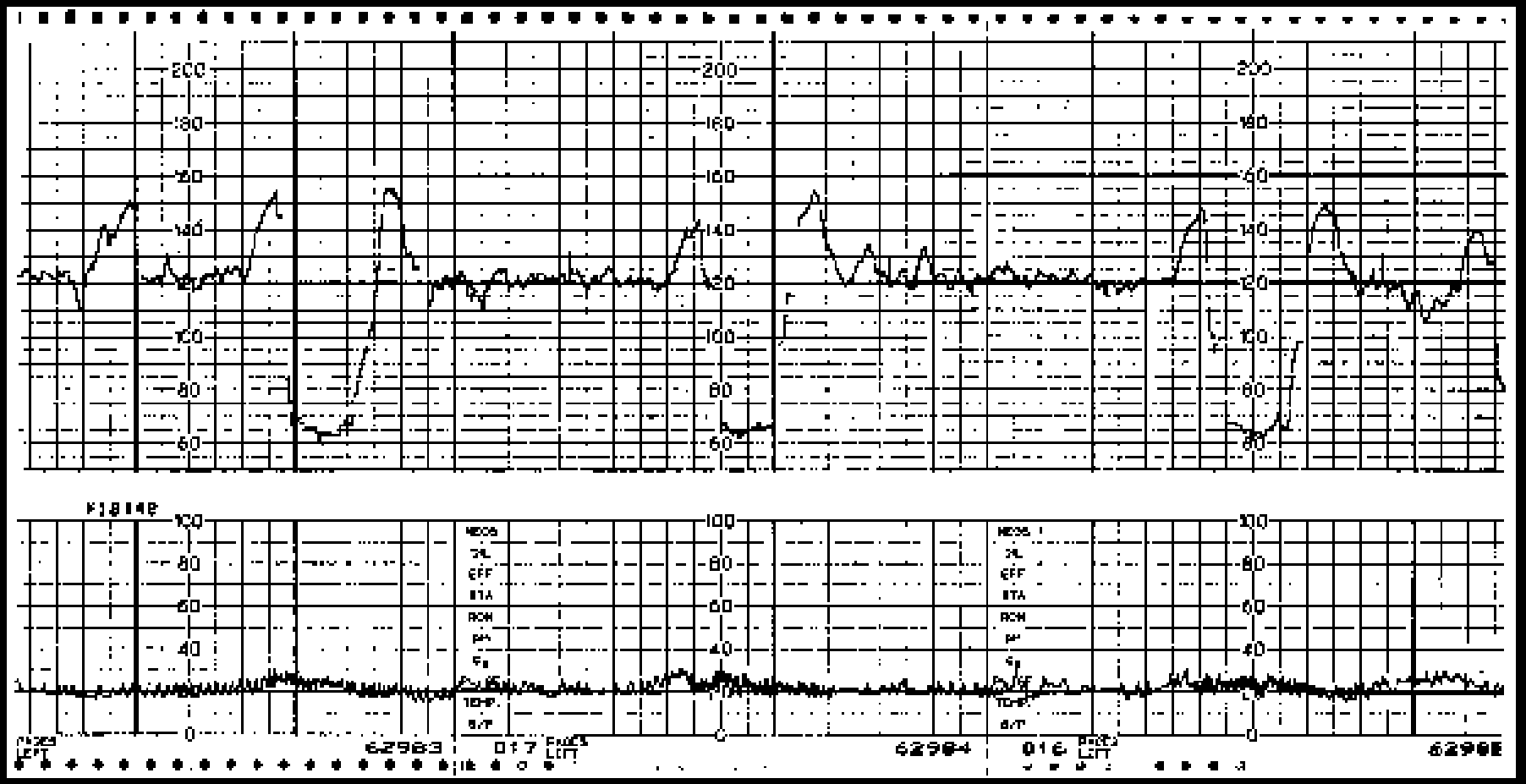


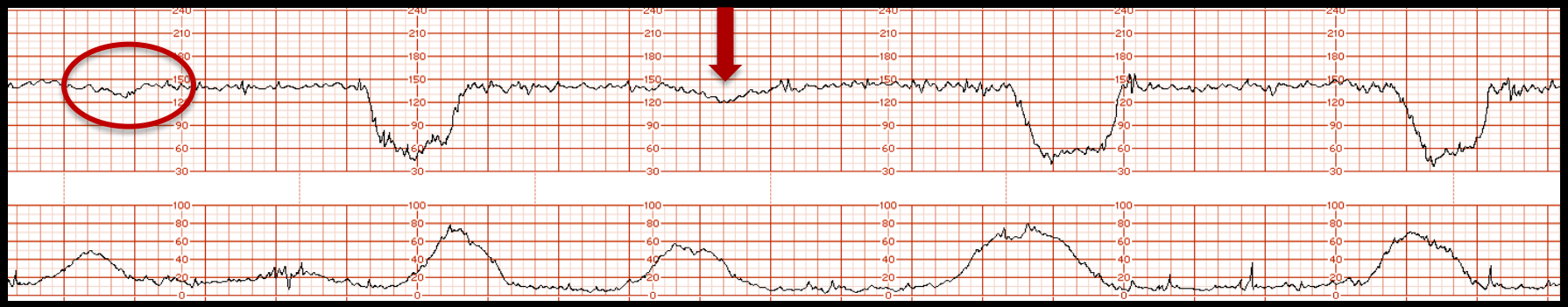
Significant variable decelerations seen here suggest umbilical cord compression during contraction, which could, over time, lead to significant acidemia. Per algorithm, if labor is progressing normally in active phase or second stage, careful observation would be appropriate. If the fetus is remote from delivery, delivery would be appropriate.

Clark. Category II FHRT. Am J Obstet Gynecol 2013.


