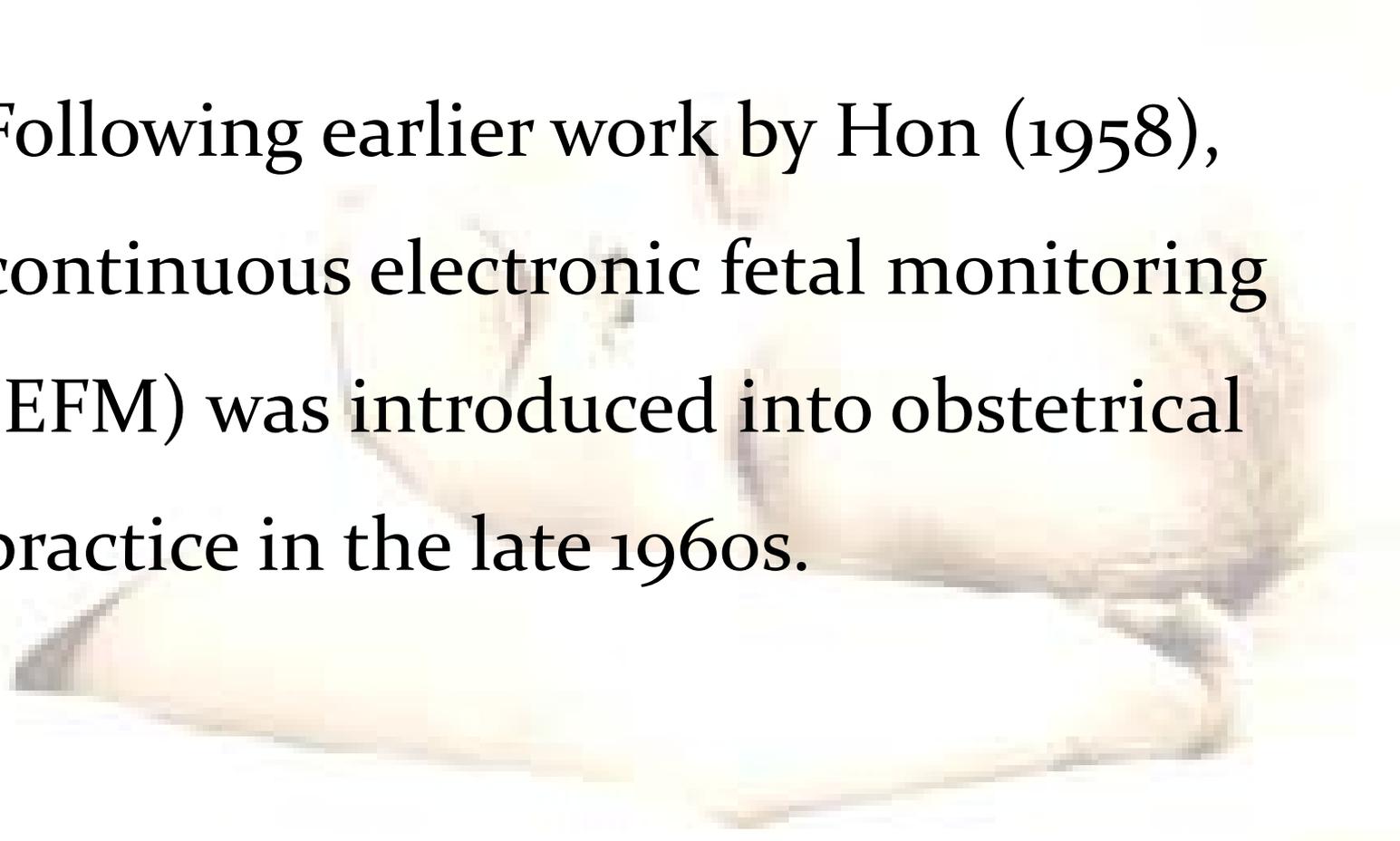


# Intrapartum Assessment

Dr. Nooshin Eshraghi



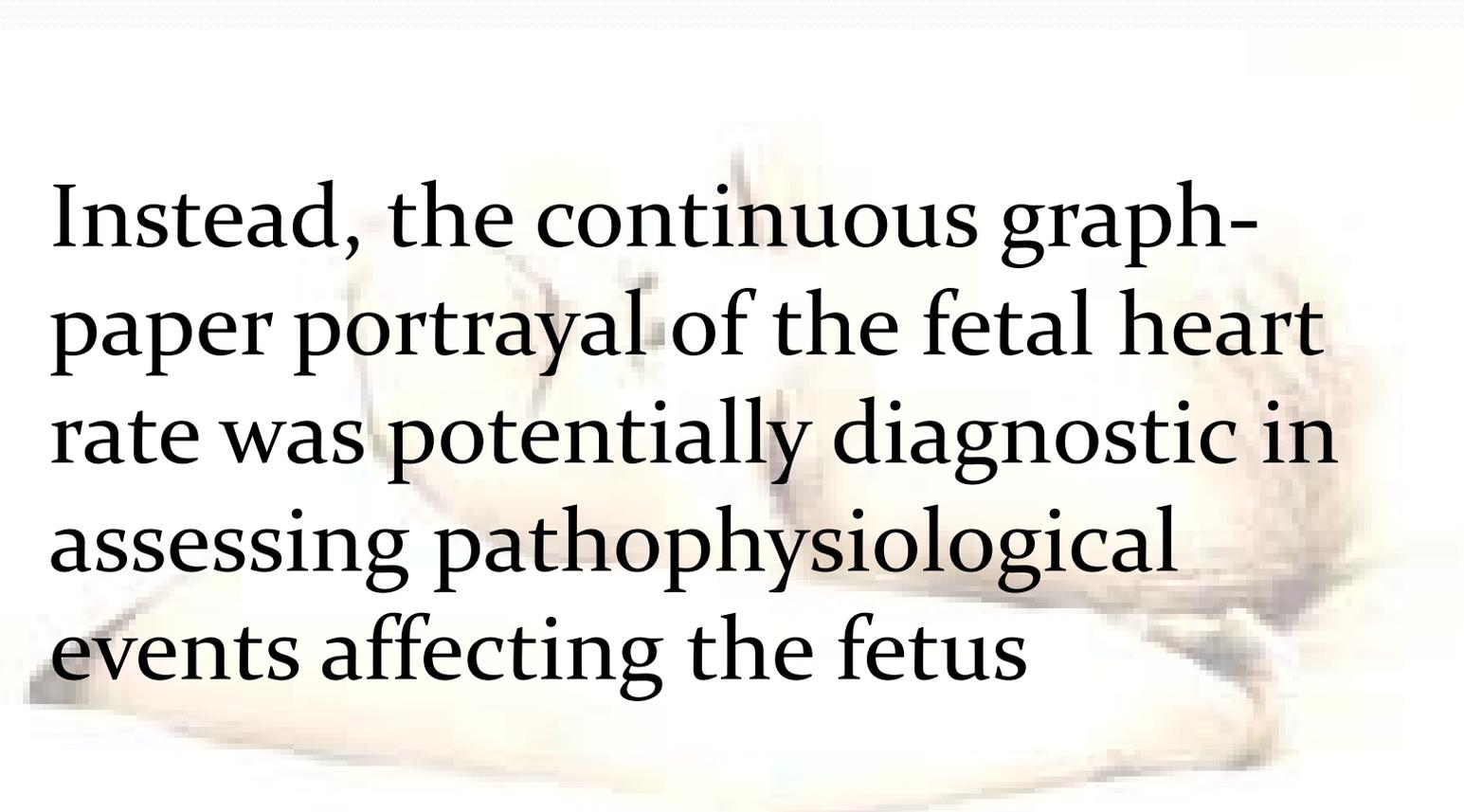
Following earlier work by Hon (1958), continuous electronic fetal monitoring (EFM) was introduced into obstetrical practice in the late 1960s.



No longer were intrapartum fetal surveillance and the suspicion of fetal distress based upon periodic auscultation with a fetoscope.

