

CTG Interpretation

A CTG (cardiotocograph) is a device used, often, in the 3rd trimester of pregnancy, to monitor fetal and maternal wellbeing. It measures the fetal heart rate using ultrasound, and the strength of uterine contractions (indirectly via measuring tension in the abdomen and equating this to pressure).

CTG's are continuous if the pregnancy is 'high risk' and in normal pregnancies every 15 minutes in the first stage of labour and every 5 minutes in the 2nd stage.

It is very important to be able to interpret a CTG, as it guides management and intervention, even indicating need for an emergency C-section.

There are certain areas to check and comment on, and the easiest way to do this is by following a framework. DR C BRAVADO is a popular mnemonic.

Define **R**isk

- Deciding whether a pregnancy is high or low risk
- Provides context when interpreting a CTG, in order to determine the threshold for intervention.
- High risk pregnancies are defined as:
 - Maternal complications:
 - Gestational diabetes mellitus
 - Asthma
 - Hypertension
 - Obstetric complications:
 - Previous c-section
 - Multi-gestation pregnancy (twins, triplets etc)
 - Post-dates pregnancy (40+ weeks)
 - Pre-eclampsia
 - Induction of labour
 - Intra-uterine growth restriction
 - Fetal abnormality
 - Premature rupture of membranes
 - Lifestyle/other:
 - Smoking during pregnancy
 - Drinking alcohol excessively during pregnancy
 - Drug abuse during pregnancy
 - Lack of pre-natal care

Contractions

- Uterine contractions are represented on the bottom trace on a CTG
- An upwards deflection = contraction

- Contractions are reported by how many occur in 10 minutes. Since each small square on a CTG = 1 min, you simply have to count the number of complete contractions that take place within 10 small squares, and report them as “4 in 10” e.g.
- Less than 5 in 10 minutes in the 2nd stage of labour is ideal
- You should also report how long each contraction lasts (again count small squares).
- Note that the amplitude of the peak denoting contractions does not directly equate to their intensity. Their intensity can only be measured by palpating the abdomen during a contraction.

Baseline fetal heart Rate

- Fetal heart rate monitoring is the top trace
- The y-axis of this trace is fetal heart rate
- The average fetal heart rate –the baseline - should be reported. This can be determined by finding an imaginary line about which the fetal heart rate peaks (accelerations) and troughs (decelerations).
- Normal baseline is 100-160bpm
- Tachycardia:
 - > 160 bpm
 - non-reassuring: 161-180
 - abnormal: >180
 - caused by:
 - fetal hypoxia
 - chorioamnionitis
 - fetal tachyarrhythmia
 - maternal fever
 - hyperthyroidism
 - fetal or maternal anaemia
- Bradycardia:
 - Abnormal: <100
 - Mild: 110-120. Caused by:
 - Post-dates
 - Occiput posterior or transverse positions
 - Severe, prolonged: <80 bpm for 3 mins or longer. Caused by:
 - Epidural and spinal anaesthetics
 - Prolonged cord compression
 - Cord prolapse
 - Maternal seizures
 - Rapid foetal descent
 - Immediate delivery is the cause cannot be corrected

Variability

- How much the fetal heart rate varies by (about the baseline)
- Normal is 10-25bpm

- A good indicator of fetal health as a healthy fetus is able to respond to environmental signals and thus its heart rate will vary
- Classified into:
 - Reassuring: >5bpm
 - Non-reassuring: <5bpm for 30-90mins
 - Abnormal: <5bpm for >90mins
- Decreased variability can be caused by:
 - Fetus sleeping (but should not be longer than 40mins)
 - Fetal acidosis due to hypoxia (look for late decelerations)
 - Certain drugs (opiates, benzodiazepines, magnesium sulphate)
 - Prematurity <28 weeks
 - Thumb sucking
 - Maternal dehydration
 - Congenital heart abnormalities
 - Fetal tachycardia

Accelerations

- When the fetal heart rate increases suddenly by > 15bpm for >15 seconds
- This is normal, and on average should occur twice in 15mins
- A reassuring sign is if they take place at the same time as uterine contractions – healthy fetus.

Decelerations

- A sudden decrease in fetal heart rate by >15bpm for >15 seconds
- There are different classifications:
 - Early decelerations:
 - Physiological
 - Occurs during uterine contractions when fetal intracranial pressure is raised, increasing vagal tone and slowing the heart rate
 - Resolves after a contraction
 - Variable decelerations:
 - rapid fall in baseline rate with a variable recovery phase and variable duration.
 - Non-reassuring:
 - Drop from baseline by 60bpm or less and taking 60s or less to recover, present >90mins and occurring with over 50% of contractions
 - Or drop from baseline by >60bpm or taking >60s to recover, lasting for up to 30mins, occurring with over 50% of contractions
 - Abnormal:

- Variable decelerations as above that are still occurring 30mins after conservative measures (e.g. changing position)
 - Occurring with >50% of contractions
 - Causes:
 - Labour
 - Reduced amniotic fluid volume (oligohydramnios)
 - Umbilical cord compression: umbilical vein occlusion (first) causes accelerations, then umbilical artery occlusion causes decelerations, then once the pressure is lowered another acceleration occurs before the return to base line. Therefore, we know that the fetus is not hypoxic during these episodes if the acceleration before and after the deceleration occurs, as it means the fetus is adapting to reduced blood supply.
 - May resolve if the mother changes position, relieving the cord compression. However close monitoring is needed if its recurrent.
- Late decelerations:
 - Occur at the peaks of uterine contractions
 - Recover after contraction
 - Shows that there is reduced blood flow through the uterus and placenta, and to the fetus, causing hypoxia then acidosis.
 - Non-reassuring:
 - Present for up to 30mins
 - In >50% of contractions
 - Abnormal:
 - Present for >30mins
 - Do not improve with conservative measures
 - Present in >50% of contractions
 - Caused by:
 - Pre-eclampsia
 - Maternal hypotension
 - Uterine hyperstimulation
 - An indication for fetal blood sampling (tranvaginally from the head of the fetus) as an acidic pH indicates a significant fetal hypoxia and requires an emergency C-section
- Prolonged deceleration
 - Deceleration lasting >3mins
 - abnormal
 - urgent foetal blood sampling and if pH less than 7.2, C-section
- Sine wave
 - A sign of probable poor outcome
 - Sine wave at a frequency of 2-5 cycles a minute
 - Baseline stable 120-160
 - No beat to beat variability
 - Causes:
 - Severe fetal hypoxia
 - Sever fetal anaemia

- Severe maternal/fetal haemorrhage
- Immediate C-section

Overall Impression:

- What the CTG shows: is it reassuring, non-reassuring or abnormal?
- Based on what baseline rate, variability, and deceleration are classified as:
 - Normal: all 3 features classified as reassuring
 - Non-reassuring: one feature non-reassuring and the rest reassuring
 - Abnormal: 2 or more non-reassuring or 1 or more abnormal