CardioTocoGraphy

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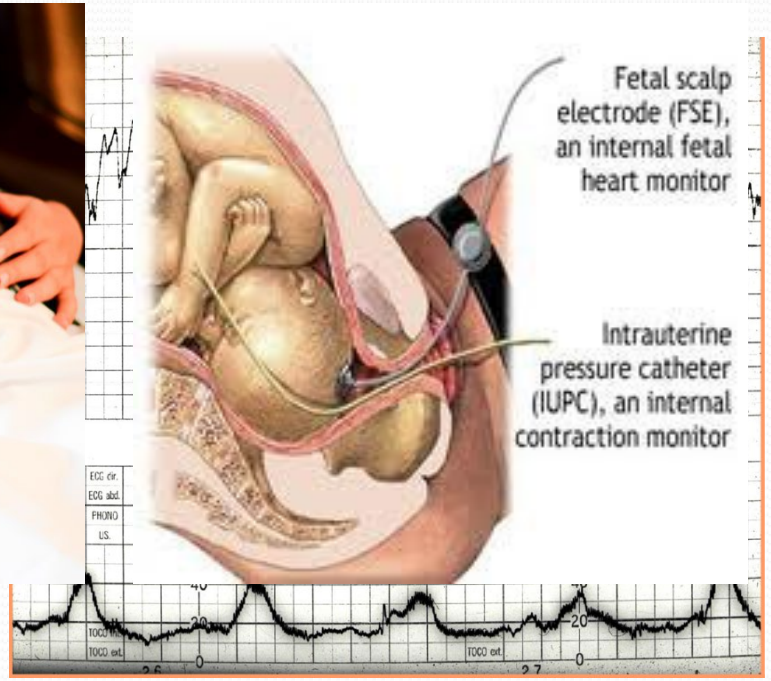
What is a CTG?

- A monitoring device that records fetal heart rate and uterine activity
- Gives us an idea about fetal oxygenation, fetal wellbeing, and signs of fetal distress
- CTG is Comprised of:
  - One transducer that uses ultrasound to measure the fetal heart rate
    - Can be replaced by a fetal scalp electrode
  - One transducer that uses abdominal wall tension to approximate intrauterine pressure
    - Can be replaced by an intrauterine pressure catheter
- Computerised CTGs can also record maternal heart

What does it look like?



When do we use it? Antepartum

- From 24 weeks onwards
- High risk pregnancies – routine monitoring. Examples- Diabetes in Pregnancy, Fetal Growth Restriction, Hypertensive Disorders of Pregnancy
- Emergency admissions: Examples- Reduced fetal movements, Antepartum haemorrhage, Rupture of membranes, trauma, infection

When do we use it? (intrapartum)

- When there are antenatal risk factors that give us concern for fetal wellbeing
  - Suspected reduced placental function (post dates, oligohydramnios, PET, abnormal dopplers)
  - Maternal risks that can affect fetus (medical conditions, GDM, AMA, obesity)
  - Fetal risks (multiples, congenital abnormalities, breech, IUGR, RFM)
- When there are intrapartum factors that give us concern for fetal wellbeing
  - Suspected chorioamnionitis; PROM, pyrexia
  - Hyperstimulation/asphyxia; induction/augmentation/tachysystole/hypertonus
  - Poor fetal reserves; prolonged labour, preterm
  - Meconium liquor
  - Abnormal bleeding in labour
  - Abnormal intermittent auscultation

But what are we looking for?

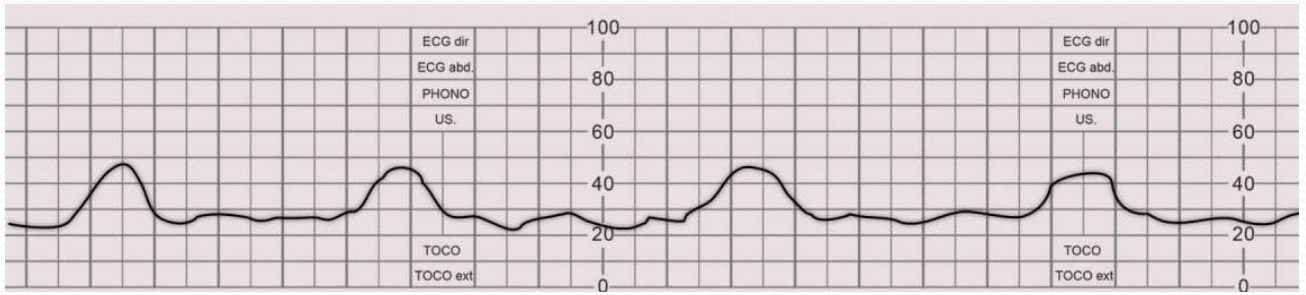
- Remember the acronym "**Dr C BraVADO**"
  - Dr : Define risk
  - C : Contractions
  - Bra : Baseline rate
  - V : Variability
  - A : Accelerations
  - D : Decelerations
  - O : Overall impression