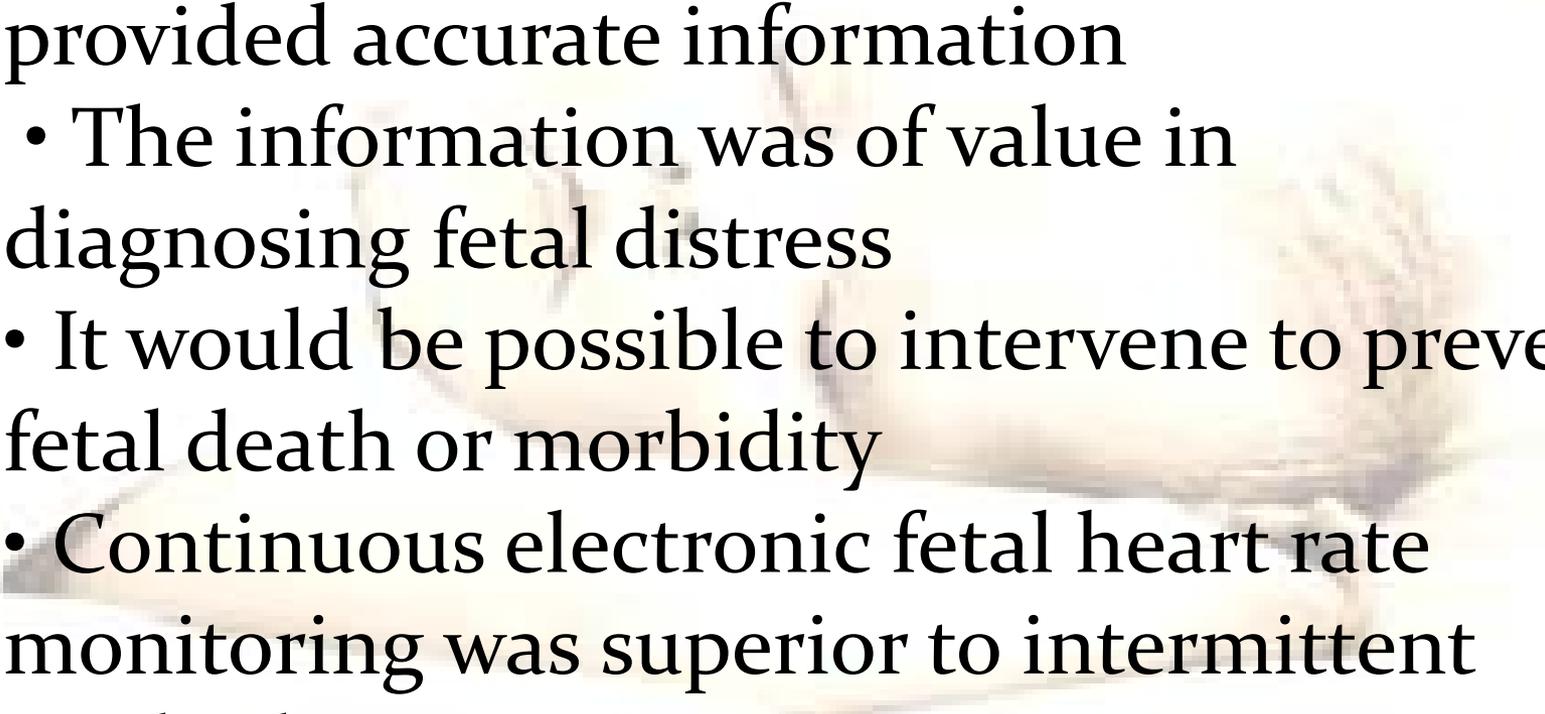


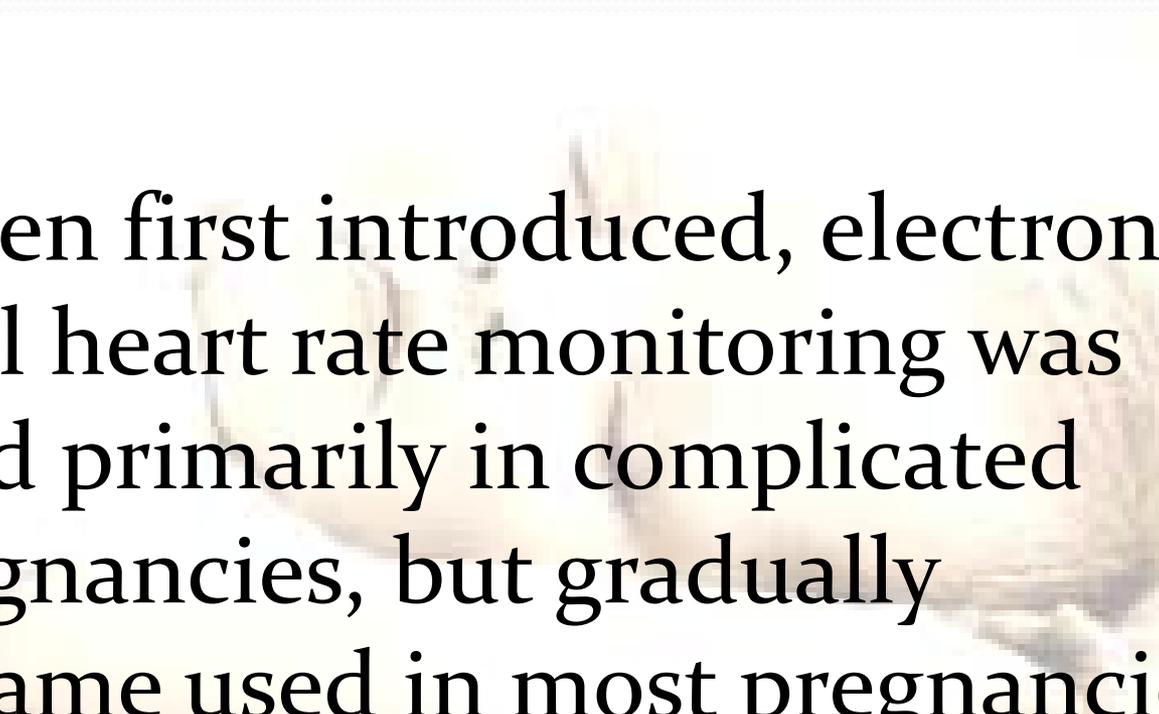
Instead, the continuous graph-  
paper portrayal of the fetal heart  
rate was potentially diagnostic in  
assessing pathophysiological  
events affecting the fetus





Indeed, there were great expectations that:

- Electronic fetal heart rate monitoring provided accurate information
    - The information was of value in diagnosing fetal distress
    - It would be possible to intervene to prevent fetal death or morbidity
    - Continuous electronic fetal heart rate monitoring was superior to intermittent methods.
- 



When first introduced, electronic fetal heart rate monitoring was used primarily in complicated pregnancies, but gradually became used in most pregnancies.



Indeed, fetal monitoring has become the most prevalent obstetrical procedure in the United State

# ELECTRONIC FETAL MONITORING :

- Internal Electronic Monitoring
- External (Indirect) Electronic Monitoring

# Internal Electronic Monitoring :

The fetal heart rate may be measured by attaching a bipolar spiral electrode directly to the fetus



The wire electrode penetrates the fetal scalp, and the second pole is a metal wing on the electrode. Vaginal body fluids create a saline electrical bridge that completes the circuit and permits measurement of the voltage differences between the two poles



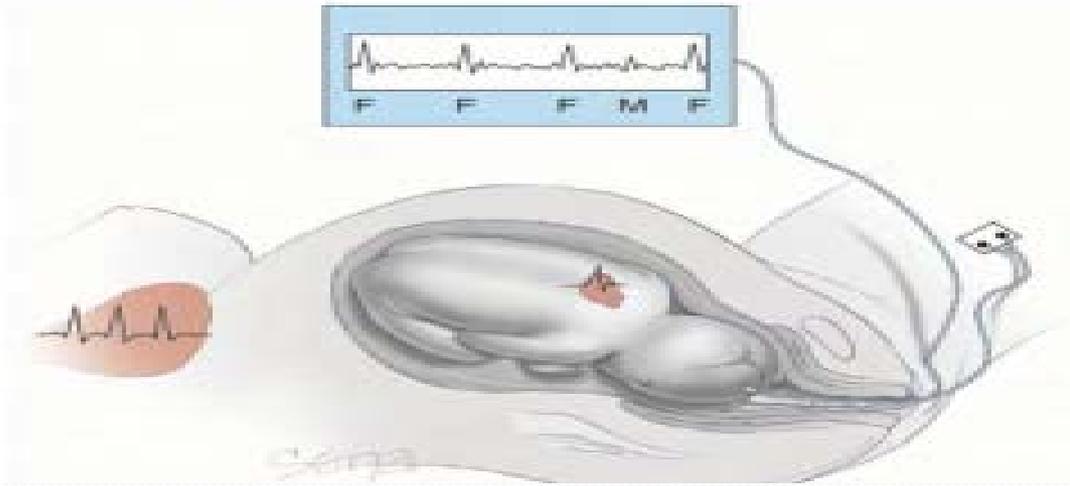
The two wires of the bipolar electrode are attached to a reference electrode on the maternal thigh to eliminate electrical interference.



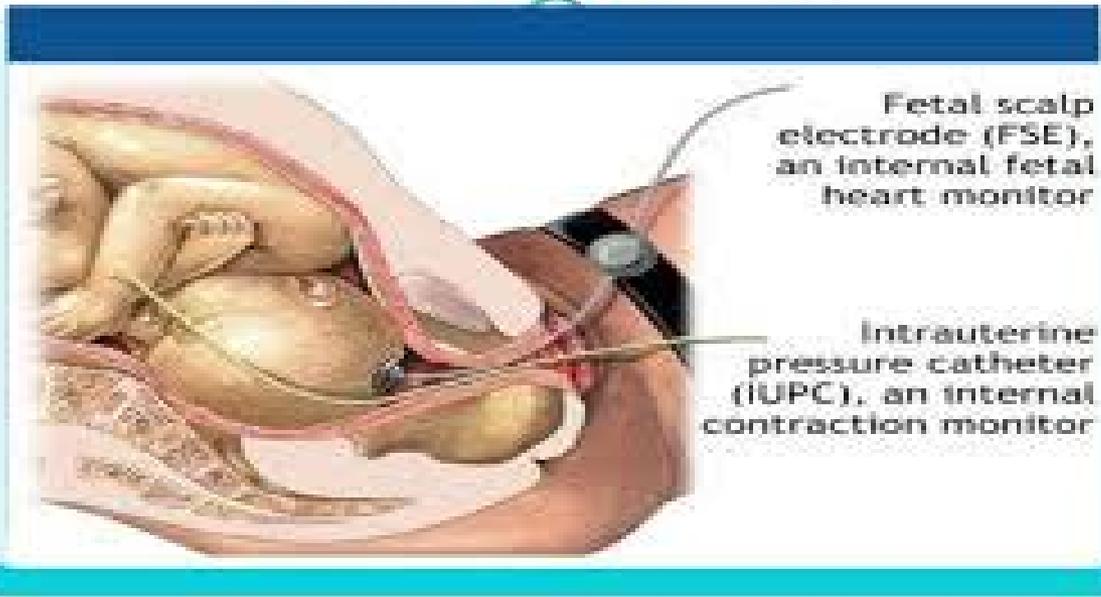
The electrical fetal cardiac signal—P wave, QRS complex, and T wave—is amplified and fed into a cardiometer for heart rate calculation. The peak R-wave voltage is the portion of the fetal electrocardiogram most reliably detected.



