

Clinical Application of Cardiotocography

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Antepartum

1. Non-stress test (NST)
2. Contraction stress test (CST)
Oxytocin challenge test (OCT)
3. Admission test

Intrapartum

1. Intermittent CTG - usually at onset, mid-active phase, second stage
2. Continuous CTG

Admission Test (1)

Objectives :

- to identify the already compromised or likely to become compromised fetus of an apparently normal / low-risk pregnancy upon admission

Procedure :

- immediately upon admission, run a short trace (5 - 30 min), may include both the components of NST and CST

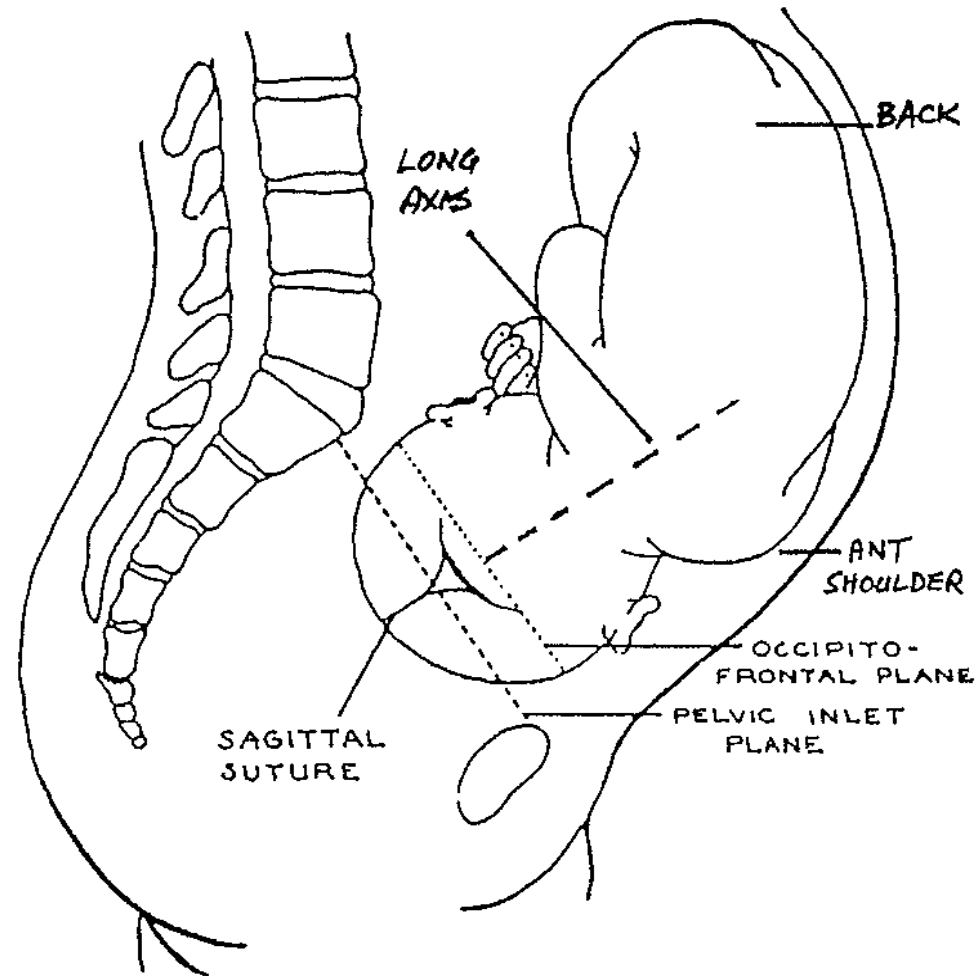
Admission Test (2)

Value :

