- The presence of FHR accelerations, even with reduced baseline variability, is generally a sign that the baby is healthy.

FHR parameters and assessment criteria (Tables 4.1 to 4.3)

Intrapartum, the CTG reading must be constantly classified. The 30 minute segment with the highest number of suspicious or pathological FHR parameters must be analyzed and documented. If an assessment is classed as "suspicious", a repeat assessment should be done after 30 minutes and the number of suspicious parameters must be recorded. Here a number of conservative measures can be taken to clarify or improve the patterns (e.g. change of position, infusion).

If the reading is classified as "pathological", assessment must be continuous and recorded every 10 minutes including information on the number of suspicious parameters. In addition to various conservative measures

Table 4.1: FHR parameters and their definition (modified after ACOG, FIGO, SOGC, RCOG)[7,8]

Term	Definition
Baseline (bpm)	Its mean FHR maintained over at least 10 minutes in the absence of accelerations or decelerations, given in beats per minute (bpm). For immature fetuses, mean FHR was in the upper range of variation. A progressive increase of FHR must be monitored carefully!
• Normal	Normal range: 110–160 bpm*
• Suspicious	Slight bradycardia: 100–109 bpm Slight tachycardia: 161–180 bpm without simultaneous accelerations
• Pathological	Severe bradycardia: < 100 bpm Severe tachycardia: >180 bpm
Range (variability) (bpm)	Fluctuations in the fetal baseline rate occur 3–5 times per minute. The range is the difference in bpm between the highest and the lowest fluctuation during the most part of the 30 minute reading monitor strip.
• Normal	>5 bpm during the interval when no contractions occur
• Suspicious	<5 bpm and >40 minutes, but <90 minutes or >25 bpm

*Recent studies found that the physiological range for fetal heart rate at term was probably between 115 (4th percentile) and 160 beats per minute (96th percentile) (17, 105; EL II).

**< 32nd week of gestation, rise of FHR >10 bpm or >½ range and >10 seconds. If accelerations are >10 minutes, this is considered a change in the baseline rate.

Table 4.2: Evaluation of individual FHR parameters (modified after ACOG, FIGO, SOGC, RCOG)[7,8]

Parameter	Baseline rate (bmp)	Range (bmp)	Decelerations	Accelerations
Normal	110–160	≥ 5	None[1]	Present, sporadic[2]
Suspicious	100–109; 161–180	<5 ≥ 40 minutes > 25	Early/variable decelerations, individual prolonged decelerations, up to 3 minutes	Present, periodical occurrence (with every contraction)
Pathological	<100 >180 sinusoidal[3]	< 5 >90 minutes	Atypical variable decelerations, late isolated decelerations, prolonged decelerations >3 minutes	Absent >40 minutes (significance still unclear, evaluation questionable)

[1]FHR deceleration amplitude ≥ 15 bpm, duration ≥ 15 seconds [2]FHR acceleration amplitude ≥ 15 bpm, duration ≥ 15 seconds [3]sinusoidal FHR: ≥ 10 bpm, duration ≥ 10 minutes.

CHAPTER

12

Effects of Various Drugs on CTG

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Evaluation of fetal well-being using electronic Fetal Heart Rate (FHR) monitoring needs careful observation and interpretation. A comprehensive description of cardiotocogrpahy (CTG) consisting of uterine contractions, heart rate, beat to beat variability, presence or absence of accelerations (importance in labour is downgraded now) and decelerations, is needed to contemplate prompt action. Clinician should be aware of the effect of various procedures and drugs used in different medical complications of pregnancy and during labour for augmentation or analgesia. The effects will be discussed with respect to different components of CTG for better understanding.

Baseline Fetal Heart Rate

Normal baseline heart rate is 110 to 160 bpm. Abnormal baseline FHR of more than 160 bpm is called tachycardia and a baseline of less than 110 bpm is called bradycardia.[1,2] Maternal pulse should be measured and documented at the start of every EFM trace.