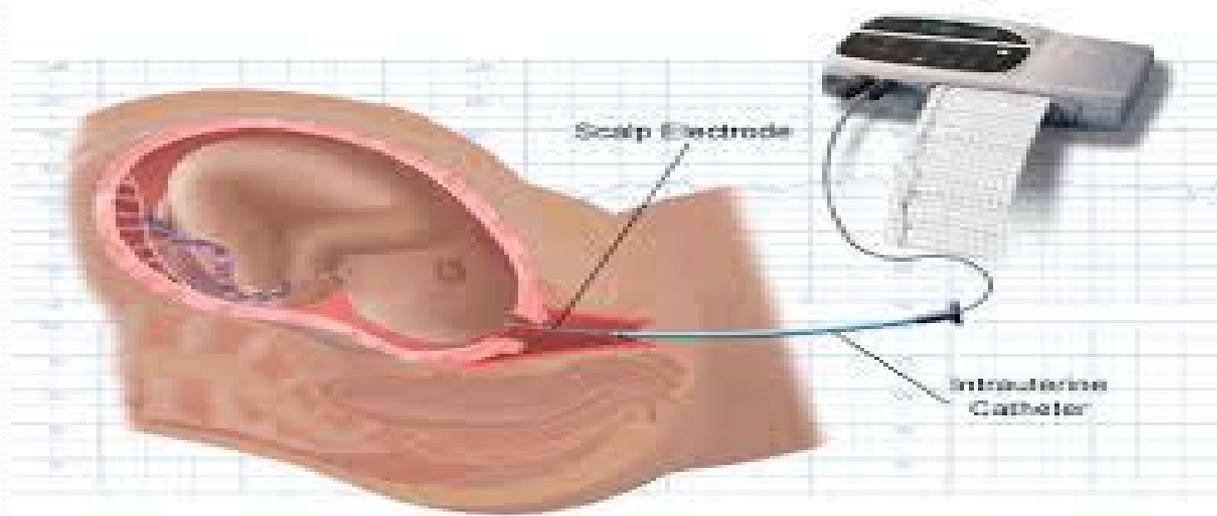
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## Internal monitoring



## Internal Fetal Heart Rate Monitoring

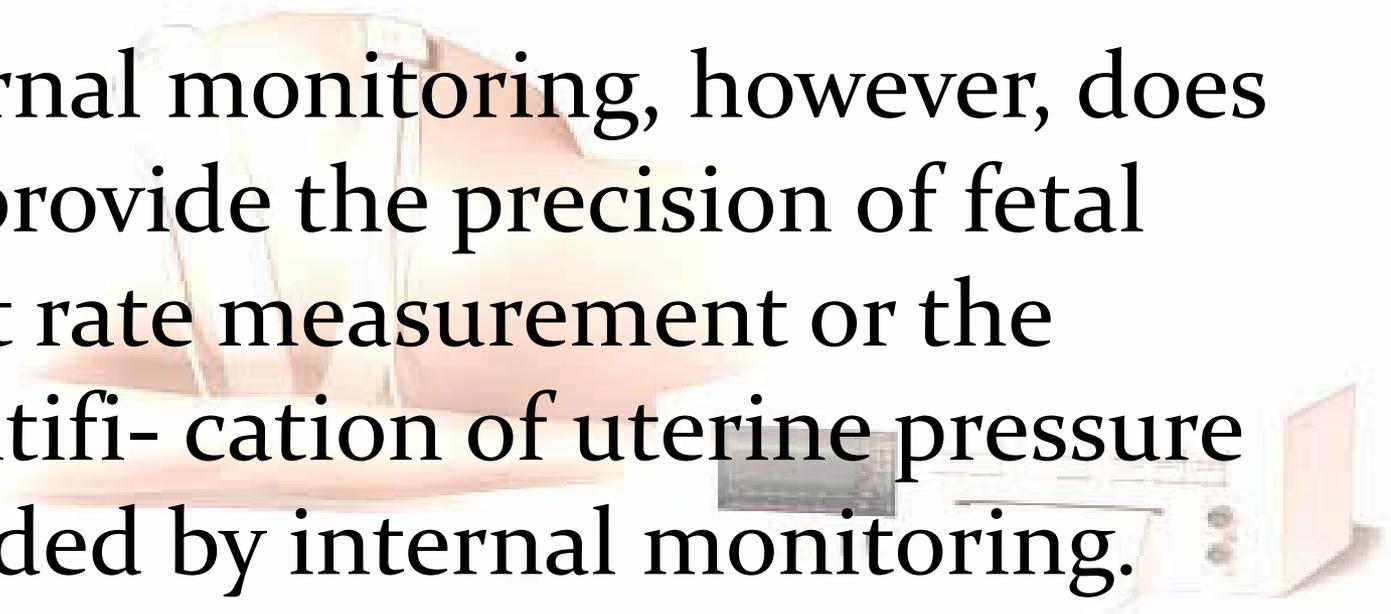


- 
- The phenomenon of continuous R-to-R wave fetal heart rate computation is known as beat-to-beat variability

- 
- The physiological event being counted, however, is not a mechanical event corresponding to a heartbeat but rather an electrical event.

# External (Indirect) Electronic Monitoring :

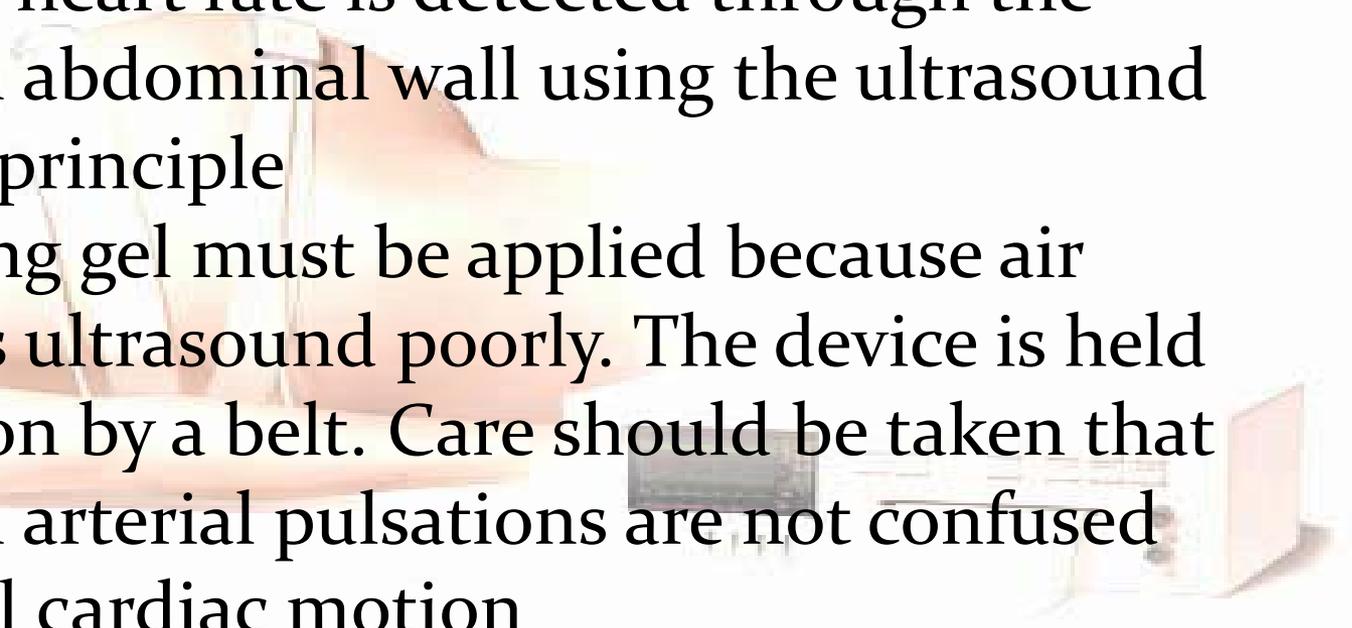
External monitoring, however, does not provide the precision of fetal heart rate measurement or the quantification of uterine pressure afforded by internal monitoring.





The fetal heart rate is detected through the maternal abdominal wall using the ultrasound Doppler principle

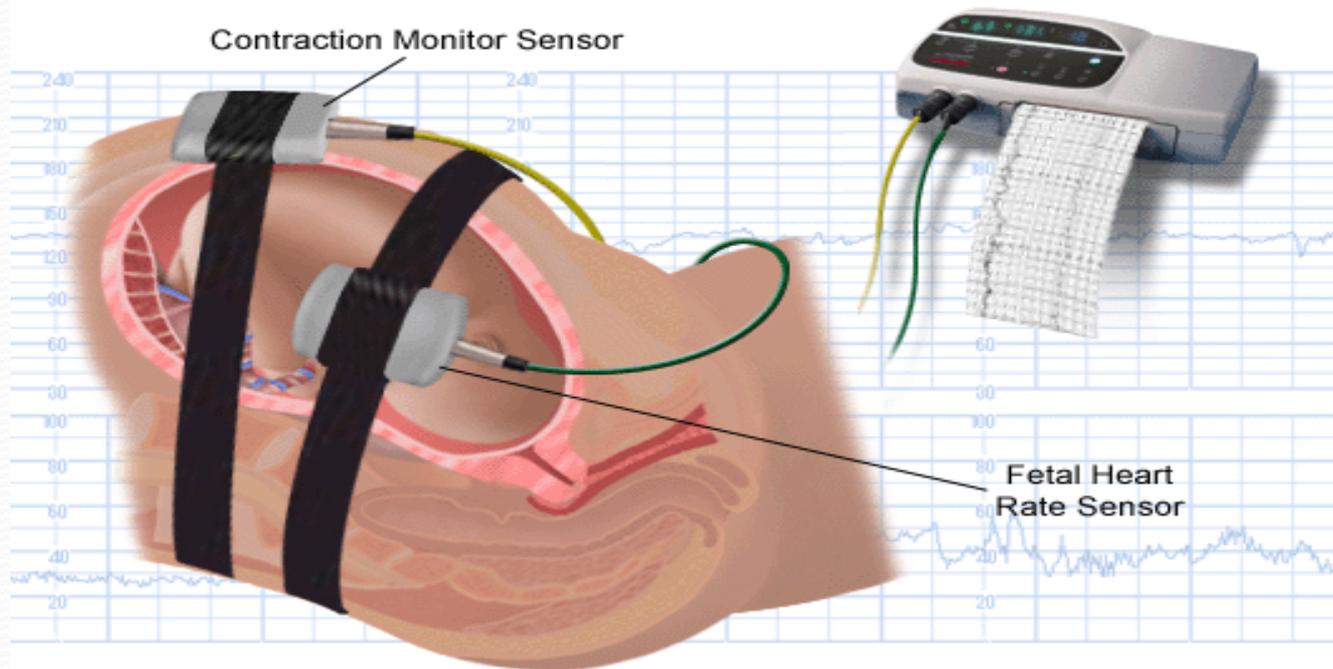
A coupling gel must be applied because air conducts ultrasound poorly. The device is held in position by a belt. Care should be taken that maternal arterial pulsations are not confused with fetal cardiac motion