240
210
180
150
120
90
60
30
100
80
60
40
20
0

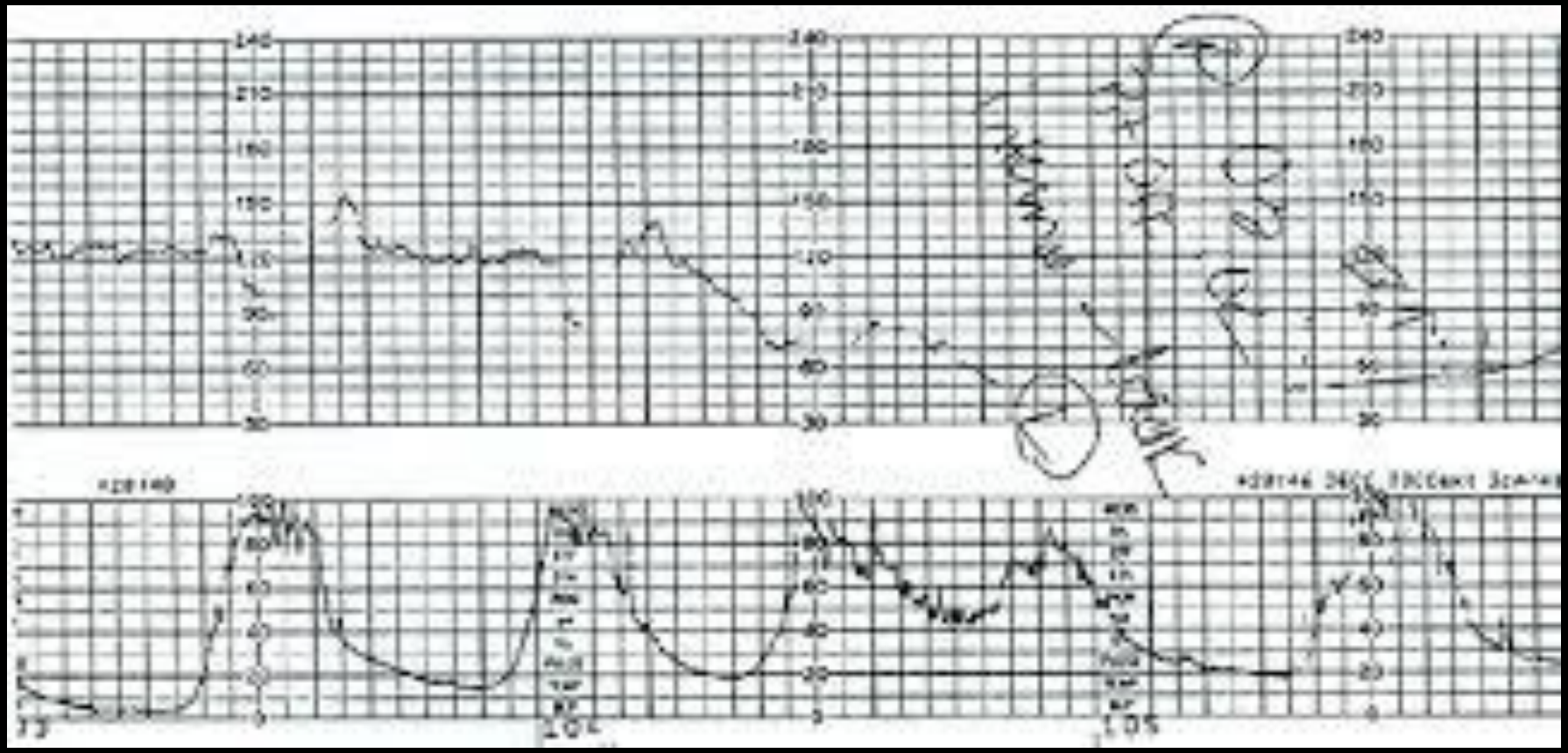

240
210
180
150
120
90
60
30
100
80
60
40
20
0


200
180
160
140
120
100
80
60
100
80
60
40
0
017
016

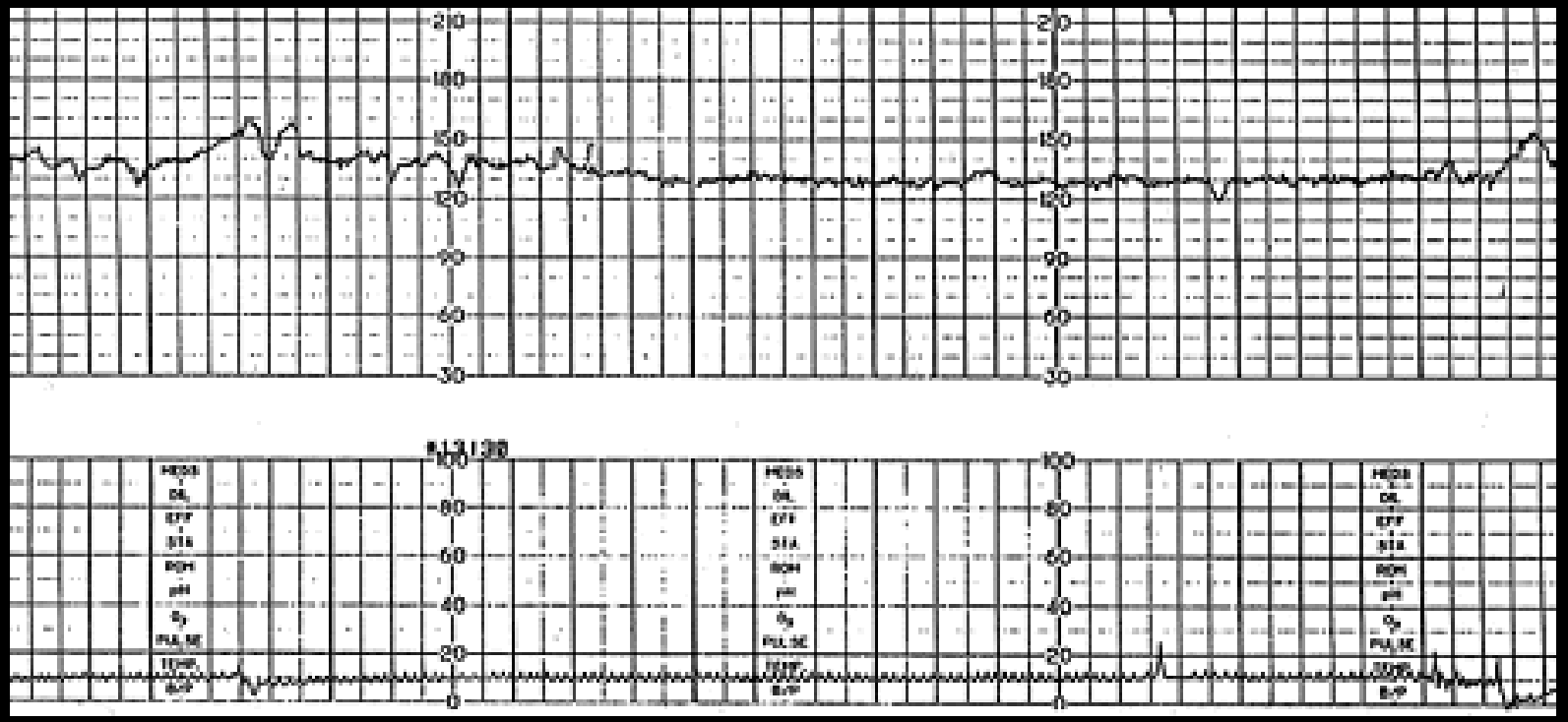

