



**FETAL HEART TRACINGS
M3 OB/GYN CLERKSHIP
ORIENTATION**

Department of Obstetrics
and Gynecology

MOST LAYPERSONS THINK WE CAN DO

...



GOALS FOR TODAY

WHO – gets monitored

WHY – is this important enough to warrant a whole separate lecture

WHEN – are fetuses monitored

WHERE – can this be done

**WHAT is it and HOW do I
interpret it??**

WHO?

Intrapartum - Women in labor (but not all)

- There are alternatives
- Some women choose not to be monitored

Antepartum monitoring

- Pregnant women with maternal or fetal concerns
- Known fetal problems

WHO — IS IT REQUIRED?

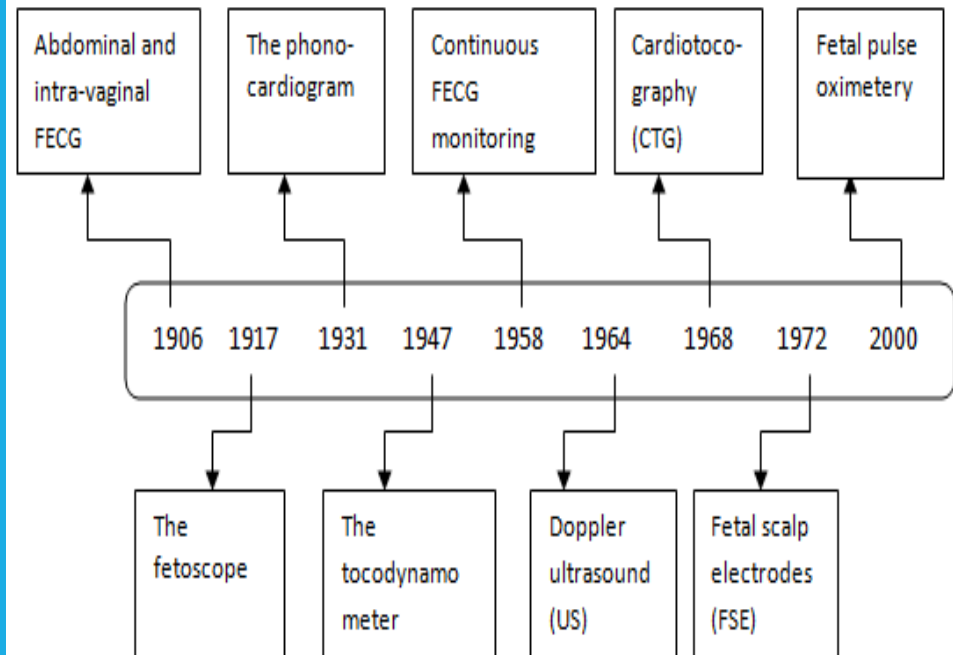
How did all this start?

-FHT monitoring is nearly 60 years old

Was developed in 1968 (Miller, et.al)

-Use has only increased since then and is now standard of care

It is the most common obstetric procedure done and 85% of fetus have had external fetal monitoring (ACOG practice bulletin number 70)



THEN WHY?

- Research has shown that not shown that monitoring leads to better outcomes (reduction of neurologic problems in neonates)
- “The goal of fetal monitoring is to prevent fetal injury resulting from interruption of fetal oxygenation during labor or the antepartum period”
- Possible decrease in neonatal seizures, cerebral palsy, and intrapartum death –resultant from neurologic response to lack of oxygenation
- Gives information about fetal status in the moment only and has poor positive predictive value

WHEN AND WHERE ANTEPARTUM AND INTRAPARTUM

Maternal indications:

- Labor
- Hypertensive disorders
- Diabetes

Fetal indications

- Growth restriction
- Decreased movement

In the ambulatory setting or

Labor and delivery

WHAT AND HOW?

The National Institute of Child Health and Human Development (NICHD) guidelines were created to standardize the nomenclature

- For appropriate patient management
- For standardized communication and documentation
- To assist with decisions about delivery and advising our pediatric colleagues about expected outcomes

WHAT AND HOW

External monitoring (EFM)

Internal monitoring (FSE) – fetal scalp electrode

HOW DO WE DO IT?



Fetoscope



DOPPLER ULTRASOUND



FETAL SCALP ELECTRODE

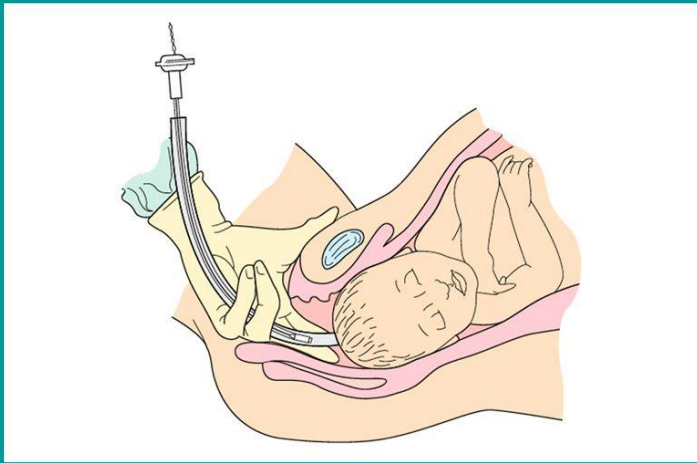
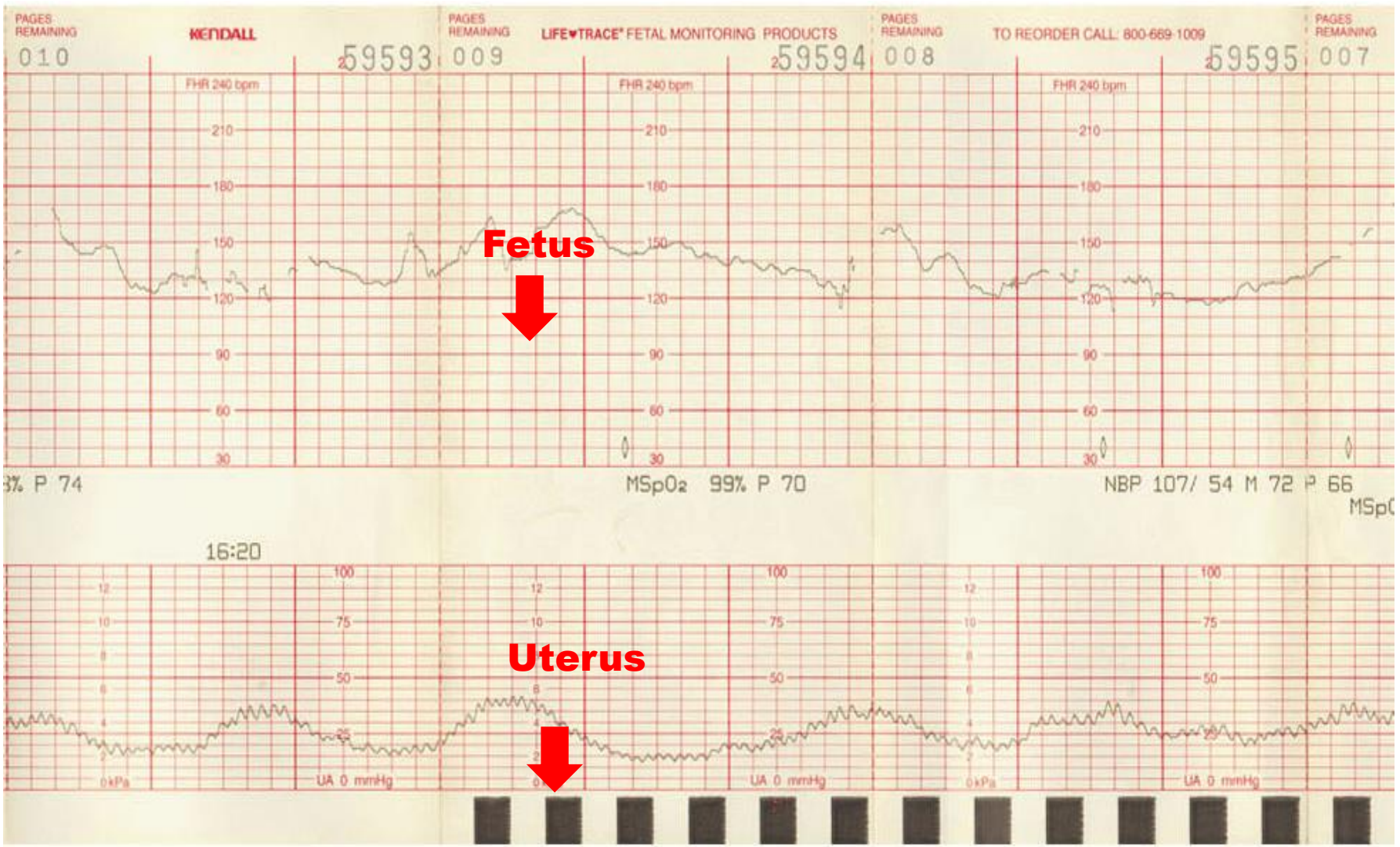


Figure 16-9b Attaching the spiral electrode to the scalp.