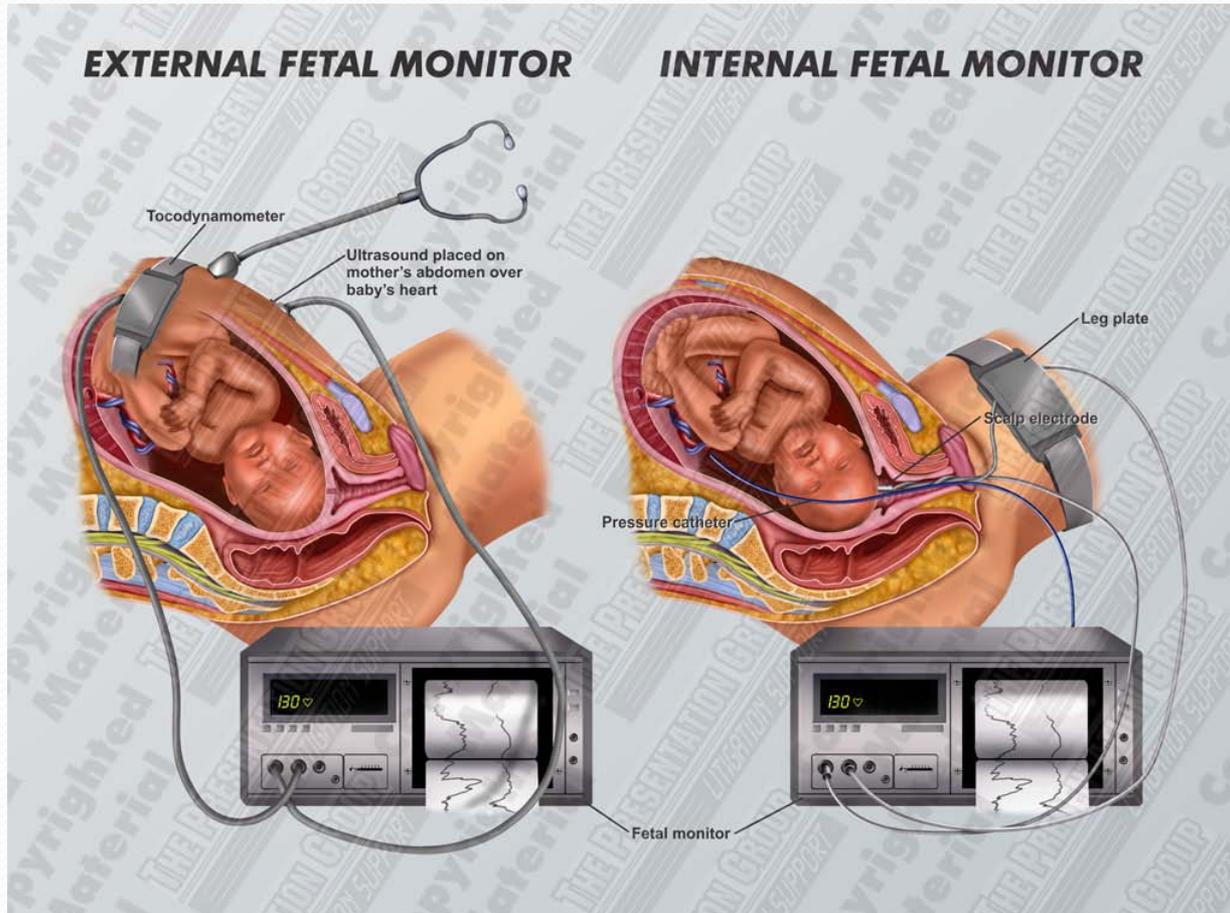
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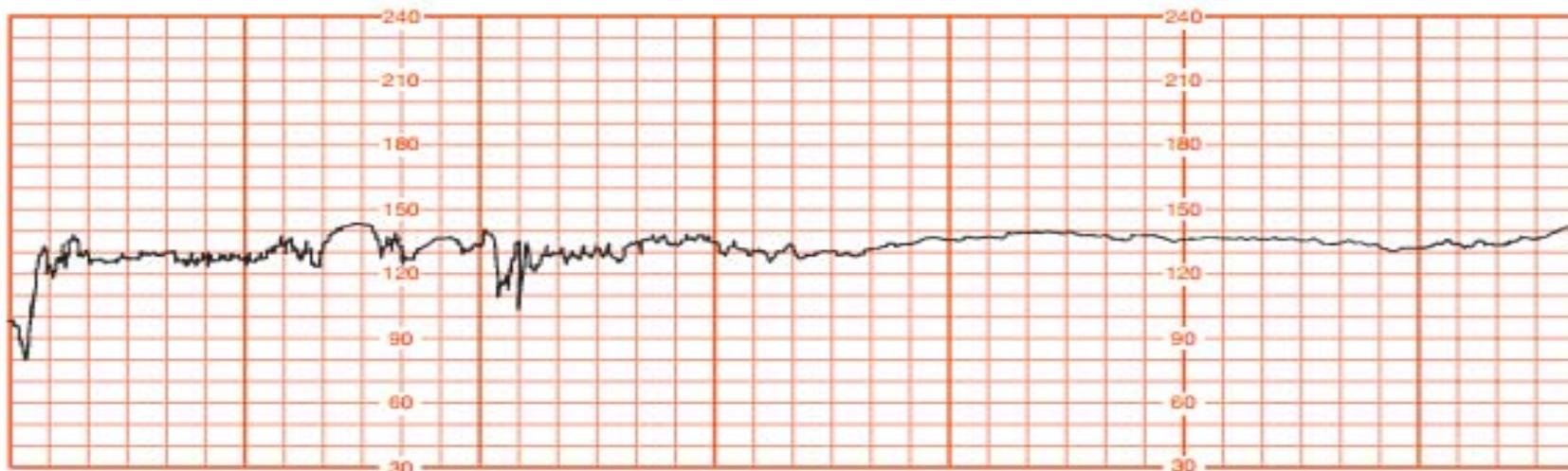
## External Fetal Heart Rate Monitoring



## EXTERNAL FETAL MONITOR

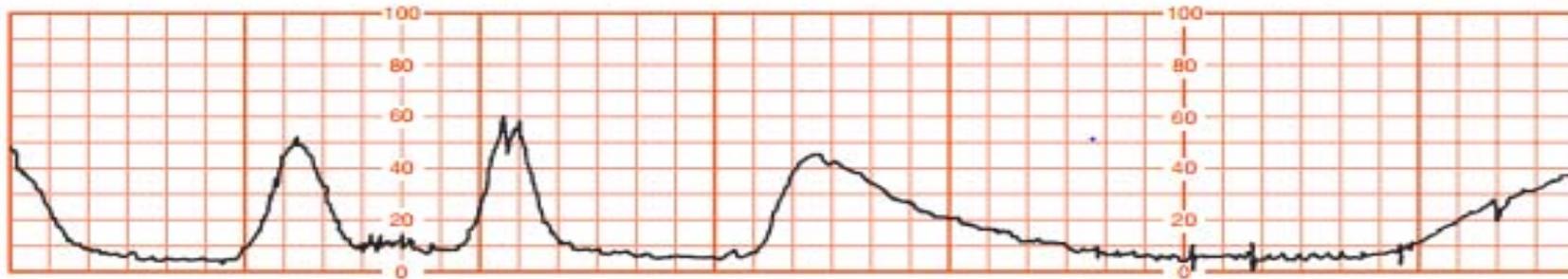
## INTERNAL FETAL MONITOR





Paper speed 1 cm/min

Paper speed 3 cm/min



# Baseline Fetal Heart Activity :

heart activity refers to the modal characteristics that prevail apart from periodic accelerations or decelerations associated with uterine contractions.

# Descriptive characteristics of baseline fetal heart activity include:

rate

beat-to-beat variability

fetal arrhythmia

distinct patterns such as sinusoidal or saltatory fetal heart rates.

# Rate

- With increasing fetal maturation, the heart rate decreases. This continues postnatally such that the average rate is 90 beats/min by age 8

- 
- The baseline fetal heart rate decreased an average of 24 beats/min between 16 weeks and term, or approximately 1 beat/min per week.

- 
- It is postulated that this normal gradual slowing of the fetal heart rate corresponds to maturation of parasympathetic (vagal) heart control

- 
- The baseline fetal heart rate is the approximate mean rate rounded to increments of 5 beats/min during a 10-minute tracing segment.

- 
- In any 10-minute window, the minimum interpretable baseline duration must be at least 2 minutes

- 
- If the baseline fetal heart rate is less than 110 beats/min, it is termed bradycardia.
  - If the baseline rate is greater than 160 beats/min, it is termed tachycardia.

- 
- The average fetal heart rate is considered the result of tonic balance between accelerator and decelerator influences on pacemaker cells.
  - In this concept, the sympathetic system is the accelerator influence, and the parasympathetic system is the decelerator factor mediated via vagal slowing of heart rate

- 
- arterial chemoreceptors such that both hypoxia and hypercapnia can modulate rate.
  - More severe and prolonged hypoxia, with a rising blood lactate level and severe metabolic acidemia, induces a prolonged fall in heart rate

# Bradycardia

- The lower normal limit is disputed internationally, with some investigators recommending 110 beats/min

- 
- Pragmatically, a rate between 100 and 119 beats/min, in the absence of other changes, usually is not considered to represent fetal compromise.

- 
- Such low but potentially normal baseline heart rates also have been attributed to head compression from occiput posterior or transverse positions, particularly during second-stage labor

- 
- bradycardia within the range of 80 to 120 beats/min with good variability is reassuring.
  - Interpretation of rates less than 80 beats/min is problematic, and such rates generally are considered nonreassuring.