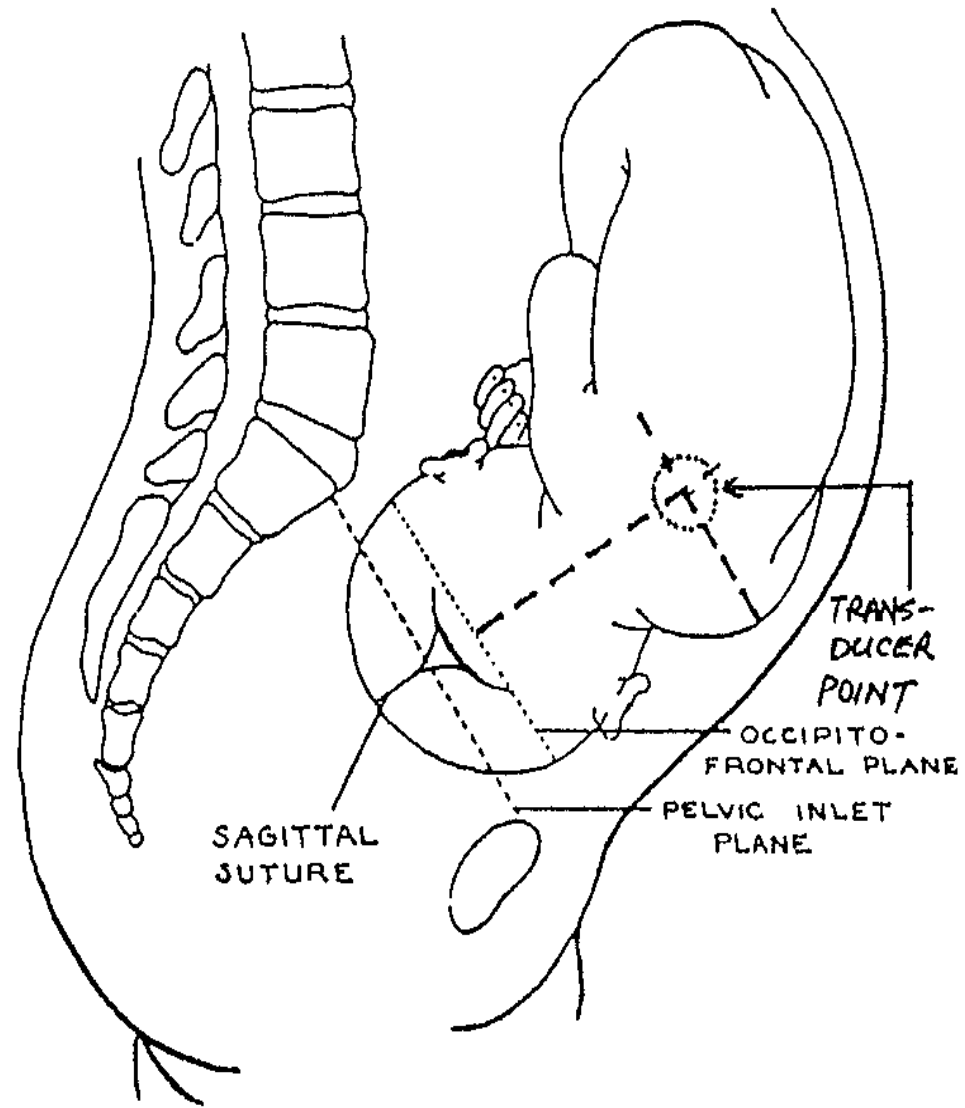
- good predictor of fetal condition at the time of admission and for the next 4 - 6 hours of labour in term low-risk fetus
- * Any one with a suspicious Admission Test (AT) should have continuous CTG from early in labour

Fetal Heart Monitoring - Placement of Abdominal Transducer

(A) Identifying landmarks



(B) Placement of transducer



CTG Procedure (1)

- Confirm fetal heart beat
- secure transducer over the loudest spot -
remember position of fetal heart descends
with descent of fetal head
- check date and time on tracing
- check paper speed - 1cm / min standard
3cm / min special
circumstances
- Label strip

CTG Procedure (2)

- ensure a good trace is obtained for 5 minutes before leaving the patient
- return within 15 minutes to double check the tracing
- consider scalp clip if attempts at good trace failed
- fetal stimulation should be considered if no reactivity is seen within 30 minutes
- mark events on the paper

Reading the CTG (1)

- Baseline heart rate - line drawn through the midpoint of the peaks and troughs excluding accelerations and decelerations
- Baseline variability - horizontally lines drawn at the level of the highest point of the peaks and lowest point of the troughs in a 1 cm (1 minutes) segment during active phase

Reading the CTG (2)

- Rest (Sleep) / Activity (Wake) cycles -
Rest phase : up to 40 minutes, decreased variability, no accelerations
- Active phase : accelerations, increased variability