BASELINE

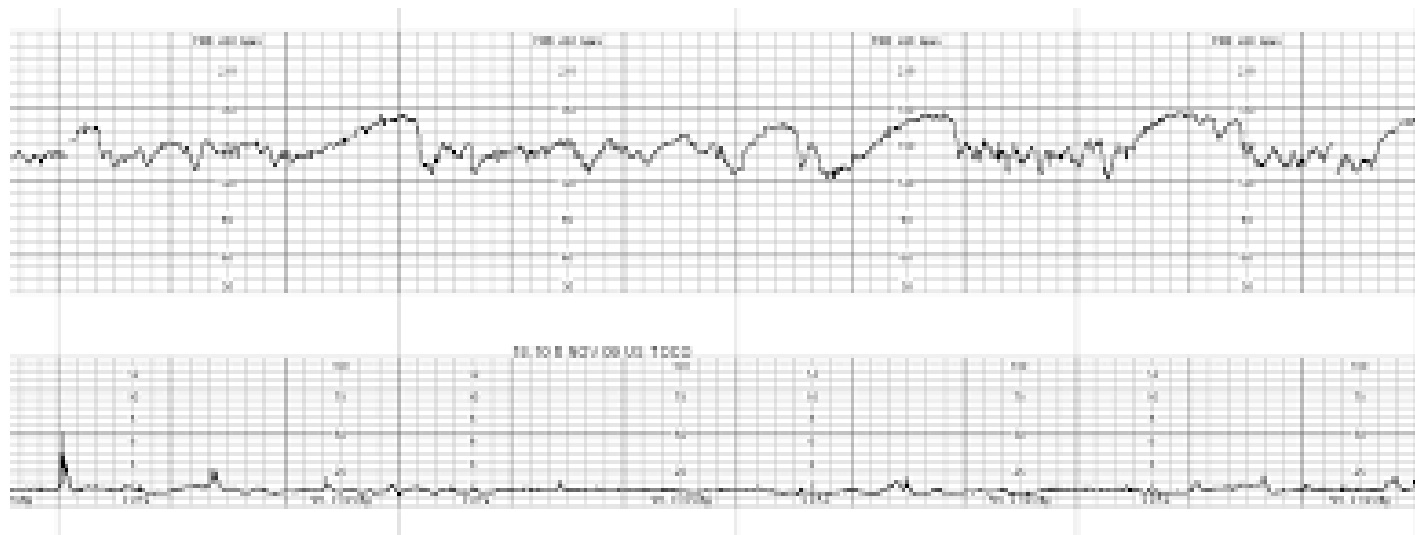
Approximate mean FHR rounded in increments of 5 bpm

- Normal 110-160 bpm
- Bradycardia < 110 bpm
- Tachycardia > 160 bpm

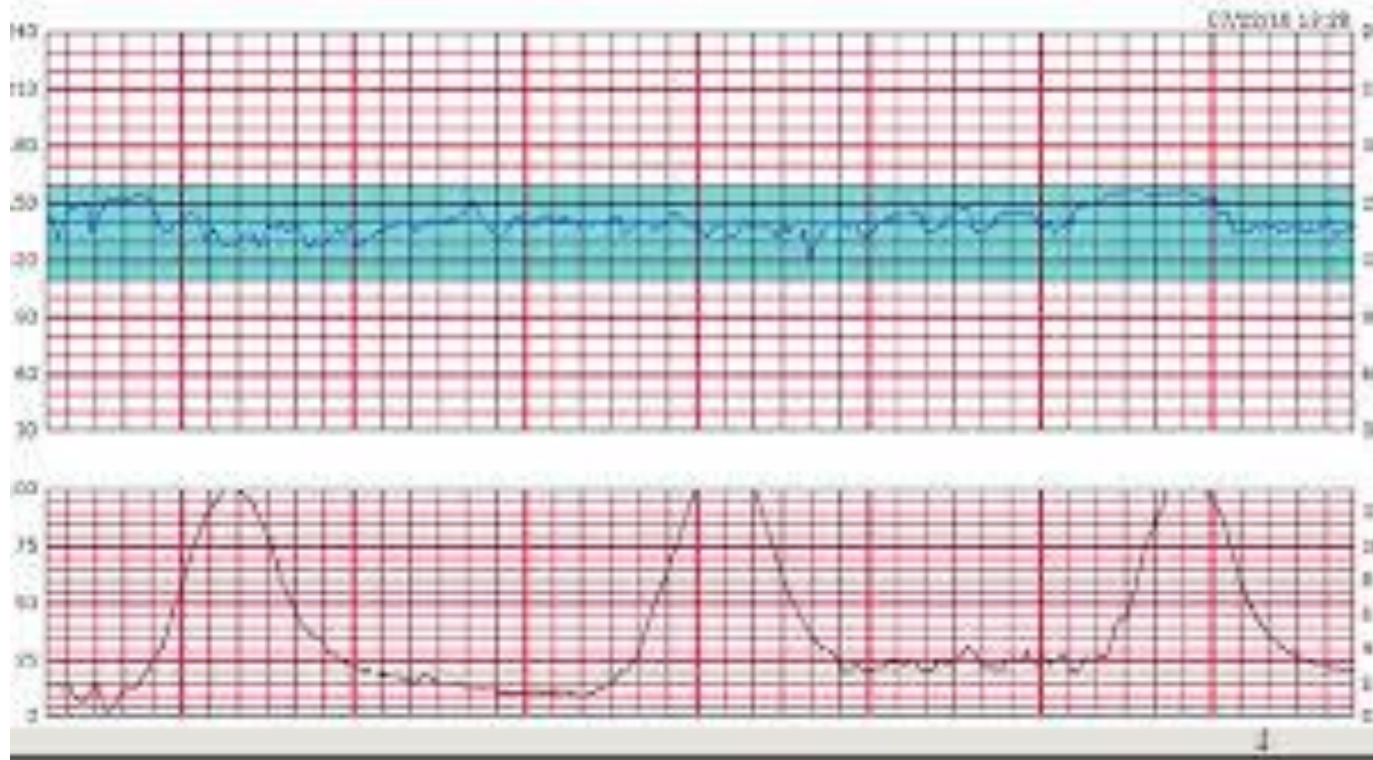
○ must be measured for at least 2 minutes of a 10 minute segment

- Can be indeterminate

NORMAL



NORMAL



HOW DO CONTRACTIONS FACTOR IN?

Most often **FETAL HEART RATE PATTERNS ARE ASSESSED IN THE CONTEXT OF UTERINE CONTRACTIONS**

Contractions are measured over a 10 minute time span, averaged over 30 minutes

Normal – 5 or less in 10 minute period

Tachysystole – 6 or more in a 10 minute time period

Decels are recurrent if they happen with at least $\frac{1}{2}$ of the contractions

UTERINE ACTIVITY

Frequency: onset of one contraction to the onset of the next contraction

Duration: onset to offset of a contraction

External tocometer (TOCO): can access the frequency and duration but NOT the strength

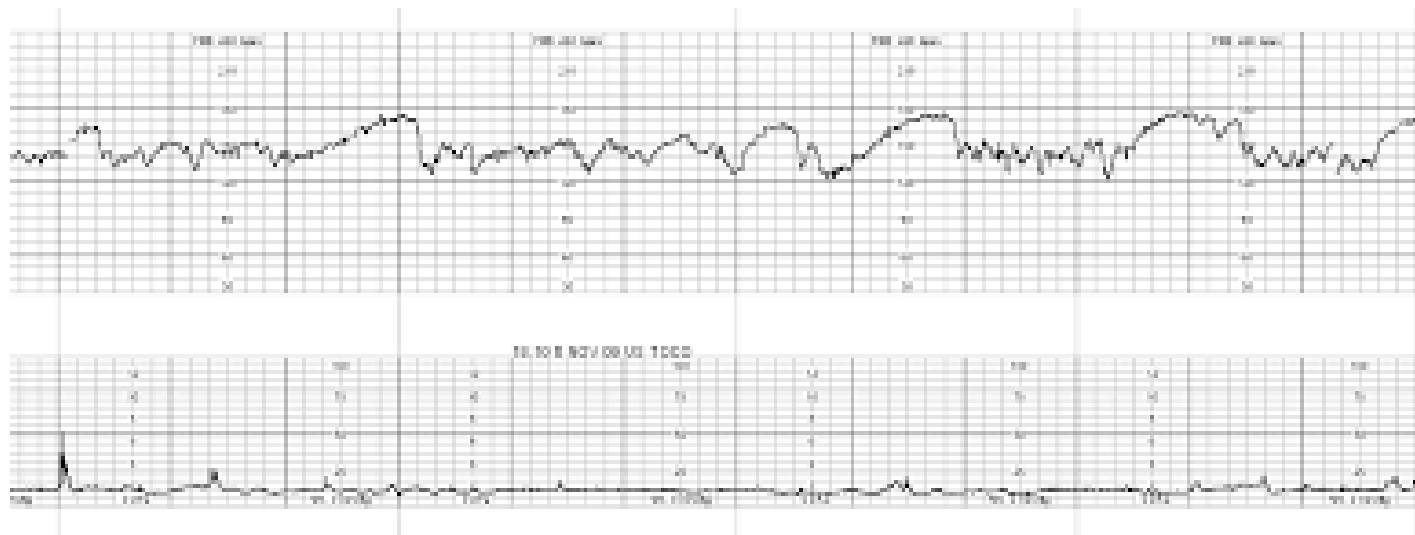
Intrauterine pressure catheter (IUPC): can access the frequency, duration and strength by measuring the intruterine pressure in mmHg