- 
- Some causes of fetal bradycardia include :
  - congenital heart block and serious fetal compromise.
  - Maternal hypothermia under general anesthesia.
  - severe pyelonephritis

# Tachycardia

Fetal tachycardia is defined as a baseline heart rate in excess of 160 beats/min

- 
- The most common explanation for fetal tachycardia :
  - maternal fever from chorioamnionitis, or from any source can increase

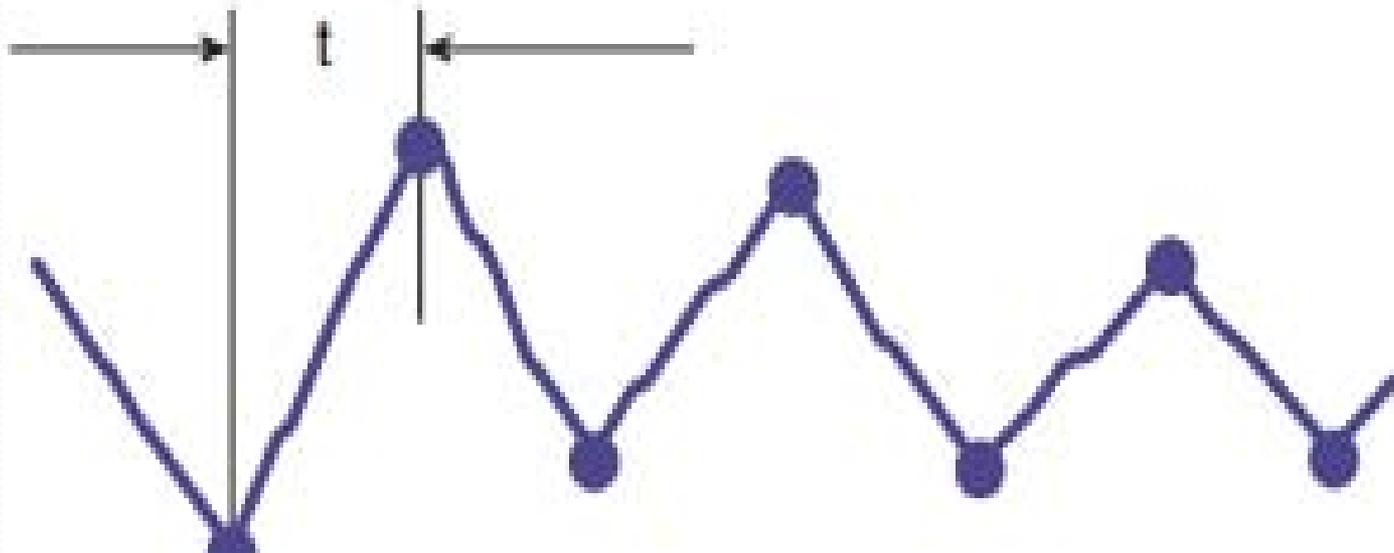
- 
- Other causes of fetal tachycardia include :
  - fetal compromise
  - cardiac arrhythmias
  - maternal administration of parasympathetic (atropine) sympathomimetic (terbutaline) drugs.

# Beat-to-Beat Variability :

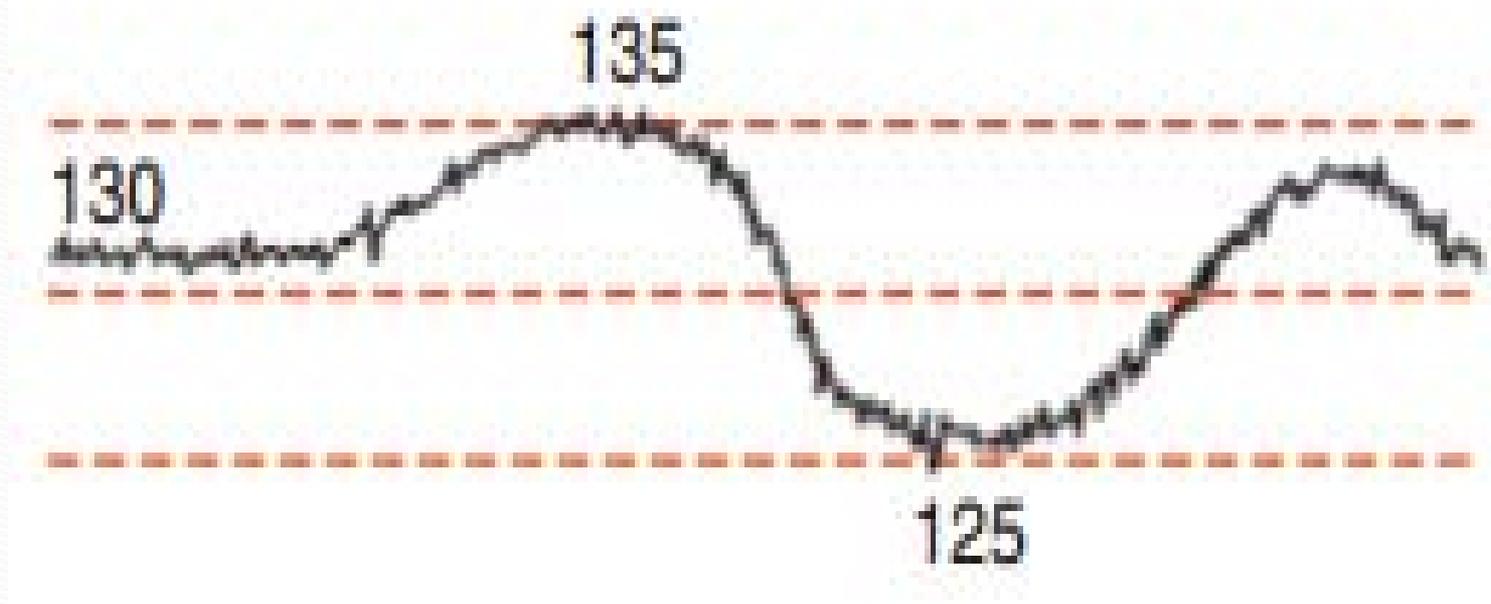
- Baseline variability is an important index of cardiovascular function and appears to be regulated largely by the autonomic nervous system

- 
- Short-term variability reflects the instantaneous change in fetal heart rate from one beat—or R wave—to the next. This variability is a measure of the time interval between cardiac systoles

- 
- Short-term variability can most reliably be determined to be normally present only when electrocardiac cycles are measured directly with a scalp electrode



- 
- Longterm variability is used to describe the oscillatory changes that occur during the course of 1 minute and result in the waviness of the baseline .The normal frequency of such waves is three to five cycles per minute



- 
- Normal beat-to-beat variability was accepted to be 6 to 25 beats/min

# Increased Variability:

- fetal breathing
- .Fetal body movements
- advancing gestation.
- lower heart rates.

- 
- . Up to 30 weeks, baseline characteristics were similar during both fetal rest and activity. After associated with diminished baseline variability and conversely, variability was increased during fetal activity.

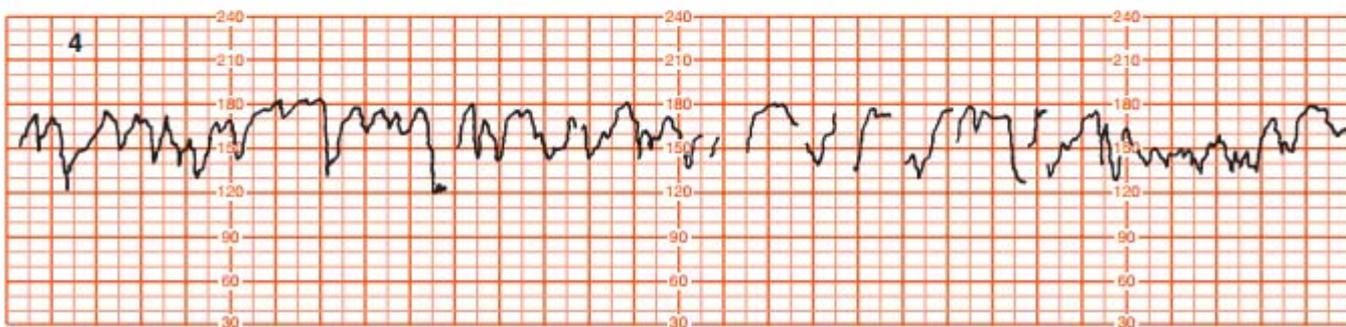
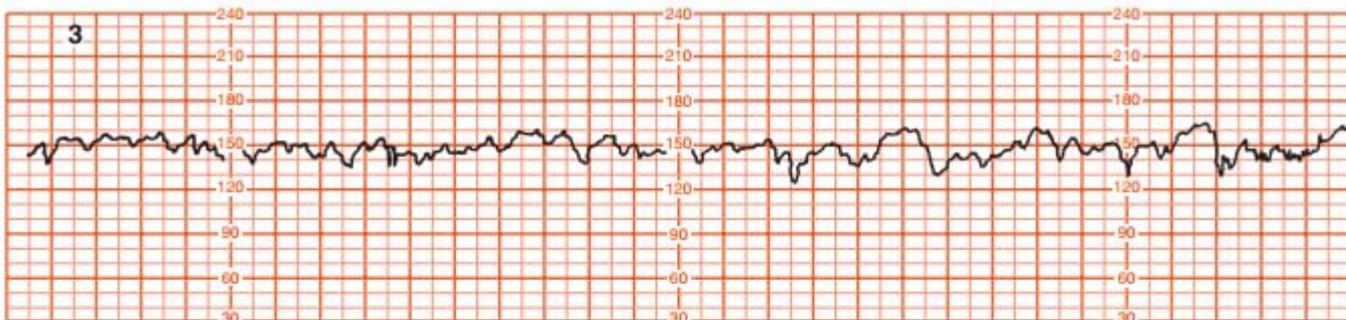
- 
- Fetal gender does not affect heart rate variability

- 
- Decreased Variability.
  - loss of variability in combination with decelerations was associated with fetal acidemia
  - analgesic drugs given during labor  
Included are narcotics, barbiturates, phenothiazines, tranquilizers, and general anesthetics

- 
- . Meperidine
  - . Butorphanol
  - Magnesium sulfate

- 
- . It is generally believed that reduced baseline heart rate variability is the single most reliable sign of fetal compromise.