240
210
180
150
120
90
60
30
100
80
60
40
20
0

Prolonged Deceleration (> 2 minute)

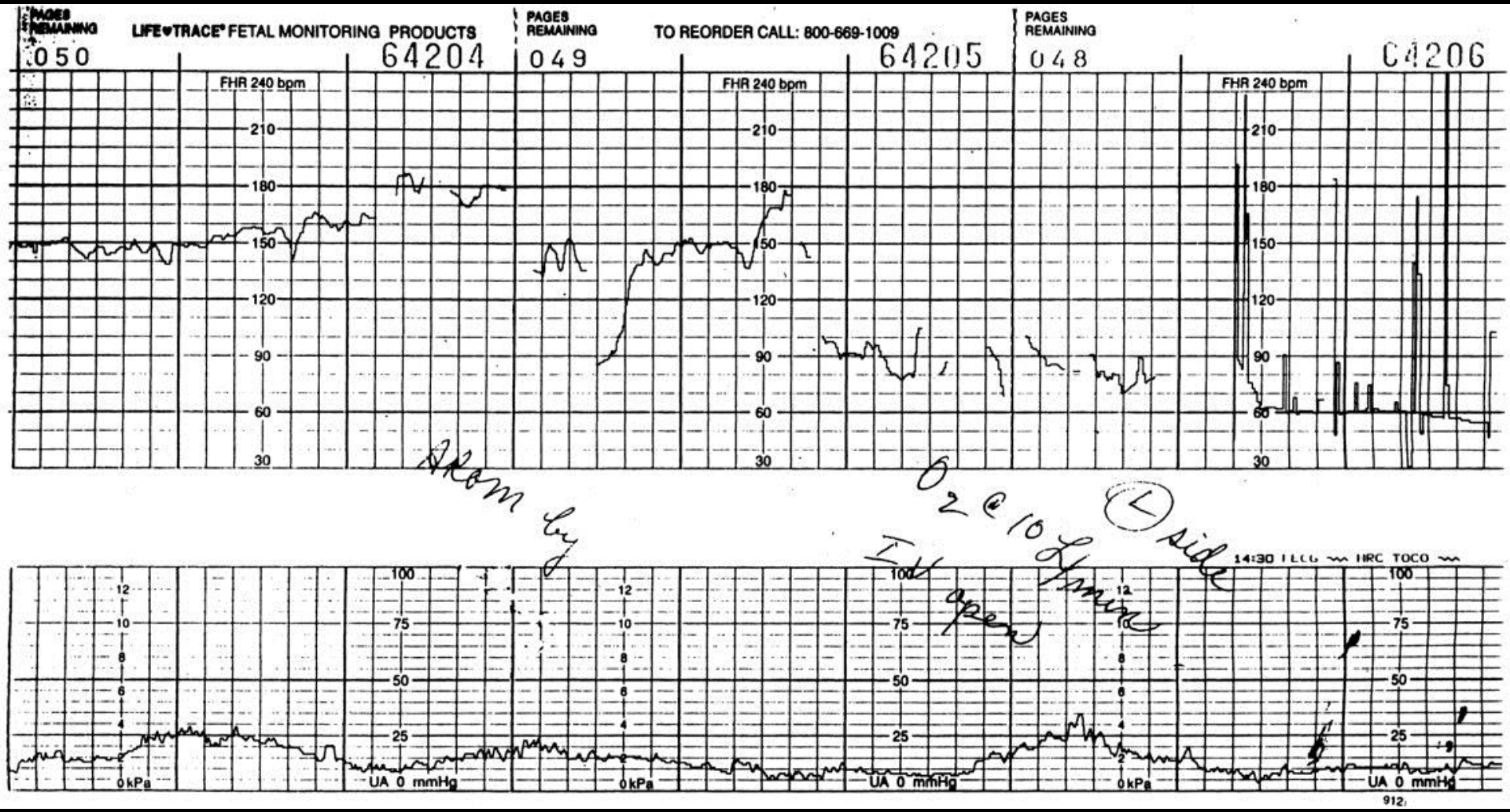
- Most commonly are simply unrelieved cord compression = bad variables.
- May represent abruption, uterine rupture or maternal cardiovascular collapse.
- Always bad
- No place for scalp stimulation
- Management depends upon situation – do I know what caused it? Can I fix it quickly?