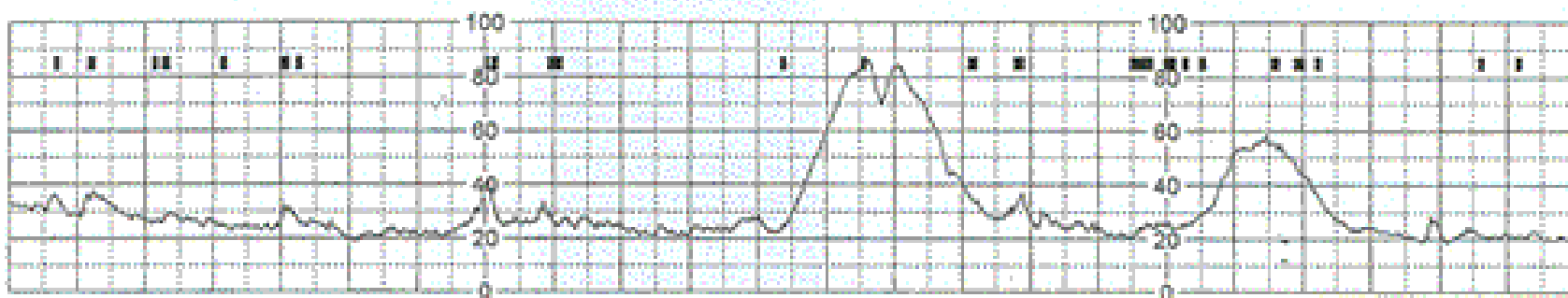
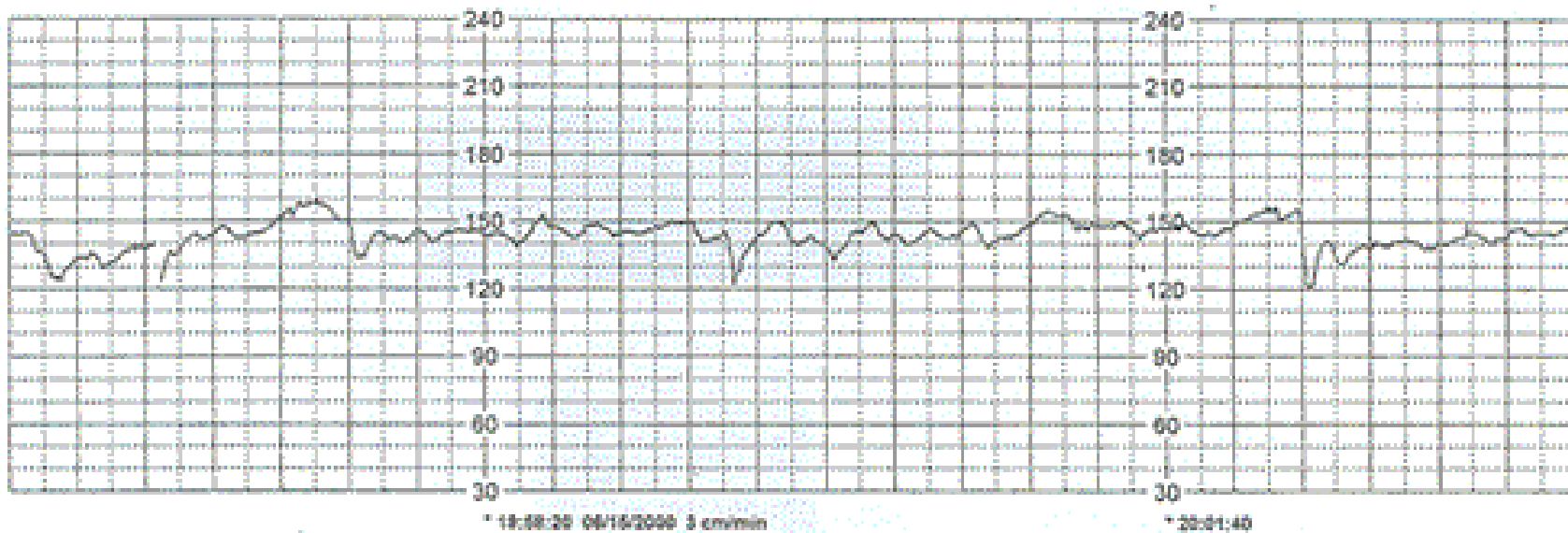
VARIABILITY

Fluctuations in the FHR baseline that are irregular in amplitude and frequency, measured from the peak to the trough

- Marked > 25 bpm
- Moderate 6 – 25 bpm
- Minimal 1 – 5 bpm
- Absent undetectable (straight line)

NORMAL







240 FHR

240 FHR

210

210

180

180

150

150

120

120

90

90

60

60

30

30

100 uA

2000 FEEDBACK 10P
100 uA

75

75

50

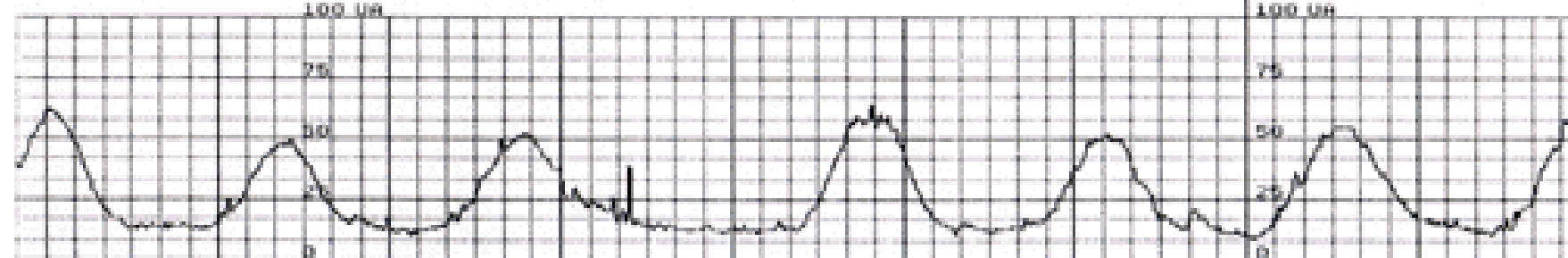
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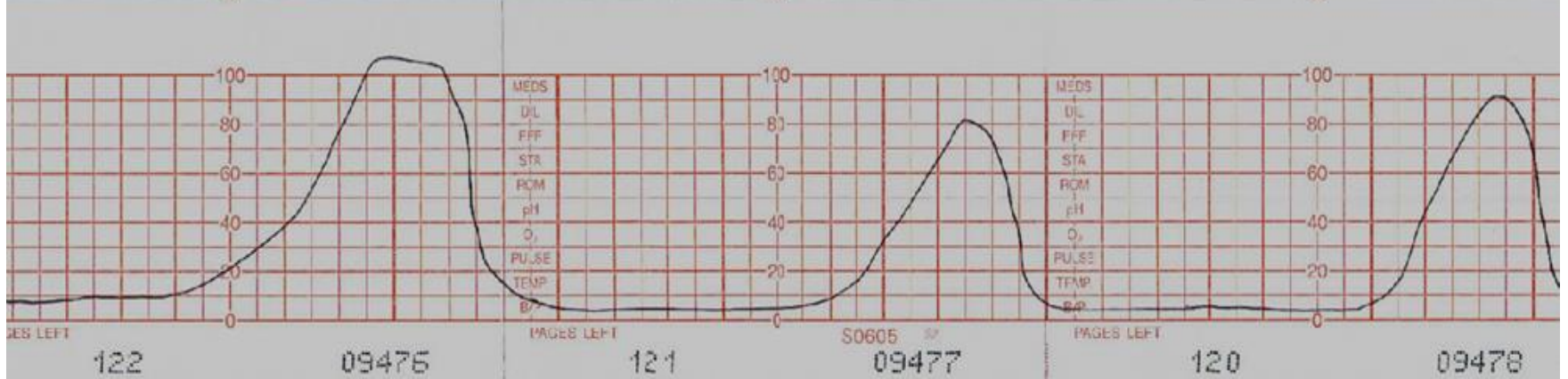
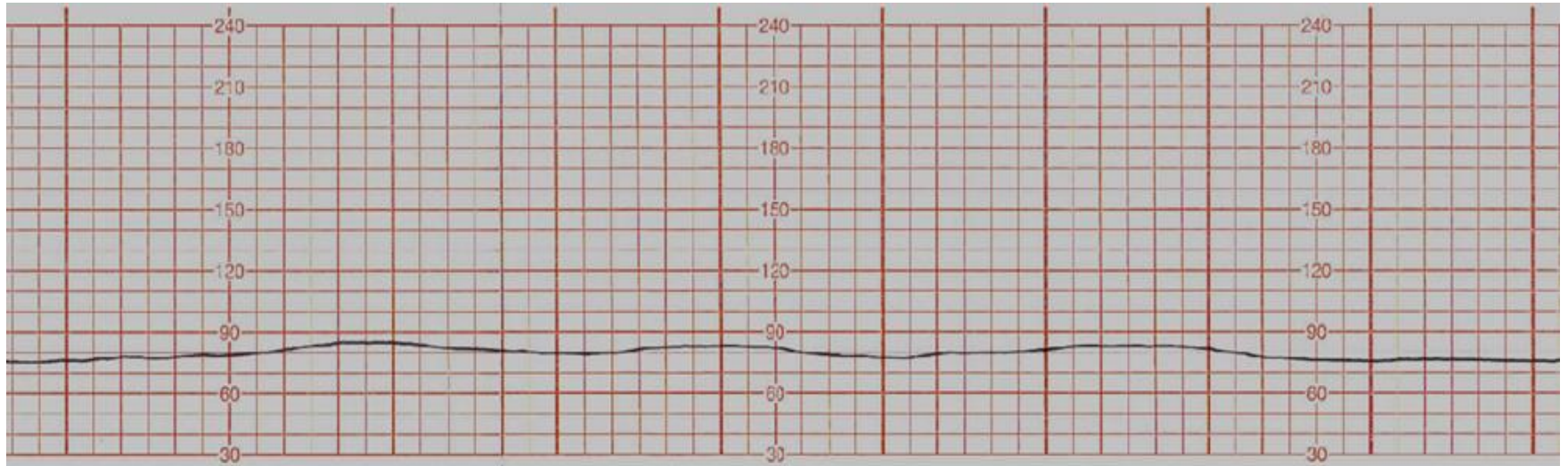
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VARIABILITY