# Cardiac Arrhythmia

- Include :
- baseline bradycardia, tachycardia,,
- abrupt baseline spiking
- .Intermittent baseline bradycardia is frequently due to congenital heart block

- 
- . Atrial extrasystoles comprised the most common arrhythmia (68 percent),
  - atrial tachycardias (12 percent),
  - atrioventricular block (12 percent),
  - sinus bradycardia (5 percent),
  - ventricular extrasystoles (2.5 percent)

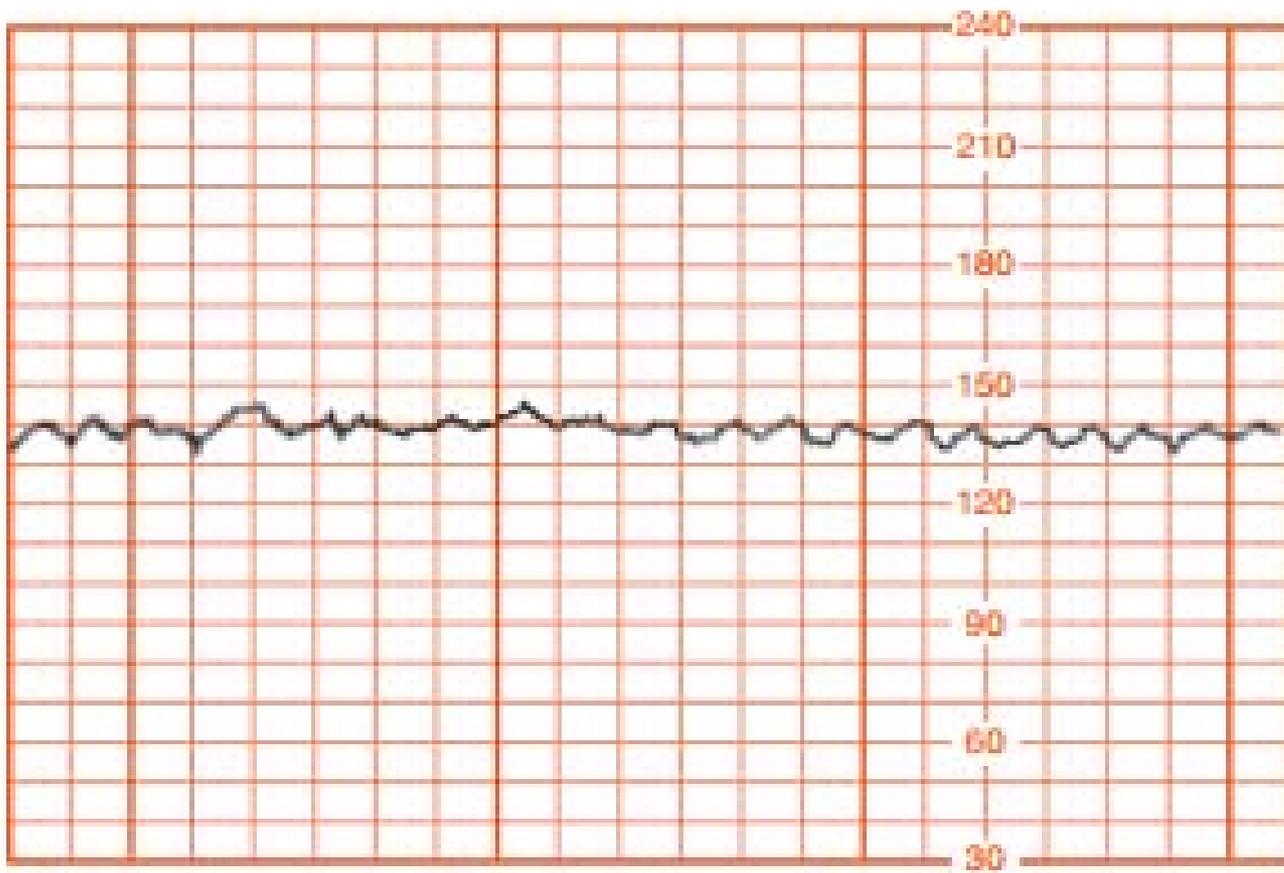
- 
- Chromosomal anomalies were found in 1.7 percent of the fetuses.
  - Fetal hydrops developed in 11 percent,

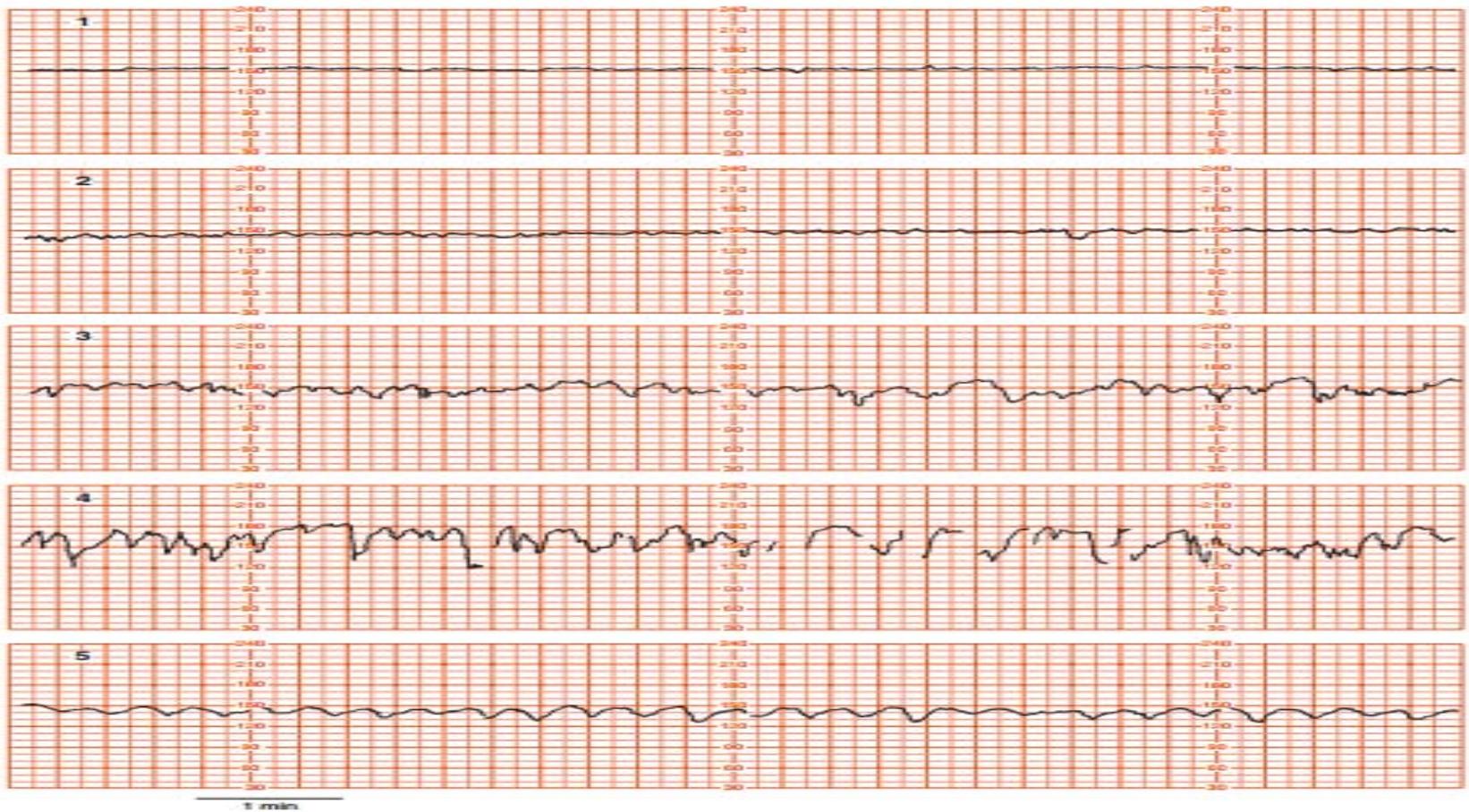
- 
- Sonographic evaluation of fetal anatomy
  - echocardiography

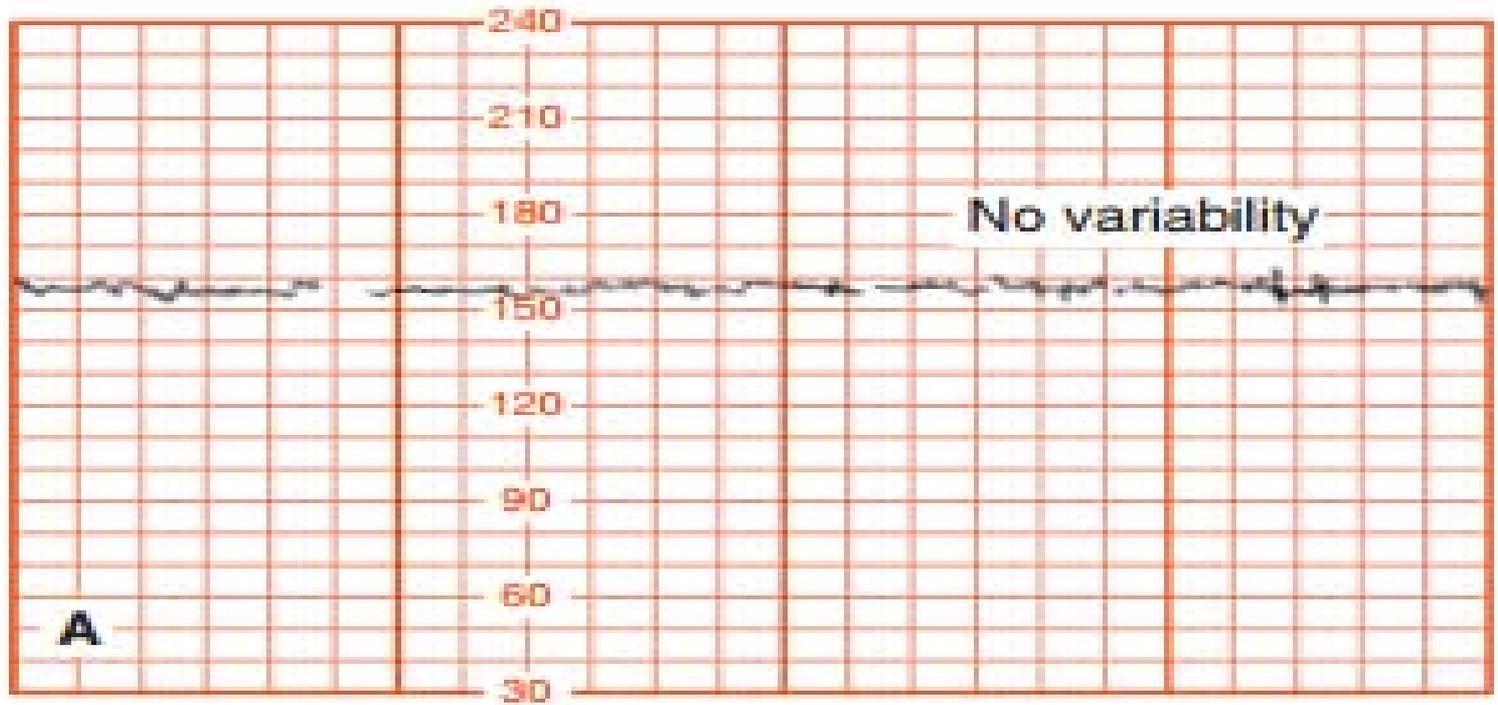
# Sinusoidal Heart Rate :