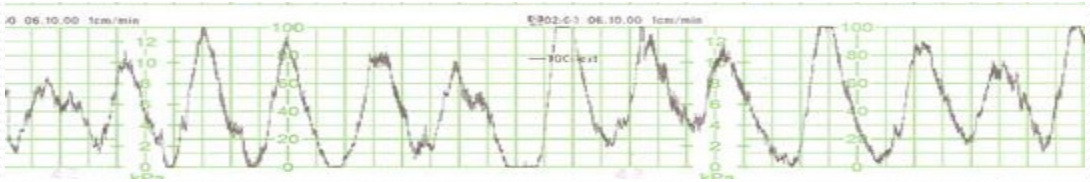
Define risk

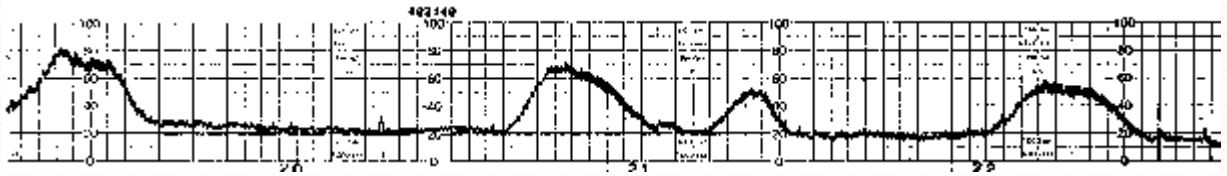
- Is this a high or low risk pregnancy?
  - Are there any complications?
- Are they maternal/obstetric/fetal complications?
  - Pre-existing medication conditions in mother?
  - Is this a PROM, VBAC, augmented labour?
  - Are they premature/post-dates?
  - Is this a growth restricted fetus?
  - Are there congenital abnormalities?
- How is the labour progressing?
  - Precipitous labour, slow progress, second stage delay?

Contractions

- How are the contractions?
  - Regular/irregular
  - How many in 10 minutes; what is tachysystole (5 or more contractions in 10 minutes vs Hyperstimulation
  - Hyperstimulation (Tachysystole with CTG abnormalities)?
  - Strength…. Don't ask the toco! Clinical assessment or Intra Uterine Pressure transducer







Baseline rate

- Is it normal, or is it bradycardia/tachycardia?
- Is it the same as it was at the start of labour?
- Normal baseline FHR 110-160bpm
- Bradycardia if FHR < 110 bpm for >5 minutes

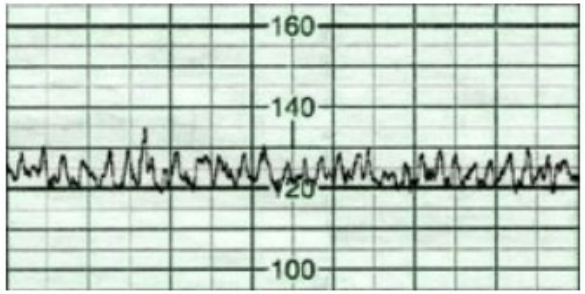
POTENTIAL CAUSES OF...

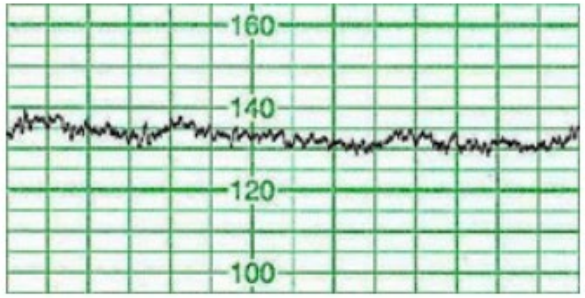
TACHYCARDIA
- Maternal causes
  - Febrile
  - Anaemic
- Hypoxia
- Chorioamnionitis
- Hyperthyroidism
- Tachyarrrythmias

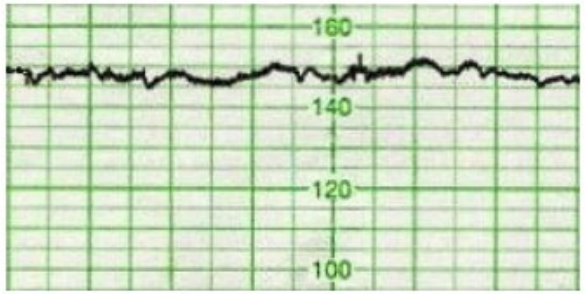
BRADYCARDIA
- Cord compression/ prolapse
- Epidurals/spinals
- Maternal seizures
- Rapid fetal decline
- Hyperstimulation
- Placental abruption
- Uterine rupture

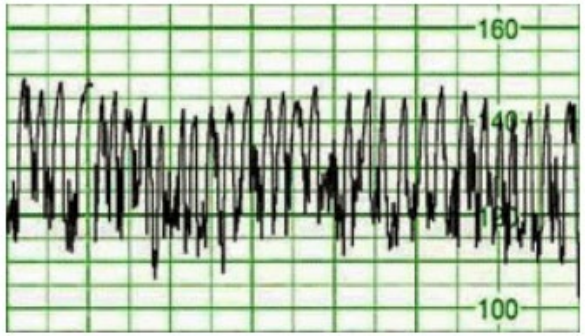
Variability

- The variation in heart rate from beat to beat
- A normal (awake) fetus with a normally functioning nervous system should have a variability of 6-25 bpm
  - This is a reflection of a good balance between the sympathetic and the parasympathetic NS
  - A poorly oxygenated central nervous system will not produce normal variability
- REDUCED variability is 3-5bpm
  - You can see this in a healthy fetus when they are asleep
- ABSENT variability is 0-2bpm
- INCREASED variability is >25bpm