Sympathetic and parasympathetic signals modulate the FHR in response to moment to moment changes in the fetal PO₂, PCO₂, and blood pressure

Moderate variability reliably predicts the absence of fetal metabolic acidemia at the time it is observed

Minimal or absent variability cannot confirm the presence of acidemia

- Fetal sleep
- Fetal tachycardia
- Medications (narcotics, general anesthesia)
- Prematurity
- Cardiac arrhythmias
- Preexisting neurological injury

ACCELERATIONS (ACCELS)

Variation in fetal heartrate that can be seen as an increase in heartrate

-Assessed based on gestational age

- <32 weeks – increase above the baseline by at least 10 bpm lasting at least 10 seconds (10x10) but less than 2 minutes
- >32 weeks – increase above the baseline by at least 15 bpm lasting at least 15 seconds (15x15) but less than 2 minutes

-Prolonged accelerations are 2 to 10 minutes

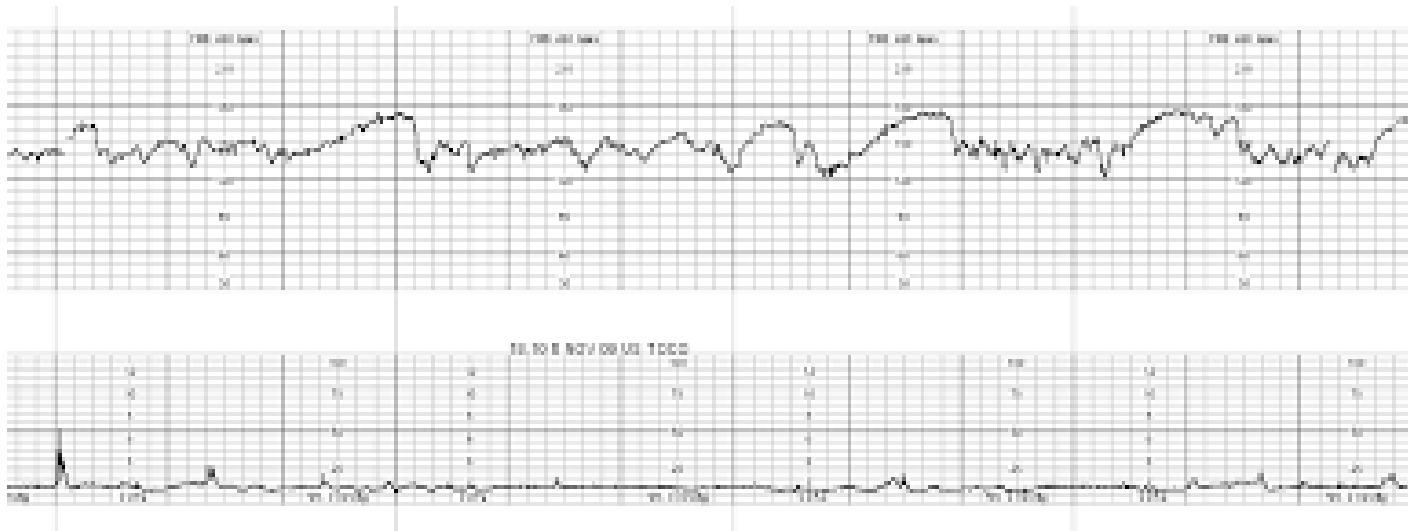
-Longer than 10 minutes is considered a baseline change

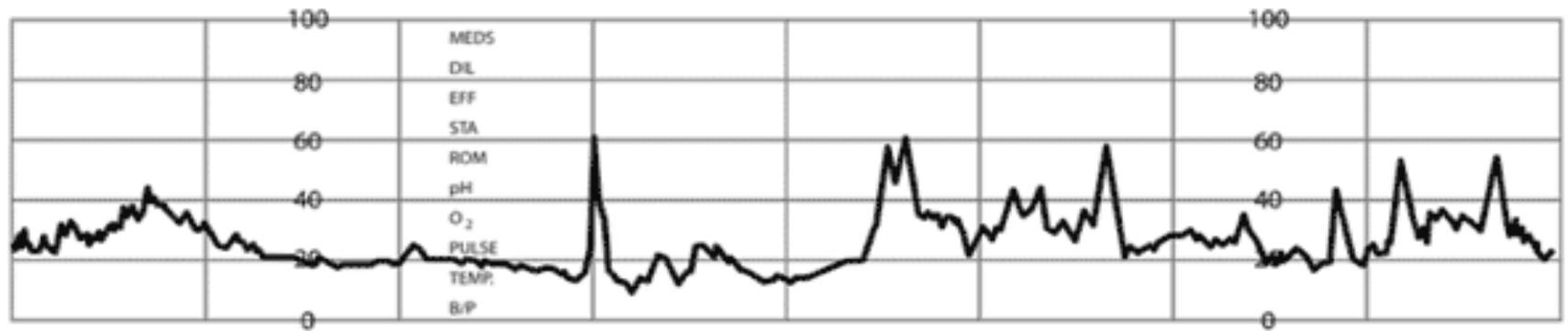
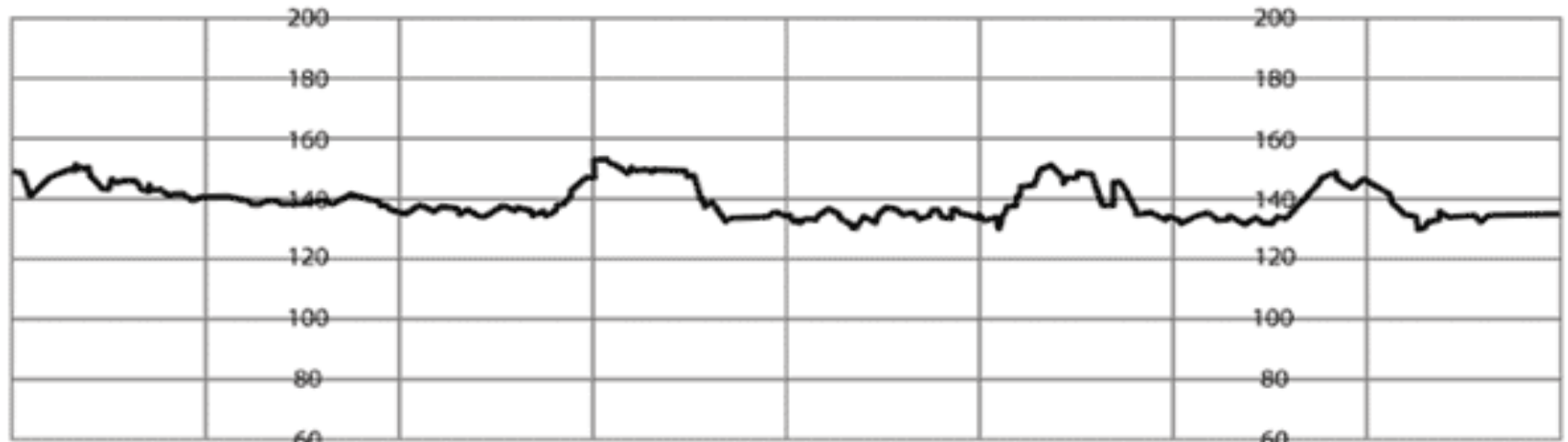
ACCELERATION