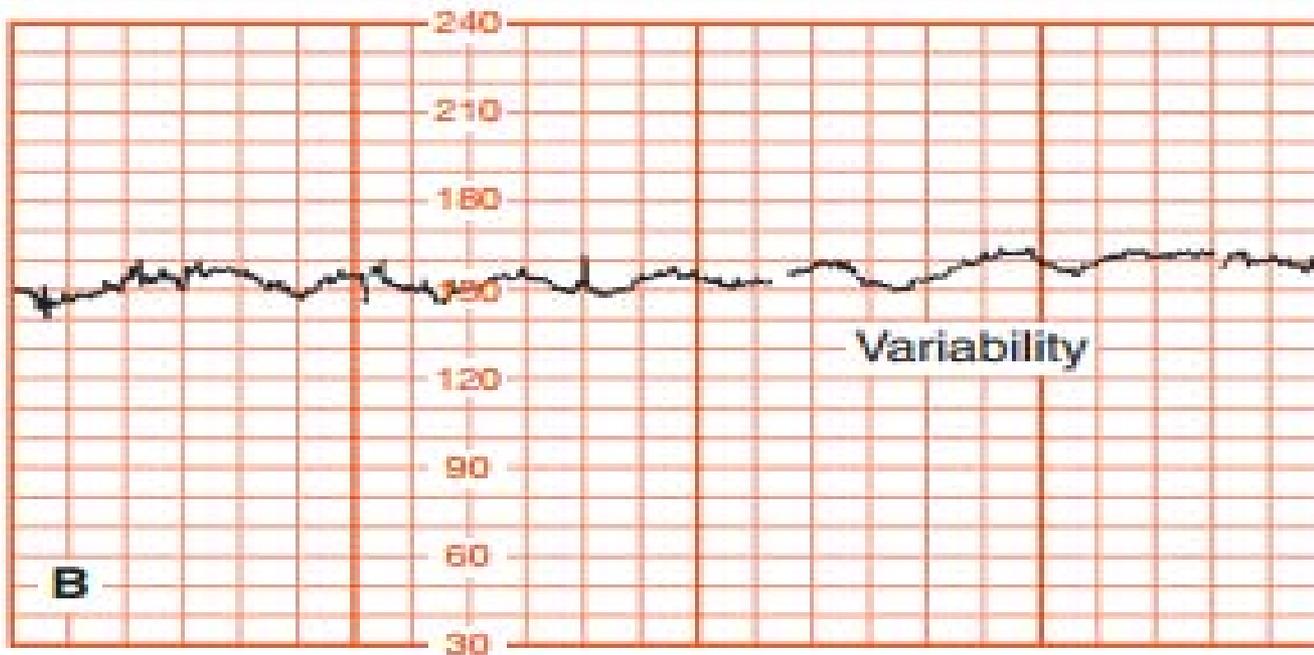
- severe fetal anemia from Rh isoimmunization, fetomaternal hemorrhage,
- twin-twin transfusion syndrome
- vasa previa with bleeding;
- with fetal intracranial hemorrhage
- and with severe fetal asphyxia .
- administration of meperidine, morphine, alphaprodine, and butorphanol

- 1. Stable baseline heart rate of 120 to 160 beats/min with regular oscillations
- 2. Amplitude of 5 to 15 beats/min (rarely greater)
- 3. Long-term variability frequency of 2 to 5 cycles per minute.
- 4. Fixed or flat short-term variability
- 5. Oscillation of the sinusoidal waveform above or below a baseline
- 6. Absence of accelerations







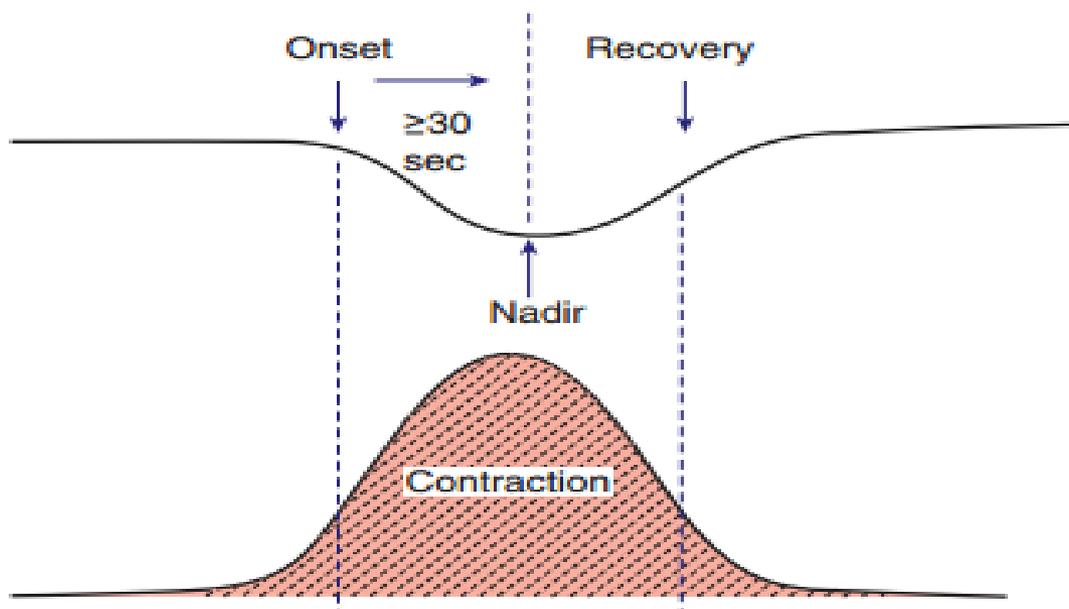


# Acceleration

- A visually apparent increase—onset to peak in less than 30 sec—in the FHR from the most recently calculated baseline
- The duration of an acceleration is defined as the time from the initial change in FHR from the baseline to the return of the FHR to the baseline
- At 32 weeks and beyond, an acceleration has an acme of  $\geq 15$  bpm above baseline, with duration of  $\geq 15$  sec but  $< 2$  min
- Before 32 weeks, an acceleration has an acme  $\geq 10$  bpm above baseline, with a duration of  $\geq 10$  sec but  $< 2$  min
- Prolonged acceleration lasts  $\geq 2$  min, but  $< 10$  min
- If an acceleration lasts  $\geq 10$  min, it is baseline change

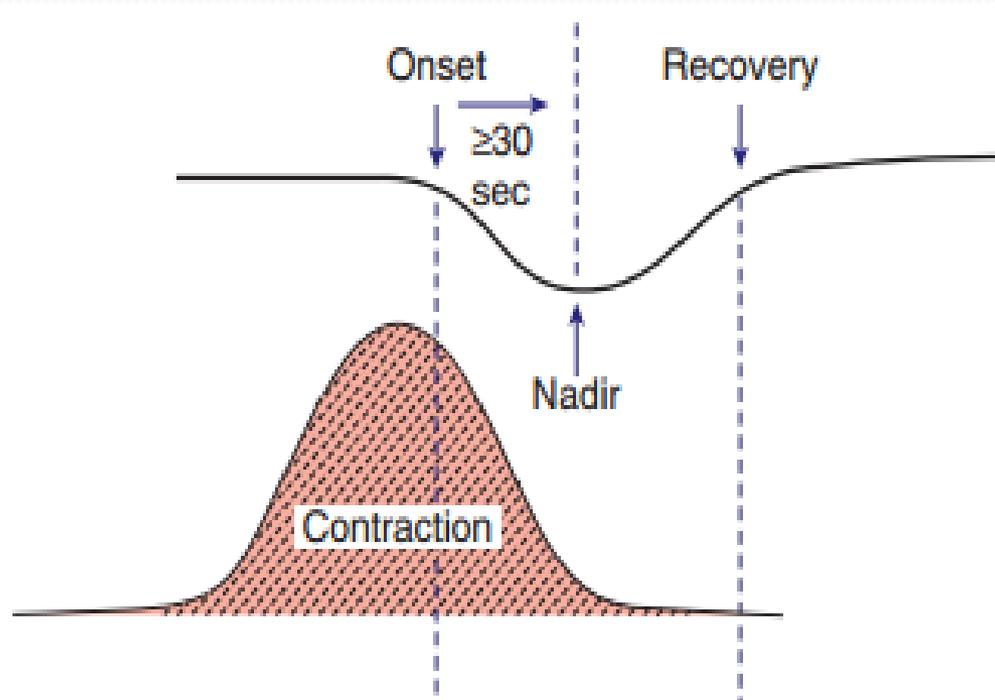
# Early -Deceleration

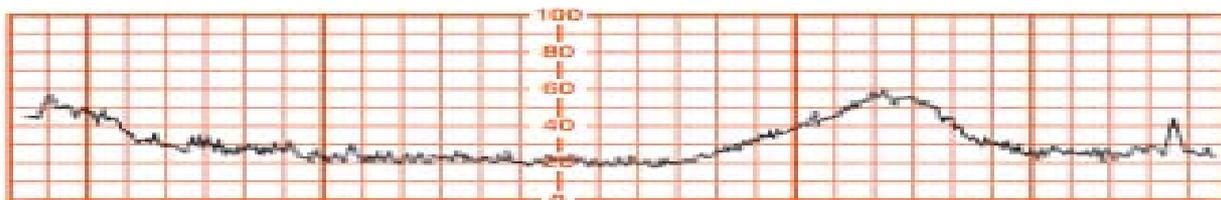
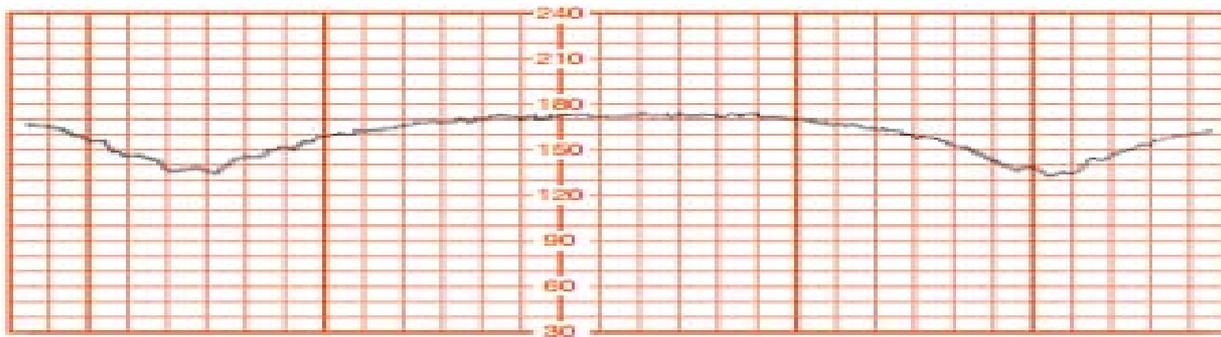
- In association with a uterine contraction, a visually apparent, usually symmetrical, gradual-onset to nadir  $\geq 30$  sec—decrease in FHR with return to baseline
- Nadir of the deceleration occurs at the same time as the peak of the contraction