Category I



Category III



Most troubling patterns are category II

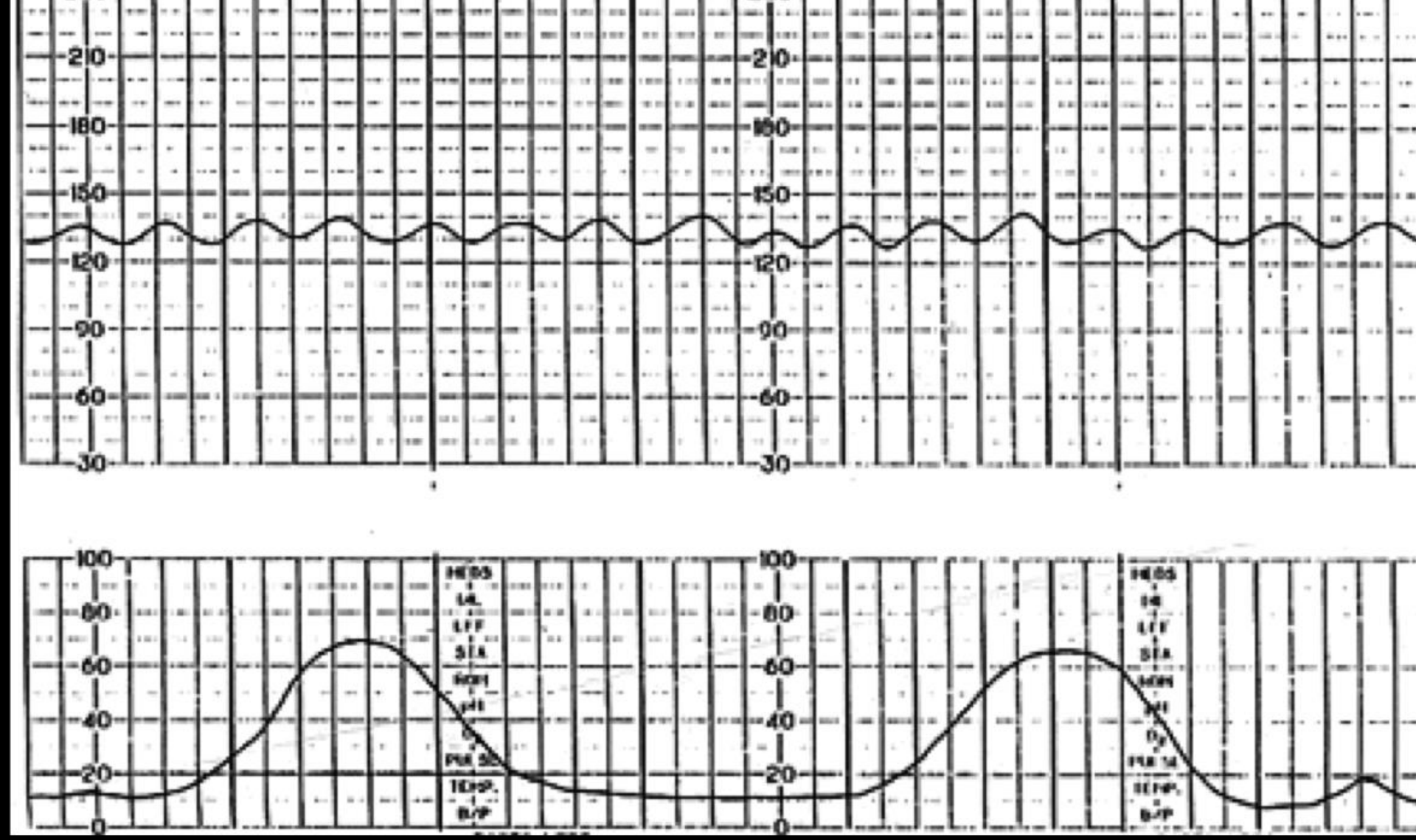
A more detailed description is always necessary.