Abrupt increase (onset to peak <30 sec) in the FHR from baseline

- After 32 weeks: peak at least 15 beats above baseline and duration of at least 15 sec
- Before 32 weeks: peak at least 10 beats above baseline and duration of at least 10 sec
- Prolonged: over 2 min, if over 10 min is considered a baseline change

NORMAL





ACCELERATION

Frequently occur in association with fetal movement

The presence of fetal heart rate accelerations, either spontaneous or stimulated, reliably predicts the absence of fetal metabolic acidemia

The absence of accelerations do not confirm the presence of acidemia

Absence can be caused by any of the conditions that can cause minimal-absent variability

Fetal scalp stimulation or vibroacoustic stimulation can be used to provoke accelerations



DECELERATIONS (DECELS)

Come in several flavors

Early

Variable

Late

DECELERATION

Early deceleration

Late deceleration

Variable deceleration

Prolonged deceleration

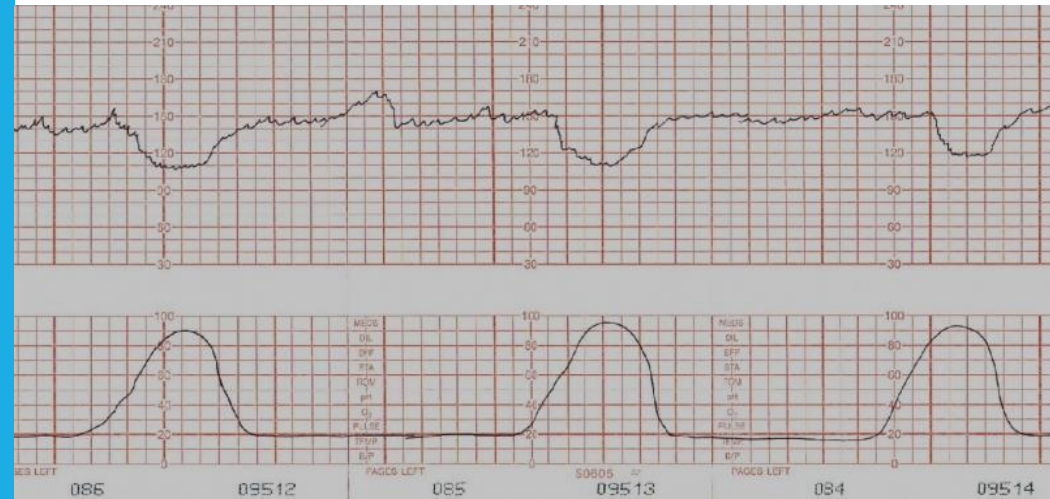
Recurrent: occurs with at least 50% of ctx

Intermittent: occur with fewer than 50% of ctx

EARLY DECELERATIONS — FETAL HEAD COMPRESSION

-Typically mirror the
contraction

-30 seconds or more from
onset to nadir



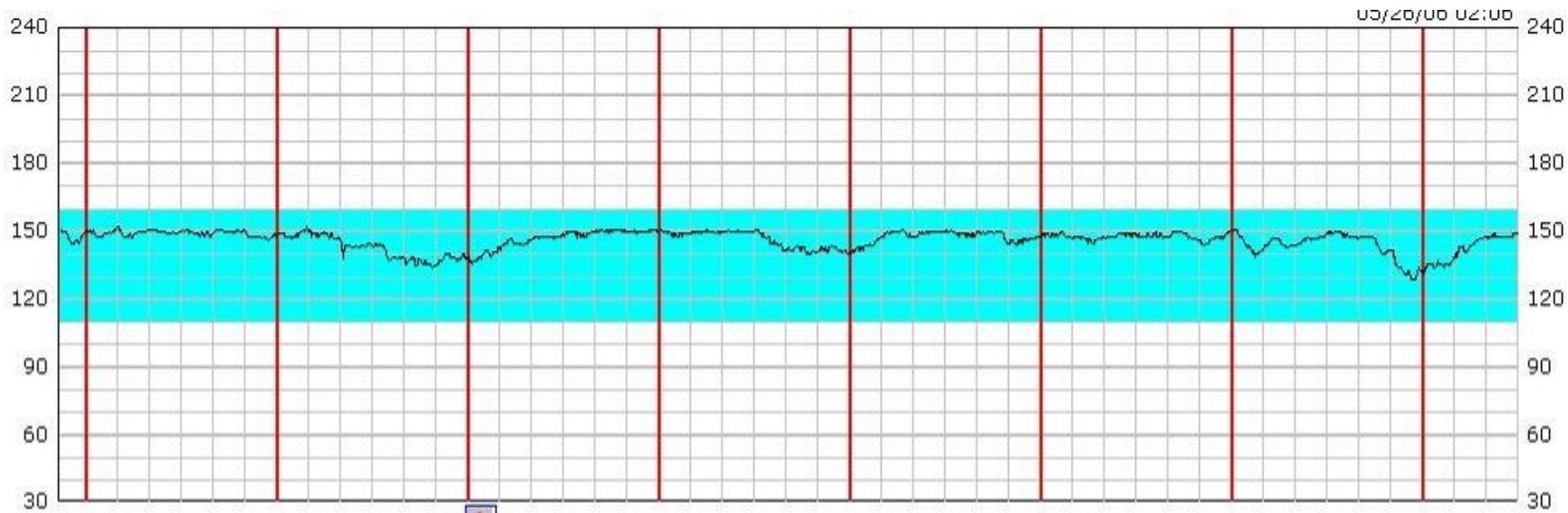
EARLY DECELERATION

Gradual onset (onset to nadir > 30 sec)

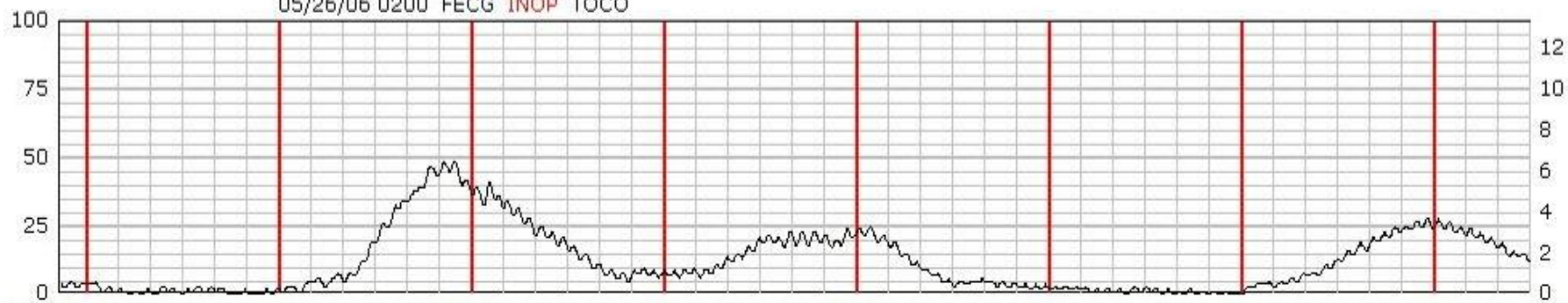
The nadir of the decel occurs at the same time as the peak of the contraction

Occurs due to vagal (parasympathetic) stimulation of the fetal head during contractions

Not correlated with adverse outcomes and are considered benign



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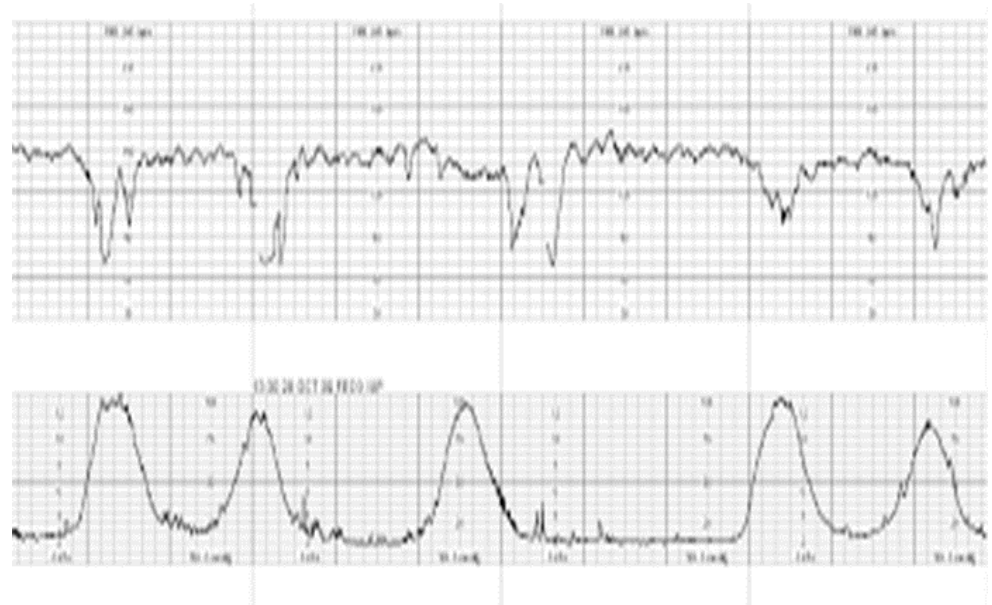
VARIABLE DECELERATIONS -CORD COMPRESSION