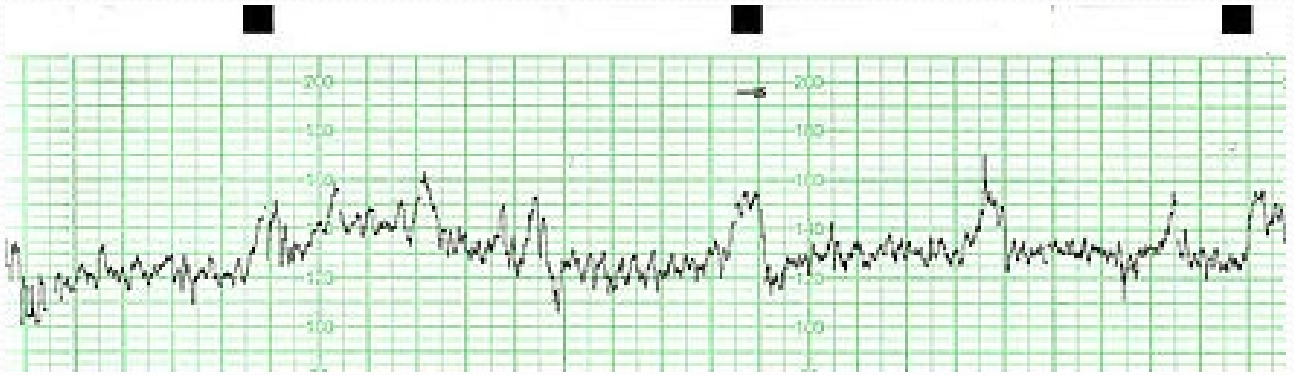






Accelerations

- These are a good thing!
- Defined as an increase in FHR of >15bpm for longer than 15 seconds
- In the antepartum period, two of these in 10 minutes is classed as a "reactive" trace if everything else is normal
  - Intrapartum they are likely to be less frequent; can't move around as much when a uterus is squeezing you!



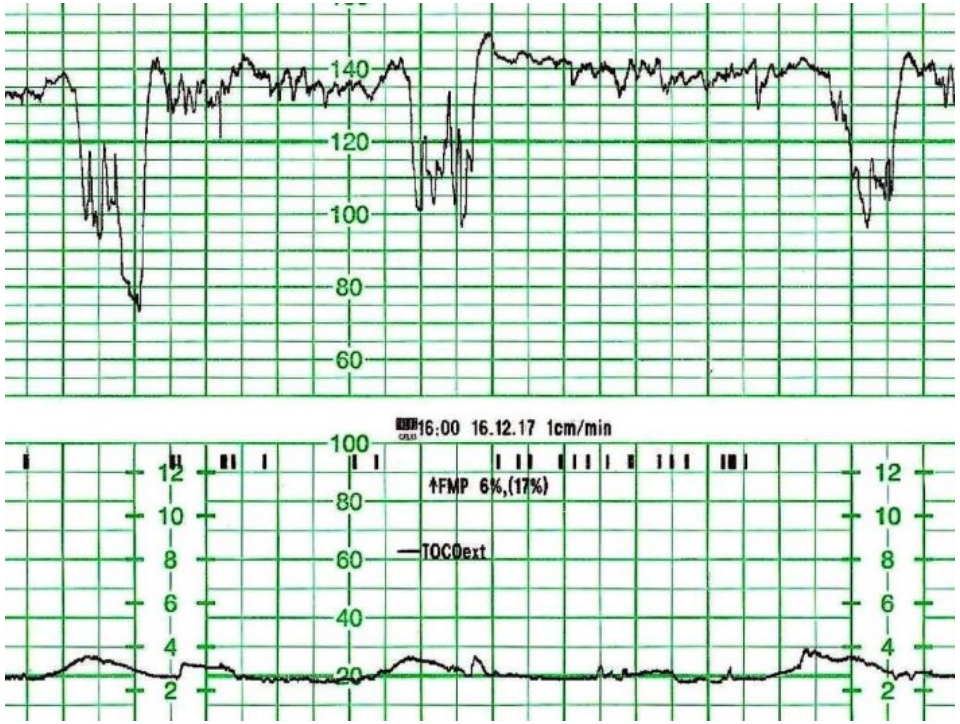
Decelerations

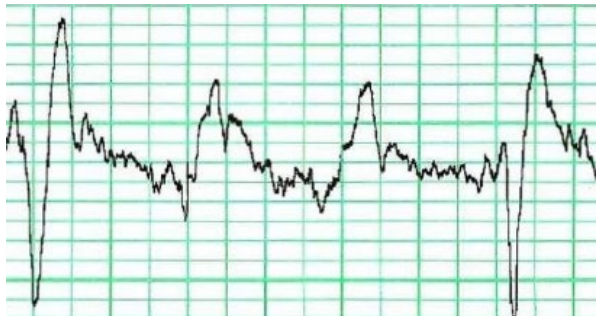
- Considered “abnormal”, but may not always be concerning
- Fall in FHR by 15 beats from baseline and lasting 15 seconds
  - There are four types
    - Early
    - Variable
    - Prolonged
    - Late
- A good recording on the toco is required to differentiate between the four

Early decelerations

- They must:
  - Be uniform
  - Start and finish with a contraction
- Often seen
  - During fetal sleep
  - At 4-8cm dilation