Fetal Tachycardia

Fetal tachycardia represents increased sympathetic activity or a decrease in parasympathetic activity. Fetal tachycardia can be an early sign of hypoxia, where the fetus is trying to elevate its heat rate to compensate. In preterm fetuses the base line rate will be higher than the term fetus. The common causes of fetal tachycardia are maternal pyrexia, hypoxia and chorioamnionitis and drugs. Drugs causing fetal tachycardia include Beta sympathomimetics (terbutaline, isoxsuprine, ritodrine) and nifedipine.[3–6]

Fetal Bradycardia

Fetal bradycardia is a response of increased vagal tone or a sign of profound myocardial depression which is a preterminal event before fetal death. This can also be seen in cardiac arrhythmias like complete heart block. Bradycardia is almost due to fetal hypoxia when associated with decelerations or a decrease in baseline variability. Other causes of fetal bradycardia are maternal hypothyroidism, beta blockers, maternal hypothermia and prolonged hypoglycemia.

Baseline Variability

The single most important determinant of fetal well-being is baseline variability of a fetal heart rate trace. This cannot be picked up by intermittent auscultation. Decreased baseline variability is seen in preterm fetus or in conditions known to be associated with central nervous system depression. Fetal hypoxia is the most important cause. The commonly used drugs causing central nervous system depression are sedatives like tramadol hydrochloride, pethidine, fantanyl.

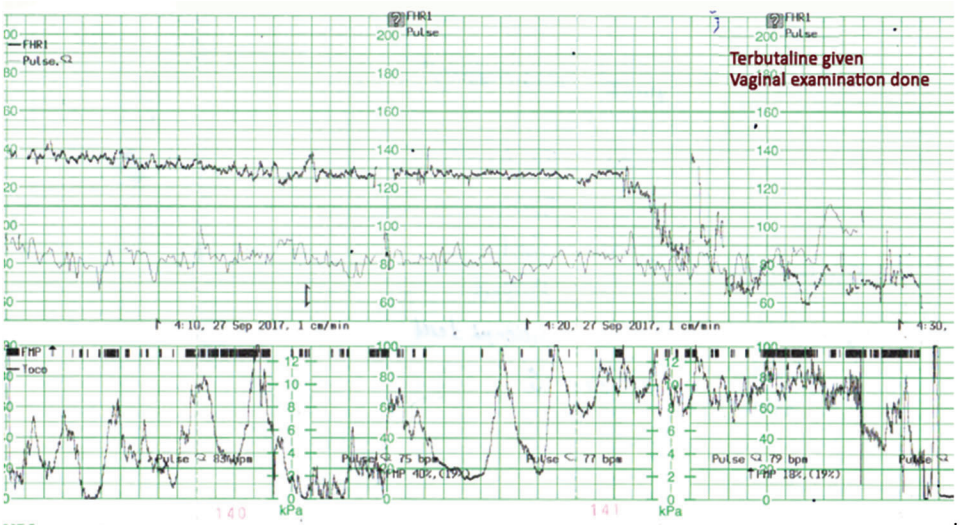

Fig 18.3: Abruption with ¾ separated placenta.

CTG Interpretation using the pneumonic DR C BRAVADO		
DR	Define Risk	Pain abdomen, preterm, recurrent pregnancy losses
C	Contractions	5 in 10 minutes
BRA	Baseline rate	130 beats per minute
V	Variability	Normal
A	Accelerations	None
D	Decelerations	Prolonged deceleration, not recovering with terbutaline
O	Opinion	Pathological trace, requiring urgent delivery.