-Sharp change in fetal heart rate with the lowest rate lasting at least 15 BPM and <30 seconds

Decrease is >15 BPM

-The nadir is typically after the peak of the contraction

-Variables can occur without a contraction

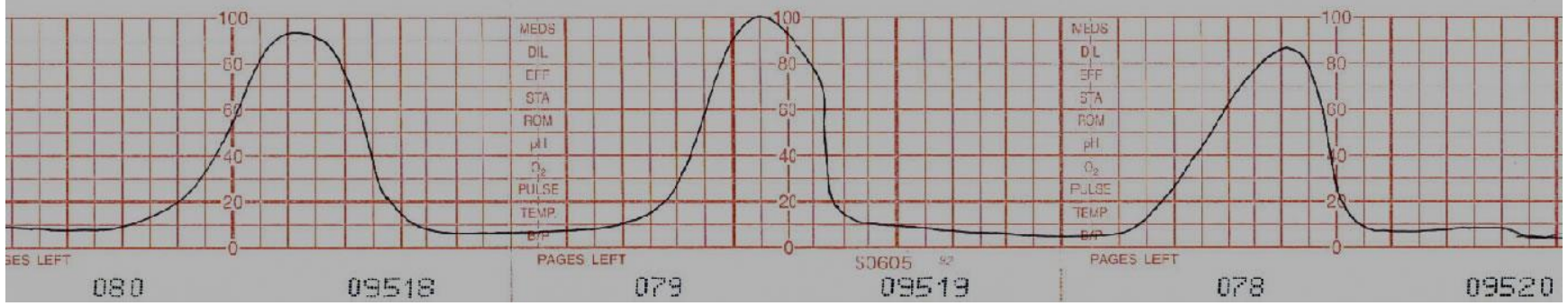
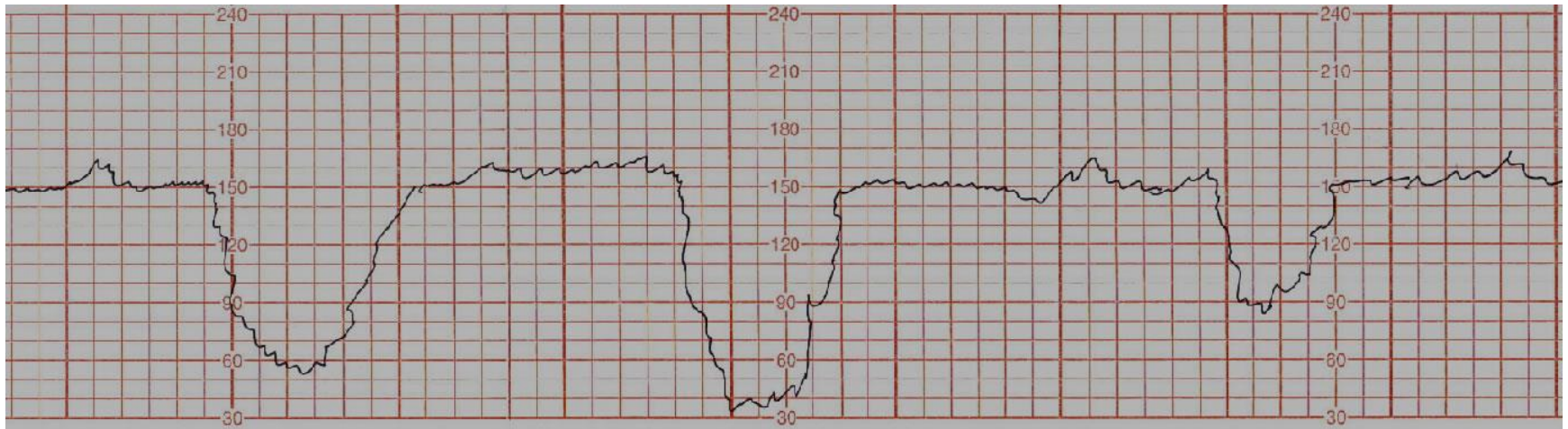


VARIABLE DECELERATIONS

Abrupt onset (onset to nadir < 30 sec)

Decrease at least 15 beats below baseline and lasts at least 15 sec

Can occur anytime in relation to a contraction or without a contraction



VARIABLE DECELERATIONS

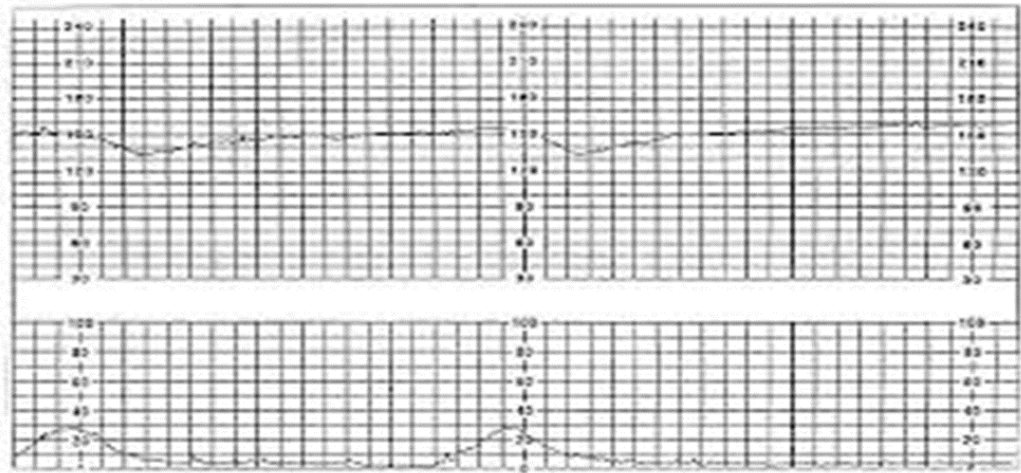
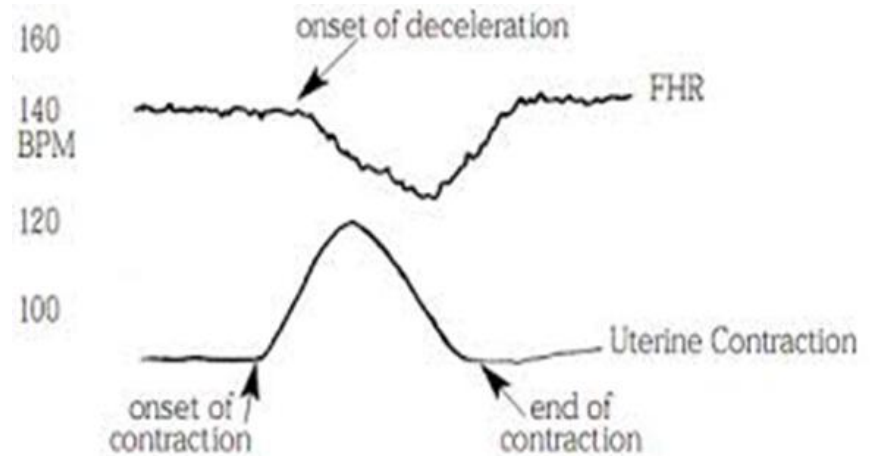
Response to transient compression of the umbilical cord