Intrapartum (1)

- Scalp electrode with “picket fence” artifact
 - due to poor contact of scalp electrode with fetal tissue or poor contact of the reference electrode with maternal tissue
- Confluent accelerations
 - identified by fetal movement markers and normal variability at true baseline and higher rates

Intrapartum (2)

- Compare with previous trace
- If baseline tachycardia with decelerations - normal will have decreased variability at trough and rapid return to baseline
- Gradual and progressive shift in baseline is an abnormal feature and should alert one to the presence of fetal stress, need to anticipate appearance of fetal compromise

FIGO Fetal Heart Rate Pattern Classification (1)

Antepartum

- Normal
- Suspicious
- Pathological

Intrapartum

- Normal
- Suspicious
- Pathological

FIGO Fetal Heart Rate Pattern Classification (2)

- Normal means fetal health
- Suspicious means
 - continue observation
 - additional tests
- Pathological means
 - additional test
 - intervention

FIGO CTG Pattern (1)

A. Normal -

- (1) Baseline 110-150 bpm
- (2) Baseline variability 5-25 bpm
- (3) No decelerations / sporadic mild deceleration of short duration
- (4) ≥ 2 accelerations during a 10 minutes period

FIGO CTG Pattern (2)

B. Suspicious -

- (1) Baseline 150-170 or 110-100 bpm
- (2) Variability 5-10 bpm for > 40 min
- (3) Variability > 25 bpm
- (4) No accelerations > 40 min
- (5) Sporadic mild decelerations of any type
- (6) Variable decelerations

Antepartum - (1) - (5) any one / combination

Intrapartum - (1) - (4) & (6) any one / combination

FIGO CTG Pattern (3)

C. Pathological :

Antepartum

- (1) Baseline < 100 or > 170 bpm
- (2) Variability < 5 bpm for > 40 min
- (3) Recurring and repeated decelerations of any type
- (4) Sporadic noncurrent severe variable, prolonged or late decelerations
- (5) Sinusoidal pattern

Any one or in combination

Abnormal Patterns

The following alone and in combination signify developing hypoxia and acidosis

- Absence of accelerations
- ↑ baseline FHR
- ↓ baseline variability
- Late decelerations
- Variable decelerations with abnormal features
- Early decelerations with abnormal features

Effect of Clinical Conditions on FHR Patterns and their Interpretation

Malpresentation and Malposition (1)

- OP / OT position - early onset of early deceleration
- Brow presentation - early and variable decelerations
- Healthy fetus - no pathological features
- Any pathological features in addition - fetus is compromised

Malpresentation and Malposition (2)

- Repeated early deceleration in the case of malposition / malpresentation before definite onset of labour / strong contractions and / or engagement of the head suggest a distressed fetus

Oxytocin Effect of FHR Tracing (1)

- Can cause
- Excessive contractions
 - Hypertonic contractions
 - Tetanic contractions

- Can results in
- Baseline shift
 - prolonged bradycardia
 - tachycardia
 - late decelerations
 - variable decelerations

Oxytocin Effect of FHR Tracing (2)

Management

- Run a strip before commencement of oxytocin
- Stop oxytocin / ↓ dose by half
- Turn patient to side
- Fluid loading
- Oxygen via mask nasal cannulae
- IV / IM tocolytics

Oxytocin Effect of FHR Tracing (3)

- * Note time taken after stopping oxytocin till FHR returned to normal. Allow same time afterwards before restarting oxytocin
- * If abnormal FHR patterns appear after restarting on oxytocin and delivery is not imminent → for C/S

Effect of medications on FHR patterns (1)

Pethidine -

- ↓ baseline variability, abolish accelerations, effect may be prolonged beyond the normal rest phase
- If no decelerations or ↑ baseline FHR → not hypoxic

Beta sympathomimetics -

- baseline tachycardia, accelerations and variability preserved

Effect of medications on FHR patterns (2)

Beta-Blockers

- ↓ baseline variability and accelerations despite fetal movements / contractions

Aldomet

- ↓ baseline variability and accelerations, despite fetal movements / contractions

Effect of medications on FHR patterns (3)

Indirect Effects of drugs

- Acts by ↓ placental perfusion, which is secondary to maternal haemodynamic changes e.g. peripheral vasodilatation, or ↑ uterine contraction e.g. oxytocin