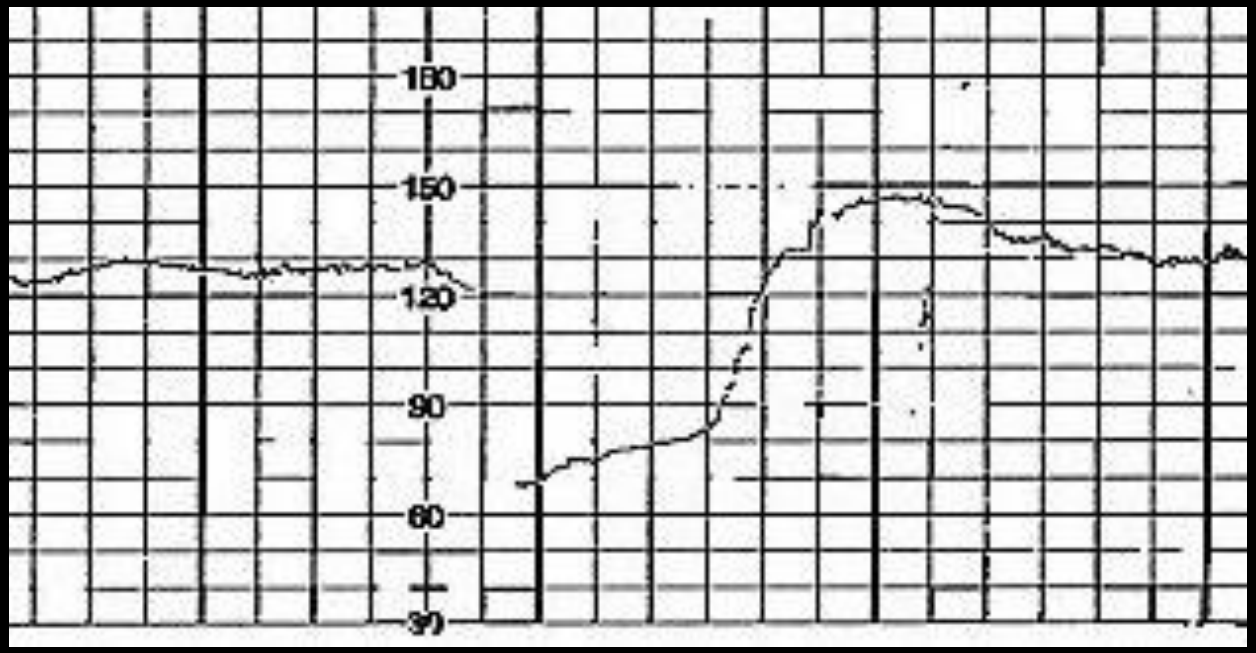
Special Categories

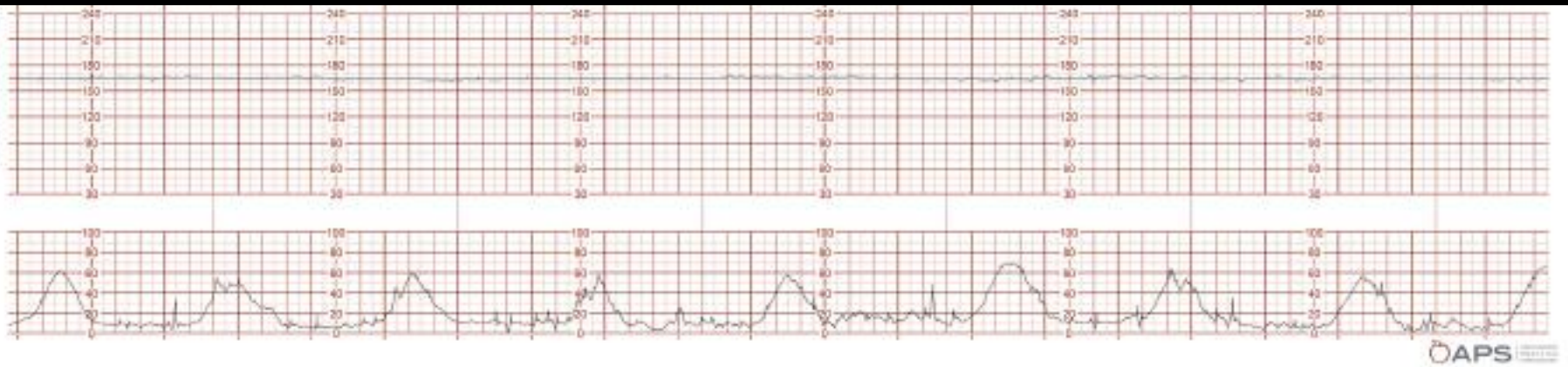
- Sinusoidal pattern vs. pseudosinusoidal
- Overshoot
- Too sick for late decelerations

- Generally represent terminally asphyxiated fetuses – rare exception is fetal anemia.

- Know them by the company they keep


210
180
150
120
90
60
30
100
80
60
40
20
0


180
150
120
90
60
30



Medication effect has been excluded clinically as part of the initial period of intrauterine resuscitation attempts. While the fetus may have experienced prelabor central nervous system injury, absence of late decelerations excludes ongoing hypoxia in a neurologically intact fetus. However, since such fetuses may not tolerate labor without sudden deterioration and demise, cesarean delivery would be appropriate, per algorithm, if pattern persists for 1 hour.

Clark. Category II FHRT. Am J Obstet Gynecol 2013.