Variable decelerations

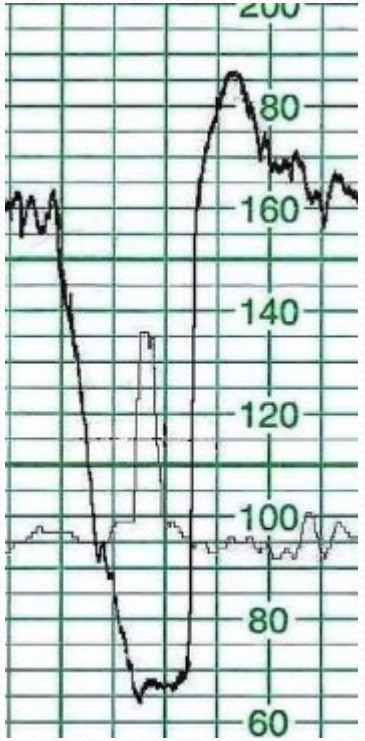


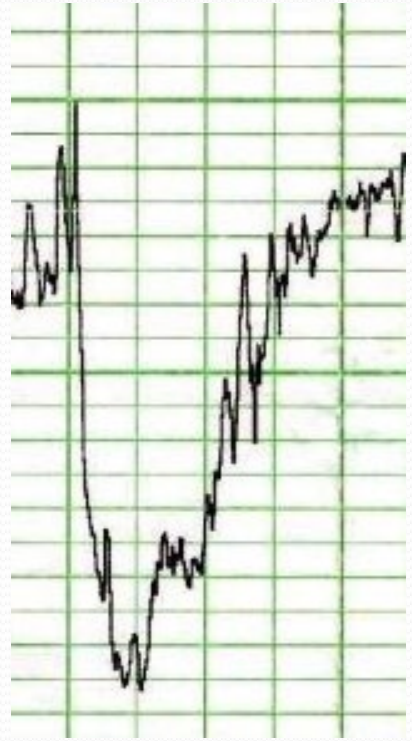


- Very commonly seen
- Generally caused by cord compression
- They vary in;
  - Depth
  - Duration
  - Timing, and
  - Typically have a rapid decent and recovery
- If the cord is compressed slowly there may be shouldering (increase in FHR just before and after deceleration)

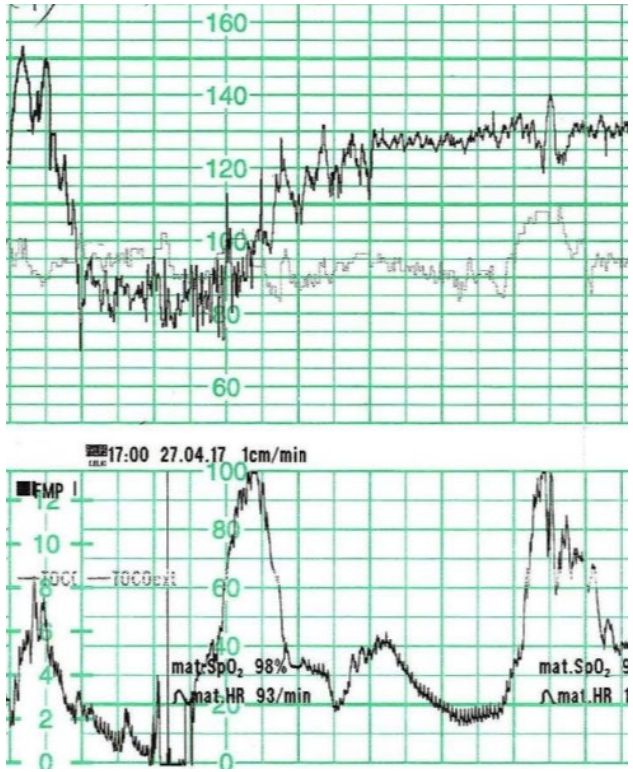
Complicated variable decelerations

- Some variables are more concerning than others
- Consider
  - A rising baseline or tachycardia?
  - Reducing variability?
  - Persistent deep or long variables?
  - A smooth post deceleration overshoot (NOT shouldering)?
  - Slow recovery?





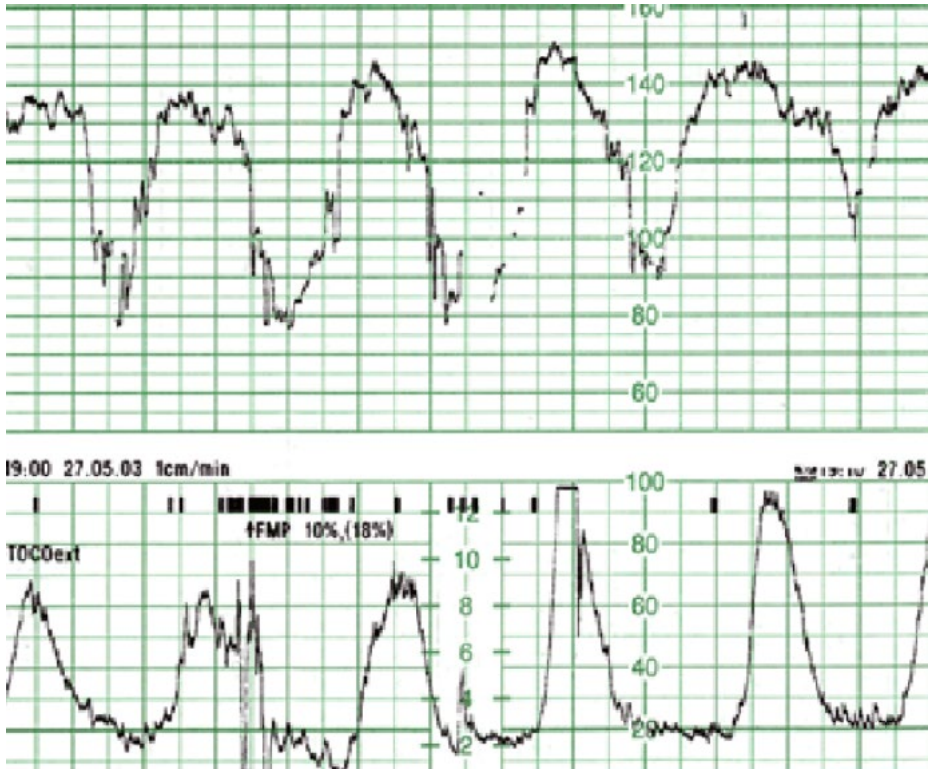
Prolonged decelerations



- A deceleration lasting >90 seconds but <5 minutes
- A sign of hypoxia, such as
  - Increased uterine activity (long or frequent contractions)
  - Maternal hypotension
  - **Abruption**
  - **Uterine rupture**

Late decelerations

- Likely cause is placental insufficiency
- These trace should lack signs of a well oxygenated fetus e.g. accelerations and normal variability
- Decelerations are uniform in regards to timing relative to contractions, and they occur with each contraction



Overall impressions

- Is the CTG normal or abnormal?
- Is it concerning or non-concerning?
- Do you need to do anything?