Multiple drug effect

- can change baseline heart rate and reactivity

Second Stage of Labour (1)

- Head compression leads to early decelerations → ↑ with features of variable decelerations. As long as there is normal baseline and variability in between contractions, the fetus is healthy

Second Stage of Labour (2)

Signs of hypoxia :

- tachycardia
 - ↓ variability between and during decelerations
 - late decelerations
 - failure to return to baseline (or > 100 bpm) after decelerations
 - prolonged bradycardia
- * Delay of 20 min → asphyxiated infant

Management of Prolonged Bradycardia

- Identify risk factors
- Adjust maternal position –left lateral is not always the best
- Improve hydration
- Stop oxytocin
- Vaginal examination
- IV / IM betamimetic (in-utero resuscitation)

Management of Prolonged Bradycardia

- Scalp blood sampling should NOT be done because it can only lead to delay in delivery if delivery is warranted, and it cannot help in the diagnosis of underlying condition
- Arrange delivery if risk factors identified or no recovery by 9 min

Effect of Obstetric Complications (1)

Placental abruption

- Uterine irritability shown by frequent contractions of low amplitude
- FHR trace - initially tachycardia \pm decelerations, no accelerations, \downarrow variability. Bradycardia is a late and danger sign of severe asphyxia

Effect of Obstetric Complications (2)

Chorioamnionitis / Fetal infection

- If maternal infection only (with/without fever) - tachycardia with normal variability and reactivity
- Preserved baseline variability and reactivity suggest healthy fetus
- If fetal infection occurs - ↓ variability ± decelerations (often variable decelerations)
- Maternal illness + preterm meconium suggest listeriosis

Effect of Obstetric Complications (3)

Fetal abnormality

- CNS abnormality → ↓ baseline variability and low baseline rate

Discrepancy between CTG (abnormal) and biophysical profile (within normal) suggest chromosomal abnormalities, especially if bony measurements are reduced / slight IUGR

Effect of Obstetric Complications (4)

Fetal heart block

- Persistent bradycardia / double counting
- No responding to stimulation

Dying fetus

- Acute / subacute insult : decelerations / tachycardia / lack of accelerations → ↓ variability → bradycardia

Effect of Obstetric Complications (5)

- Chronic / longstanding hypoxia : FHR within normal range but no accelerations and no / shallow decelerations and no baseline variability (silent pattern) → terminal pattern, may have brain death
- * Intervention for fetal wellbeing at the stage of bradycardia or terminal pattern is usually not indicated because of the very poor prognosis

Effect of Obstetric Complications (6)

Uterine rupture in Trial of Scar

- Scar rupture
+
tonic contraction
- } loss of normal
intrauterine pressure
+
interrupt perfusion
- FHR trace can be normal if placental perfusion not disturbed
- Can mimic placental abruption

Effect of Obstetric Complications (6)

Uterine rupture in Trial of Scar

- Should suspect scar rupture / uterine rupture if severe prolonged bradycardia, ↓ variability with repeated early or late decelerations, or loss of signal

Effect of Obstetric Complications (7)

Pre-eclampsia

- ↑ risk of growth retardation and placental insufficiency, oligohydramnios, abruption
- Effect of medications e.g. Aldomet, beta-blockers
- Effect of prematurity

Effect of Obstetric Complications (8)

Breech Presentation

- Cord compression and prolapse, especially flexed or footling breech
- Compression of skull above the orbits by uterine fundus can lead to variability decelerations
- After rupture of membranes, more likely to be decreased liquor volume with cord compression
- Other underlying problems which have been missed e.g. prematurity

Effect of Obstetric Complications (9)

PROM

- ↑ risk of cord compression
- ↑ risk of intrauterine infection
- Need to establish fetal wellbeing before induction of labour
- ↑ risk of dysfunctional labour and failed induction
- Preterm PROM - ↑ risk of placental abruption and fetal distress. Effect of prematurity

Effect of Obstetric Complications (10)

Twin Pregnancy

- ↑ risk of growth retardation in one or both fetuses
- ↑ risk of other complications
- Need to ensure wellbeing of both fetuses
- Continuous monitoring of the second twin is important during labour and delivery
- Effect of prematurity