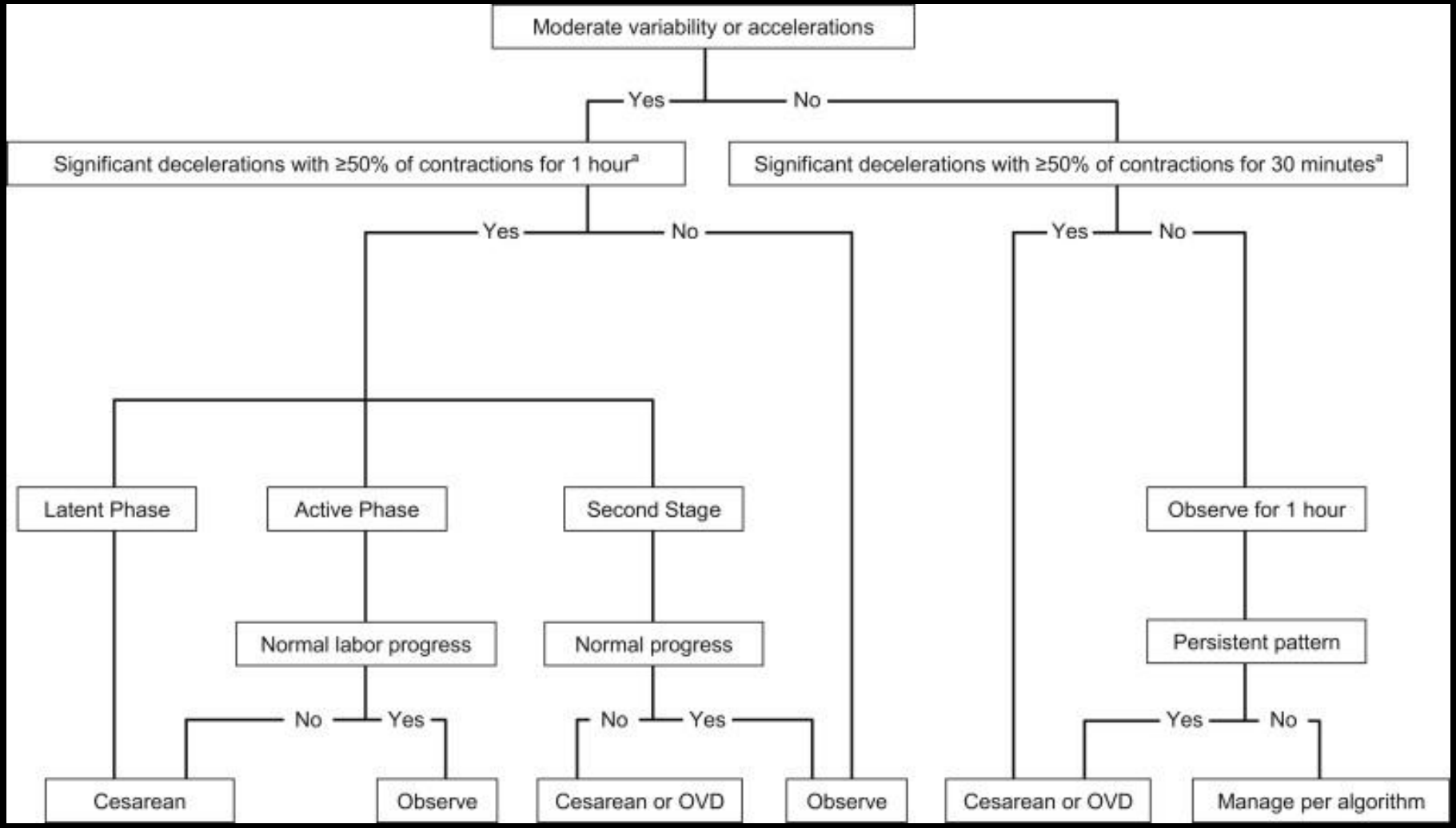
OBSTETRICS

Intrapartum management of category II fetal heart rate tracings: towards standardization of care

Steven L. Clark, MD; Michael P. Nageotte, MD; Thomas J. Garite, MD; Roger K. Freeman, MD; David A. Miller, MD; Kathleen R. Simpson, RN, PhD; Michael A. Belfort, MD, PhD; Gary A. Dildy, MD; Julian T. Parer, MD; Richard L. Berkowitz, MD; Mary D'Alton, MD; Dwight J. Rouse, MD; Larry C. Gilstrap, MD; Anthony M. Vintzileos, MD; J. Peter van Dorsten, MD; Frank H. Boehm, MD; Lisa A. Miller, CNM, JD; Gary D. V. Hankins, MD

Interpretation and management of fetal heart rate (FHR) patterns during labor remains one of the most problematic issues in obstetrics. Multiple basic science investigations and clinical trials have been published since the introduction of this technique in the late 1950s.[1-7] Unfortunately, this body of work has primarily served to raise more questions than it has answered—as a medical community, we seem to know less than we thought we did 30 years ago

There is currently no standard national approach to the management of category II fetal heart rate (FHR) patterns, yet such patterns occur in the majority of fetuses in labor. Under such circumstances, it would be difficult to demonstrate the clinical efficacy of FHR monitoring even if this technique had immense intrinsic value, since there has never been a standard hypothesis to test dealing with interpretation and management of these abnormal patterns. We present an algorithm for the management of category II FHR patterns that reflects a synthesis of available evidence and current scientific thought. Use of this algorithm represents one way for the clinician to comply with the standard of care, and may enhance our overall ability to define the benefits of intrapartum FHR monitoring.

Key words: fetal heart rate monitoring, neonatal encephalopathy, patient safety

Management of Category II FHRT