The normal CTG is associated with a low probability of fetal compromise and has the following features:

- Baseline rate 110-160 bpm.
- Baseline variability of 6-25 bpm.
- Accelerations 15bpm for 15 seconds.
- No decelerations.

All other CTGs are by this definition abnormal and require further evaluation taking into account the full clinical picture.

The following features are unlikely to be associated with fetal compromise when occurring in isolation:

- Baseline rate 100-109 bpm.
- Absence of accelerations.
- Early decelerations.
- Variable decelerations without complicating features.

The following features may be associated with significant fetal compromise and require further action, such as described in Recommendation 8:

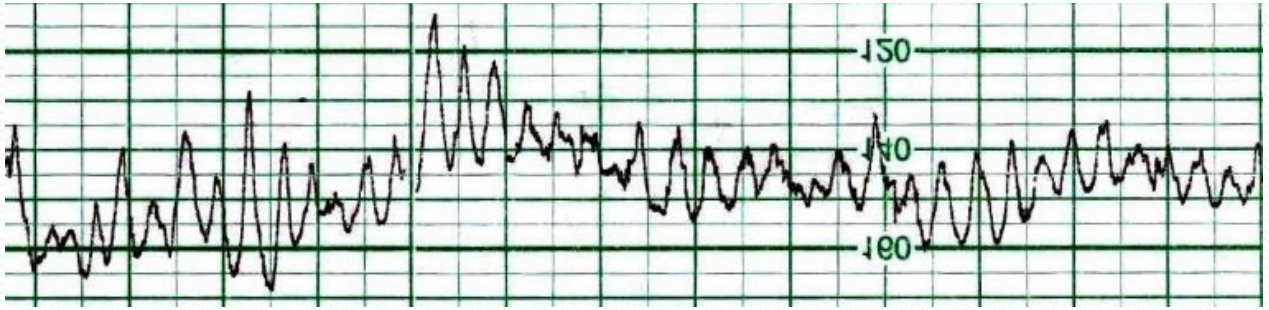
- Baseline fetal tachycardia >160 bpm.
- Reduced or reducing baseline variability 3-5bpm.
- Rising baseline fetal heart rate.
- Complicated variable decelerations.
- Late decelerations.
- Prolonged decelerations.

The following features are likely to be associated with significant fetal compromise and require immediate management, which may include urgent delivery:

- Prolonged bradycardia (<100 bpm for >5 minutes).
- Absent baseline variability <3bpm.
- Sinusoidal pattern.
- Complicated variable decelerations with reduced or absent baseline variability.
- Late decelerations with reduced or absent baseline variability.

SPECIAL PATTERNS

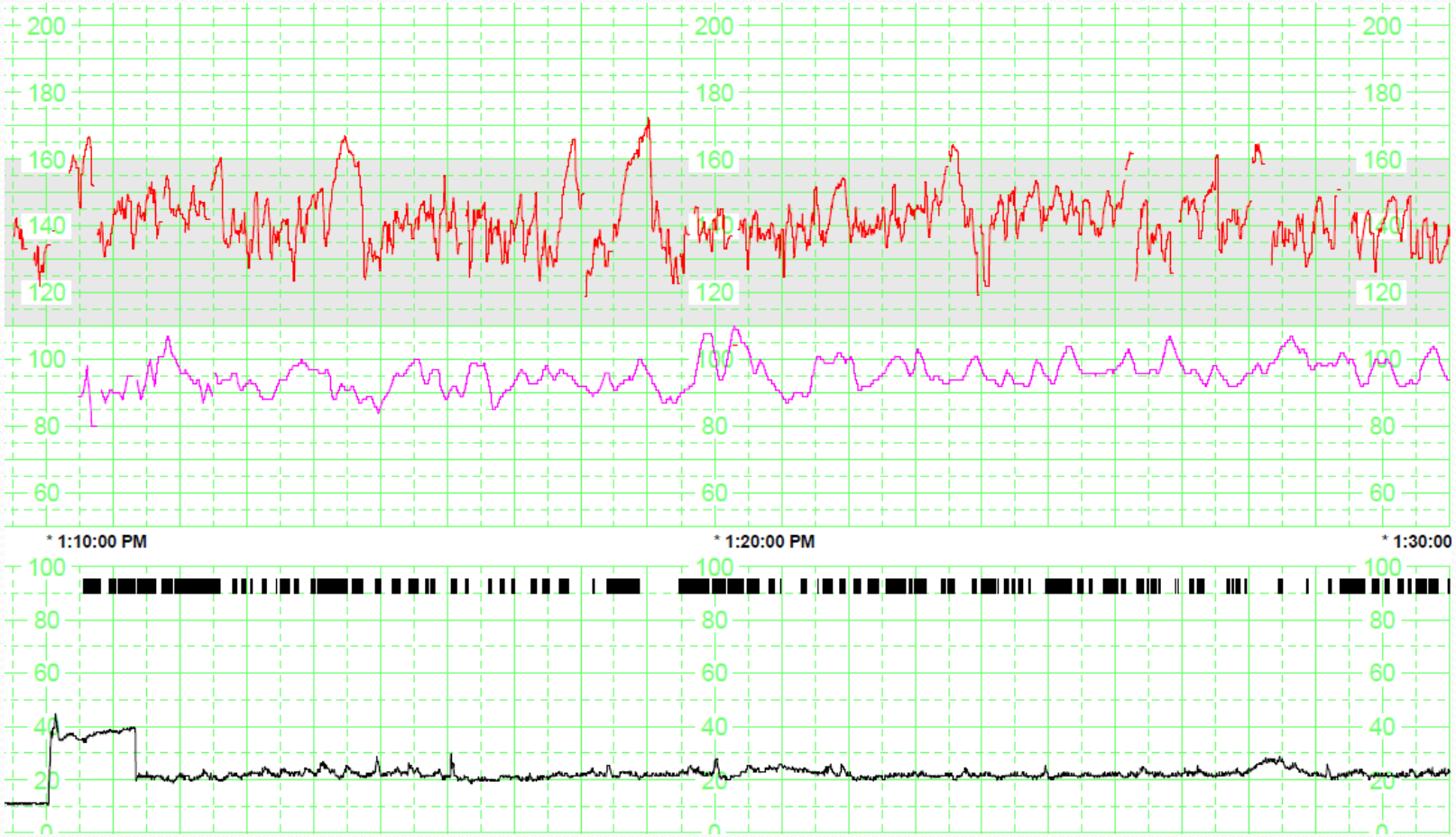
- Sinusoidal; reflective of severe anaemia in the fetus, and generally seen with a complaint of RFM
  - THIS IS A COMPROMISED FETUS
  - This trace warrants immediate delivery
- Pseudosinusoidal; looks sinusoidal, but the trace was normal before/is normal afterwards
  - Often attributed to thumb sucking!