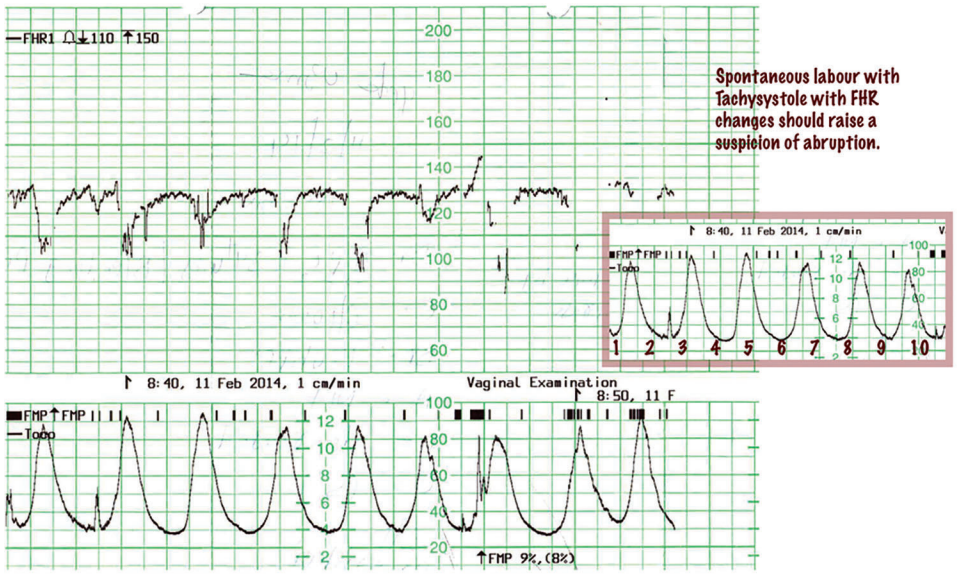

Fig. 18.4: Tchysystole with FHR change.

Table 23.4: The classification of fetal blood sampling (FBS) results (NICE)[15]

Lactate (mmol/l)	pH	Interpretation
≤ 4.1	≥ 7.25	Normal
4.2–4.8	7.21–7.24	Borderline
≥ 4.9	≤ 7.20	Abnormal

These results should be interpreted considering the previous pH measurement, the rate of progress in labour and the clinical features of the woman and baby.

2. Maternal Pulse

FHR should be auscultated prior to application of the electronic probe to avoid picking up maternal pulsations. In addition, the maternal pulse should be identified and recorded separately. Any sudden significant shift in the baseline FHR or a wide variability would suggest recording of the maternal pulse rather than FHR. If there is doubt, ultrasound should be used to locate the fetal heart and a fetal scalp electrode may be a better alternative in such a situation. Slippage of transducer from tracking the fetal heart to maternal pulse during labour is not common but can happen. The whole CTG must be reviewed from time to time for sudden changes in the rate and special attention has to be paid during twin delivery after the first baby is born. In the second stage of labour, accelerations that coincide with contractions are likely to be maternal heart rate recordings.

3. Quality of the Trace

The FHR tracing is difficult to interpret when there is persistent signal loss. The situation should be corrected by adjusting the transducer, or obtaining the signal via a scalp electrode, or changing the connections and/or machine. If these actions do not rectify the problem, intermittent auscultation should be performed and this should be documented in the medical records.

4. Misinterpretation of CTGs

While interpreting a CTG trace, emphasis should be paid to observe for reactivity (accelerations) and cycling (quiet and active sleep cycles) that indicates a non-hypoxic fetus with a normal behavioural pattern. Absence of cycling may be due to drugs, infection, cerebral hemorrhage, chromosomal or congenital malformation, previous brain damage. A nonreactive trace with baseline variability < 5 bpm and shallow decelerations (< 15 beats) that lasts for > 90 minutes suggests an existing hypoxia. In the presence of a clinical picture like post-term, growth restriction, absent fetal movements, antepartum hemorrhage or infection-such a trace should prompt earlier delivery. A previously brain damaged fetus may or may not show cycling but the cord pH at birth may be normal; such babies may not show evidence of HIE but may exhibit signs of neurological damage that manifests later. Presence of accelerations, normal baseline heart rate, variability more than 5 bpm and absence of any decelerations are features of a normal reassuring CTG (Fig. 23.1). With a normal baseline CTG, a gradually developing hypoxia will be reflected by no accelerations, repeated decelerations and gradually rising baseline rate (Fig. 23.2). Furthermore, it is

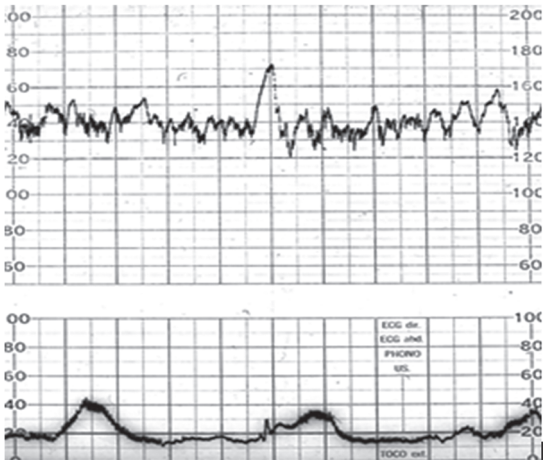

Fig. 23.1: Normal reactive CTG with accelerations, normal baseline, good variability without any decelerations.