# Late - Deceleration

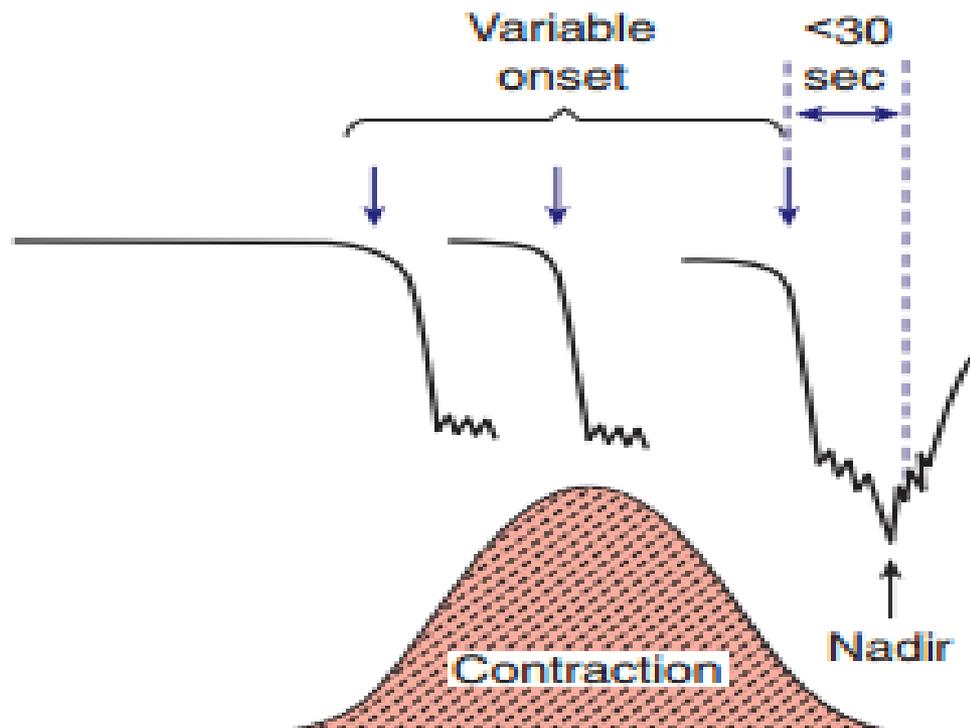
- In association with a uterine contraction, a visually apparent, gradual—onset to nadir  $\geq$  30 sec decrease in FHR with return to baseline
- Onset, nadir, and recovery of the deceleration occur after the beginning, peak, and end of the contraction, respectively

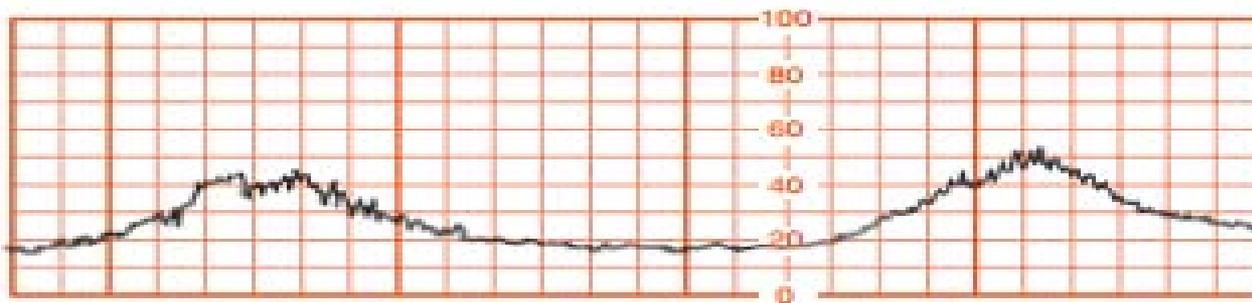
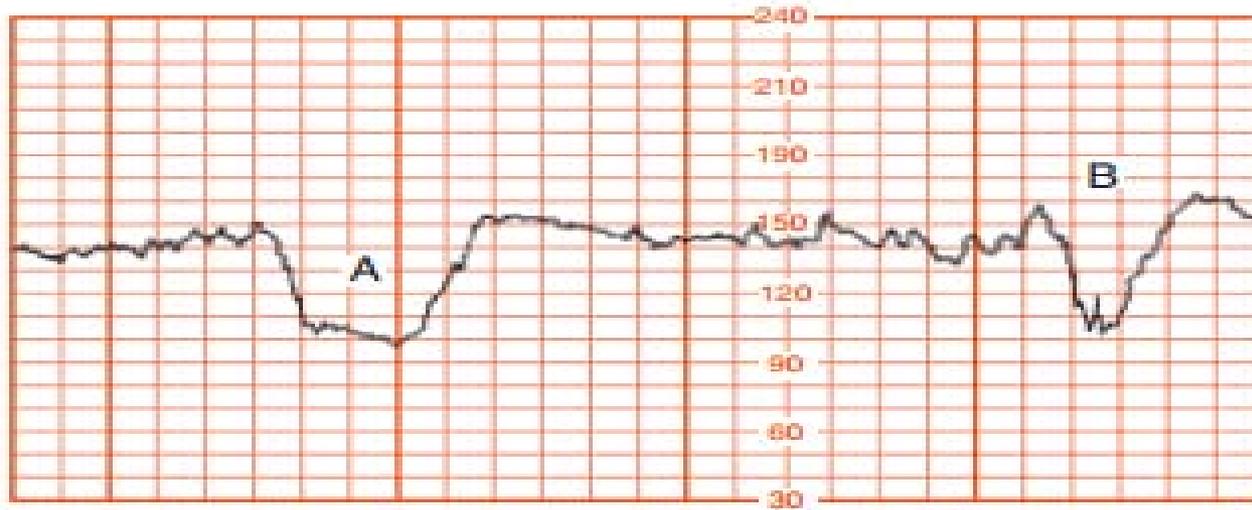




# Variable -Deceleration

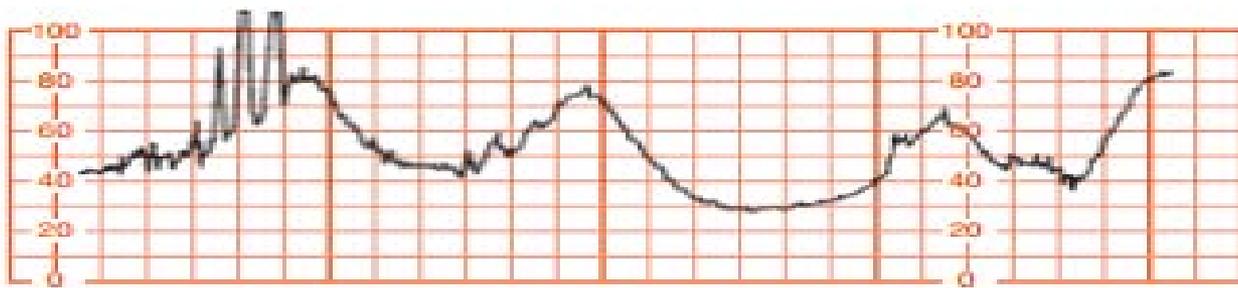
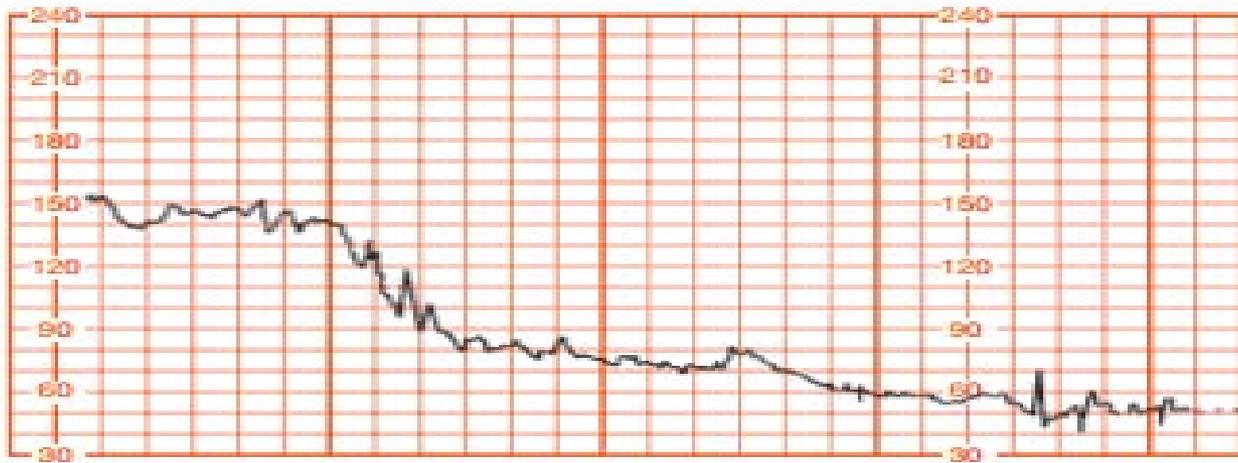
- An abrupt onset to nadir  $< 30$  sec, visually apparent decrease in the FHR below the baseline
- The decrease in FHR is  $\geq 15$  bpm, with a duration of  $\geq 15$  sec but  $< 2$  min





# Prolonged -Deceleration

- Visually apparent decrease in the FHR below the baseline
- Deceleration is  $\geq 15$  bpm, lasting  $\geq 2$  min but  $< 10$  min from onset to return to baseline





THANK  
YOU