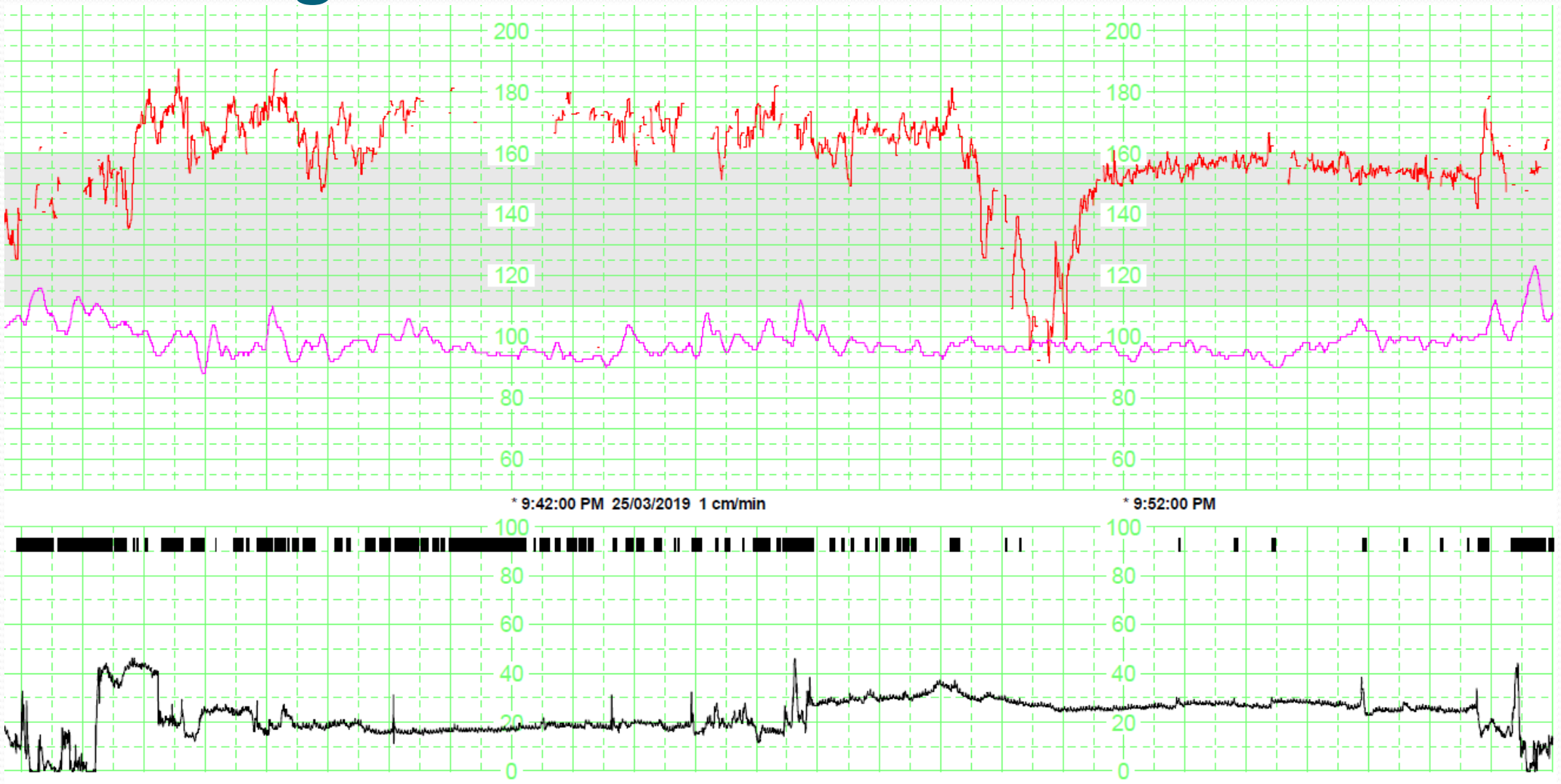
Case 1

- 27 year old
- 37 weeks and 2 days
- Admitted for induction of labour
- GDM on Insulin poorly controlled
- Renal artery stenosis
- GBS positive
- IOL with Cervidil
- Fetal distress
- Emergency Caesarean section