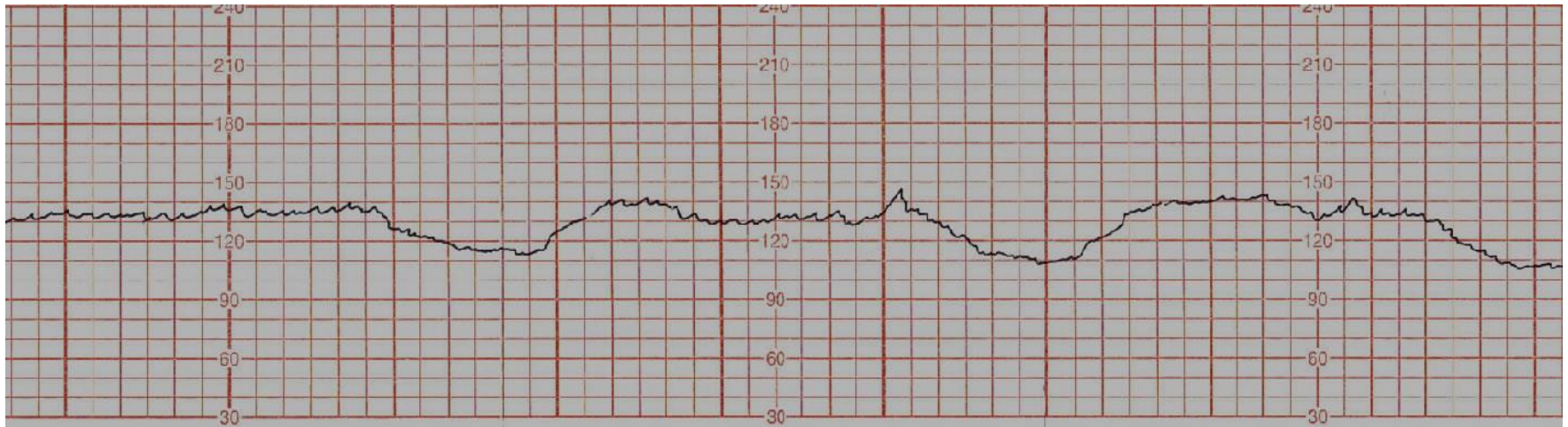
- Initially the thin walled vein is compressed decreasing venous return resulting in an increase in the FHR
- Compression of the umbilical artery leads to an abrupt increase in peripheral vascular resistance and BP
- Baroreceptors increase parasympathetic outflow leading to an abrupt decrease in FHR

LATE DECELERATIONS

ASSOCIATED WITH
UTEROPLACENTAL
INSUFFICIENCY

- Gradual decrease in fetal heart rate
- Lasts 30 seconds to 2 minutes
- The nadir happens after the peak of the contraction





MEDS
 DIL
 EFF
 STA
 HUM
 P₁
 C₂
 PULSE
 TEMP.
 B/P

MEDS
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LATE DECELERATION

Gradual onset (onset to nadir $>$ 30 sec)

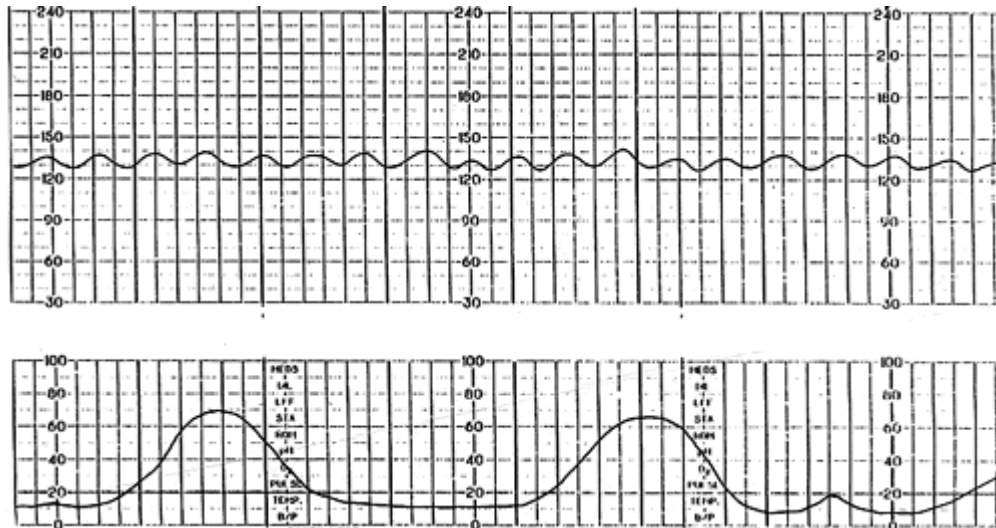
The onset, nadir, and recovery occur after the beginning, peak, and end of the contraction, respectively

LATE DECELERATION

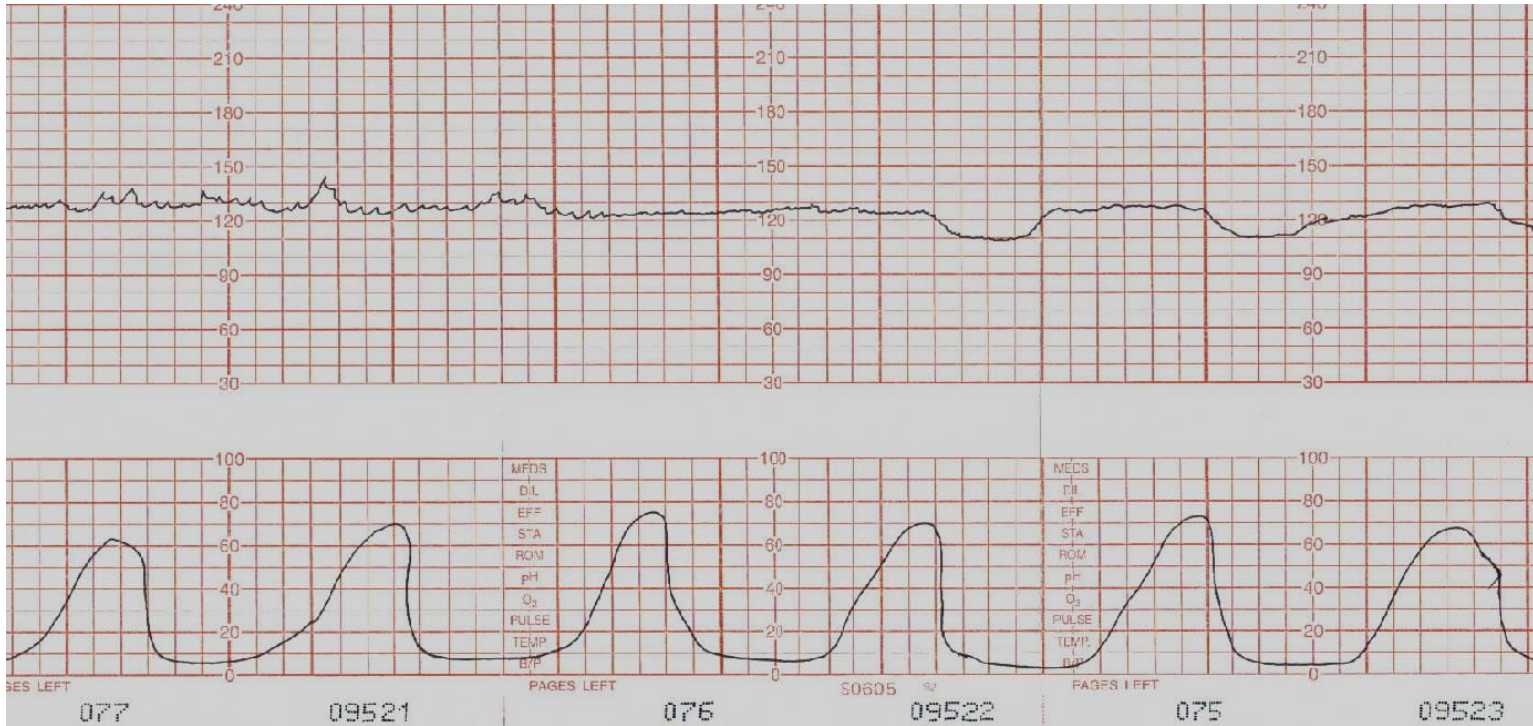
Response to transient hypoxemia during a uterine contraction

- Contractions compress maternal blood vessels leading to decreased perfusion of the placenta
- If the fetal PO₂ falls below a certain range there is an autonomic response
- Sympathetic vasoconstriction to shunt blood to vital organs leads to increased blood pressure
- Baroreceptors cause a reflex parasympathetic slowing of the FHR

SINUSOIDAL



TACHYSYSTOLE



PROLONGED DECELERATION

Either gradual or abrupt

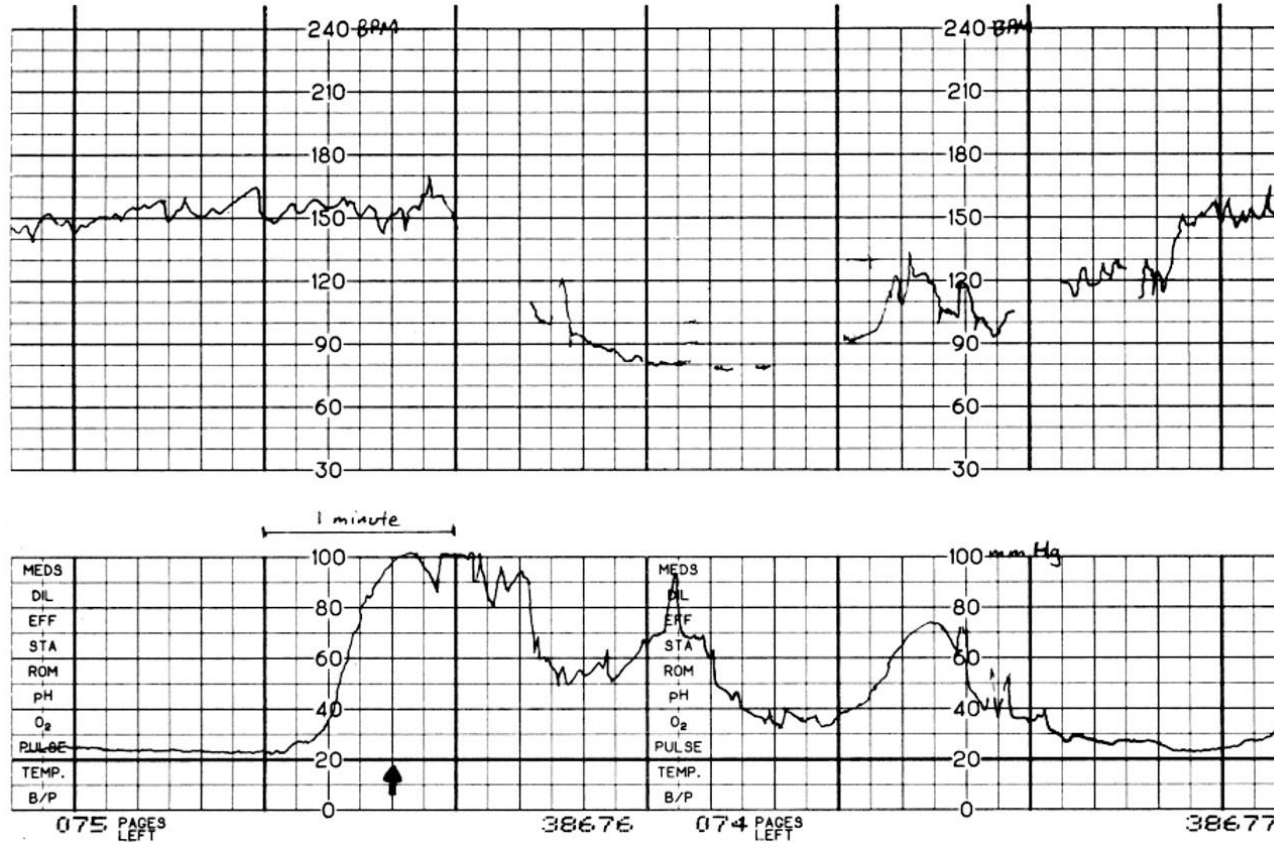
Deceleration of at least 15 bpm below the baseline and lasting > 2 min

If > 10 min considered a baseline change

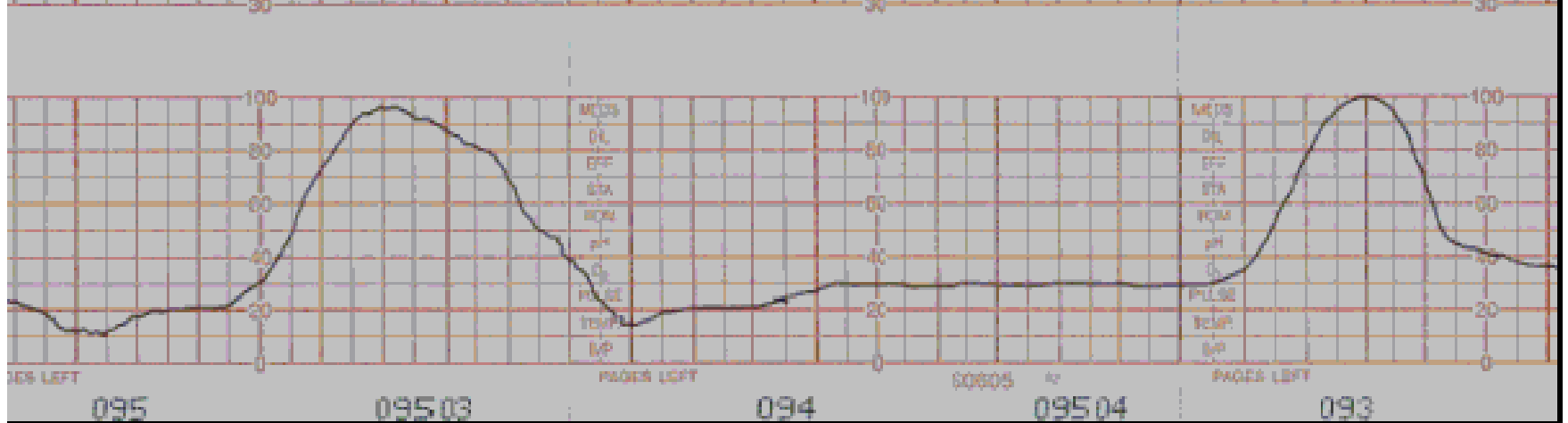
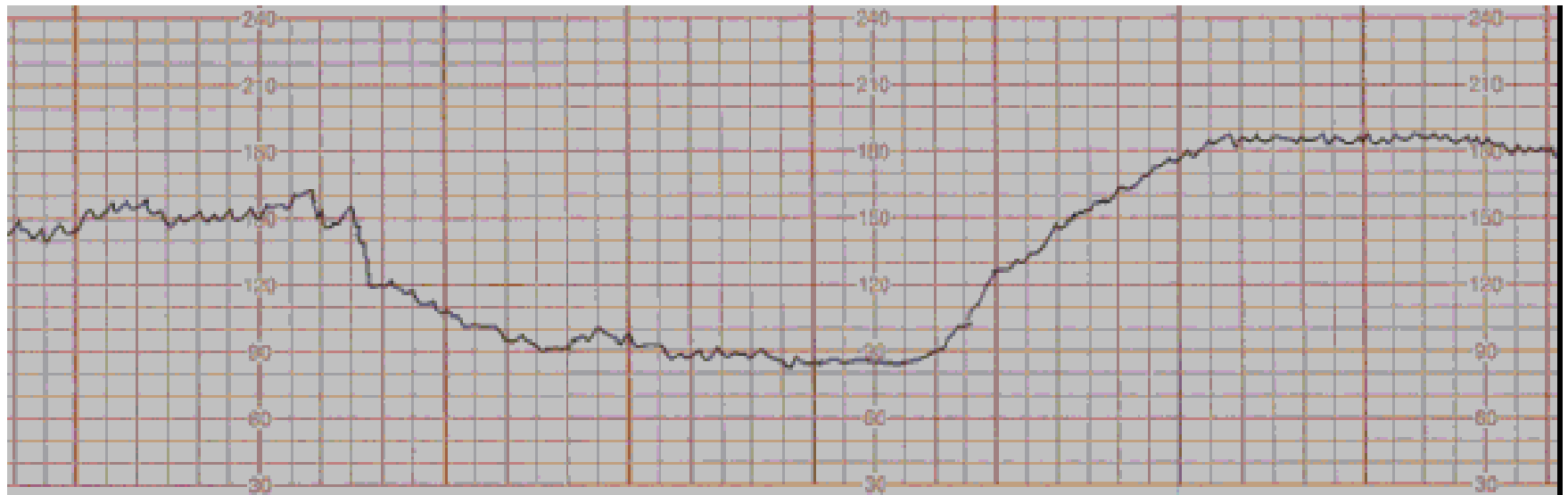
Common causes of prolonged decels

- Apnea during a seizure
- Maternal hypotension after regional anesthesia
- Excessive uterine activity or uterine rupture
- Cord prolapse

TACHYSYSTOLE



Presence or absence of FHR decels should be documented when noting tachysystole



ASSESSMENT – NICHD GUIDELINES

Category I – strongly predictive of normal fetal acid/base status in that moment of assessment. No intervention is indicated.

Category II – not predictive of abnormal fetal acid/base status, but do not fit criteria for category I or III. Usually managed with close observation and sometimes intrauterine resuscitative efforts

Category III – associated with abnormal fetal acid/base status. Require intervention resolve the pattern as soon as possible. If there is no improvement in a short time, expeditious delivery is indicated.

NICHD 3 TIER CLASSIFICATION

Category I

- Normal baseline
- Moderate variability
- Late or variable decelerations absent
- Accelerations and early decelerations can be present or absent

Category II

- All tracings not I or III

Category III

- Must have absent variability
- WITH recurrent late or variable decels or bradycardia for at least 10 min

SPECIAL DESIGNATIONS

Reactive vs Nonreactive

- Relevant in outpatient setting for FETAL NONSTRESS TEST
- For antenatal monitoring – typically lasts 20-40 minutes

CONTRACTIONS STRESS TEST – response of fetus to contractions. Used when there is a concern for possible poor fetal oxygenation.

- Positive – presence of late decelerations associated with 50% or more of the contractions
- Negative – no late or worrisome variable decelerations
- Equivocal/Unsatisfactory

CONCLUSIONS

- FHR tracing is an integral part of modern obstetric practice
- Standardized nomenclature is protective for patient and for provider
- However, there are no studies that compare electronic fetal monitoring and some data suggests that it increases the risk of cesarean delivery over **intermittent auscultation** every 5-15 minutes, for an abnormal FHR (ACOG practice bulletin number 70)
- EFM does not seem to reduce the risk of CP

CONCLUSIONS

- Fetal heart rate can be transiently affected by medications and drugs
 - Pain medications/ Narcotics
 - Seizure prevention medicines (Magnesium sulfate)
 - Corticosteroids
 - Cocaine

REFERENCES

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