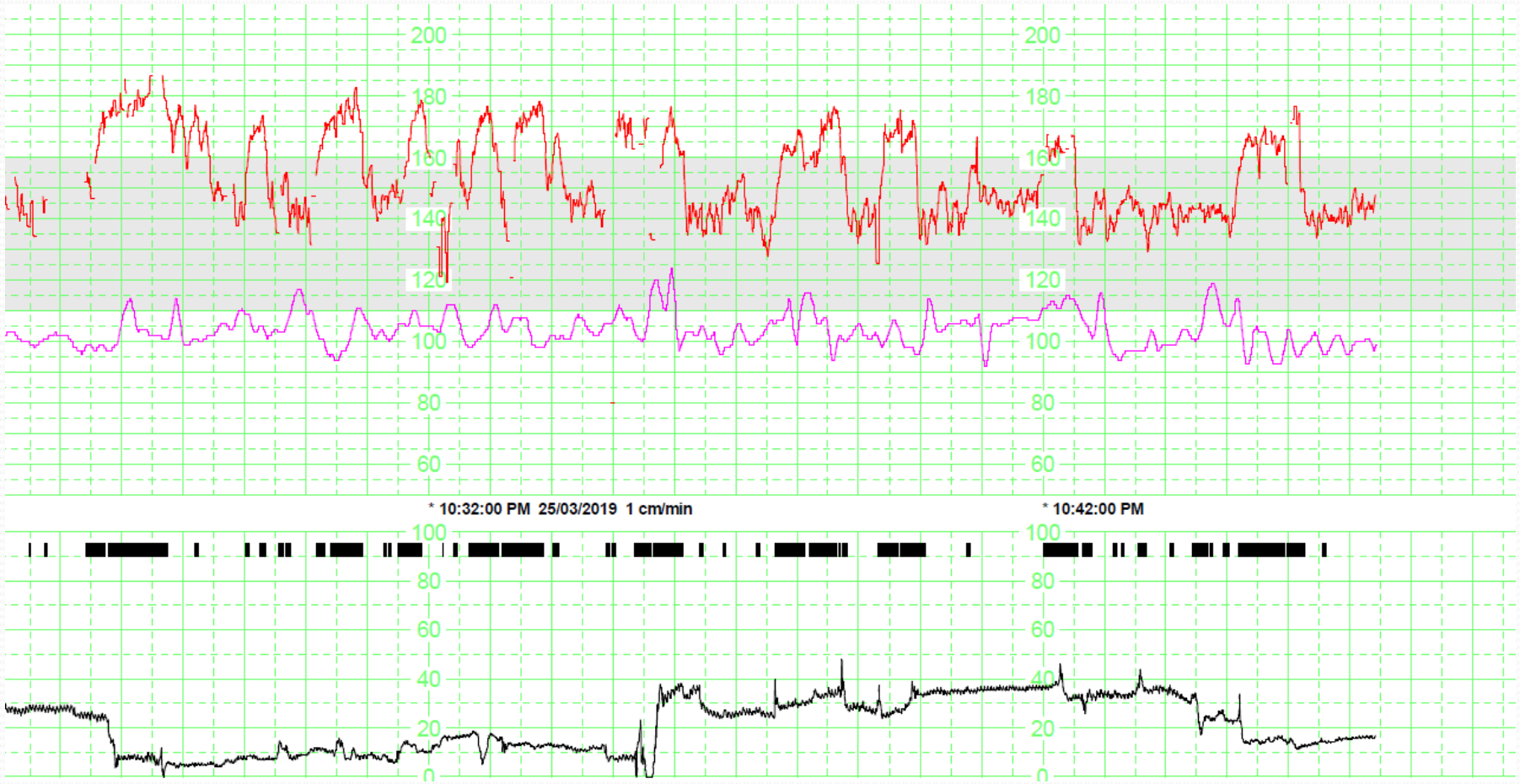
CTG at admission



CTG during IOL



CTG at decision for CS



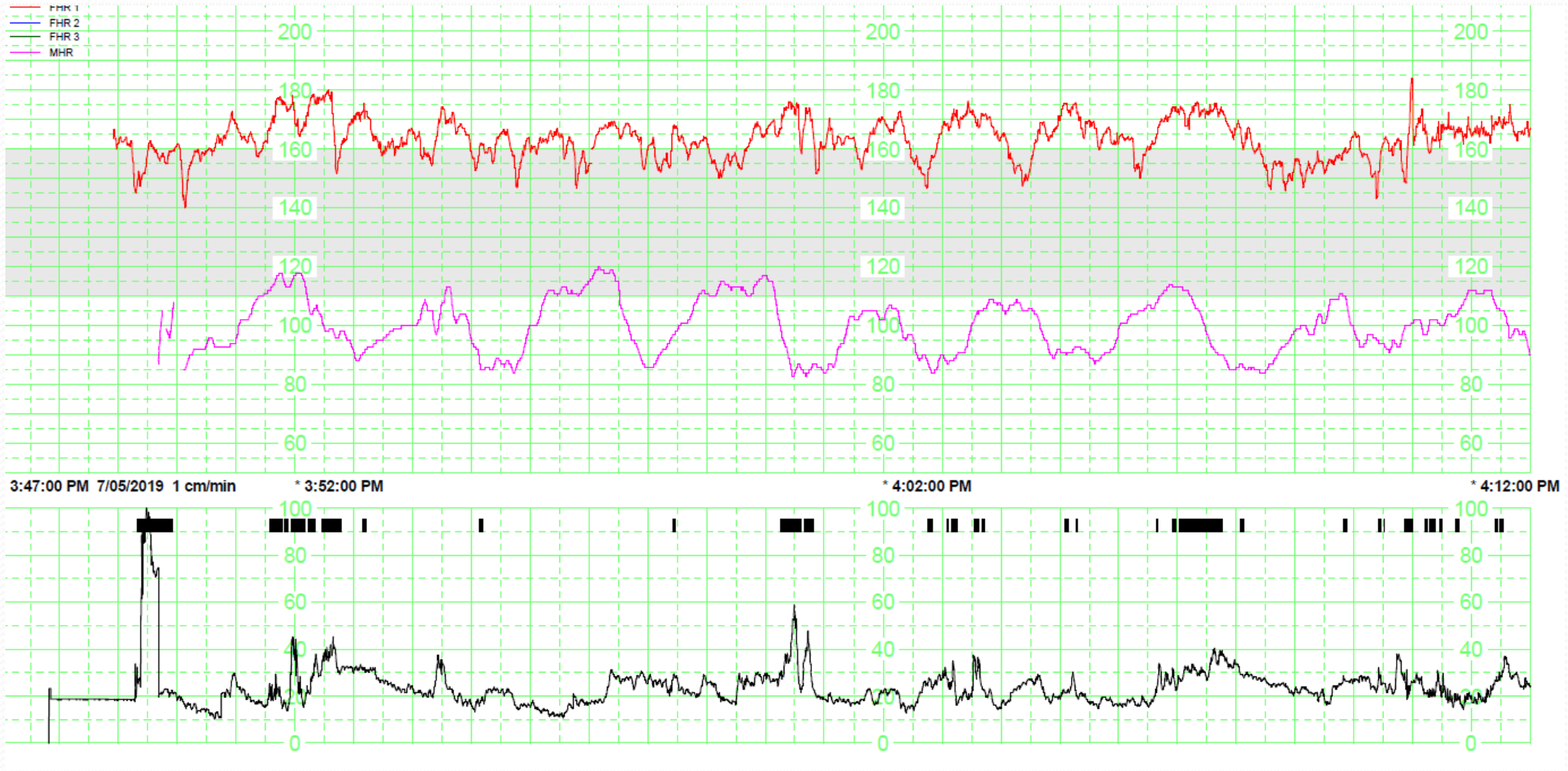
Outcome

- Baby cried at birth
- Normal cord gases

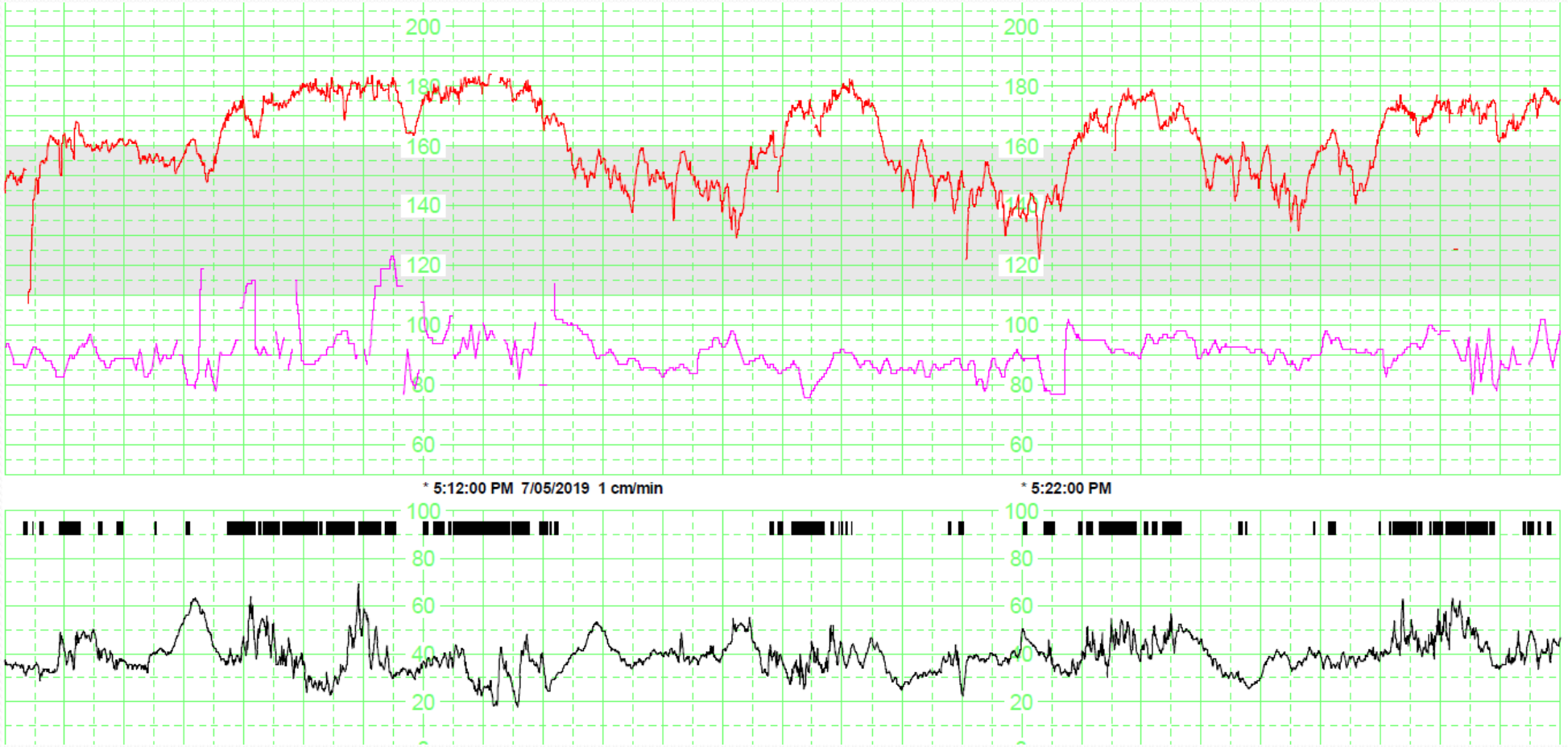
Case 2

- G2 P1
- Low risk pregnancy
- Anatomy scan- Placenta covering cervical Os
- Scan 32 weeks- Placenta upper segment
- 40 weeks and 3 days – Stretch and Sweep for IOL
- Presented with bleeding PV 24 hours later
- Scan – Placenta posterior and 5 cm from os
- IOL- fetal distress during IOL
- Emergency CS, Baby 4.5 Kg
- Normal Cord gases

CTG during bleeding episode



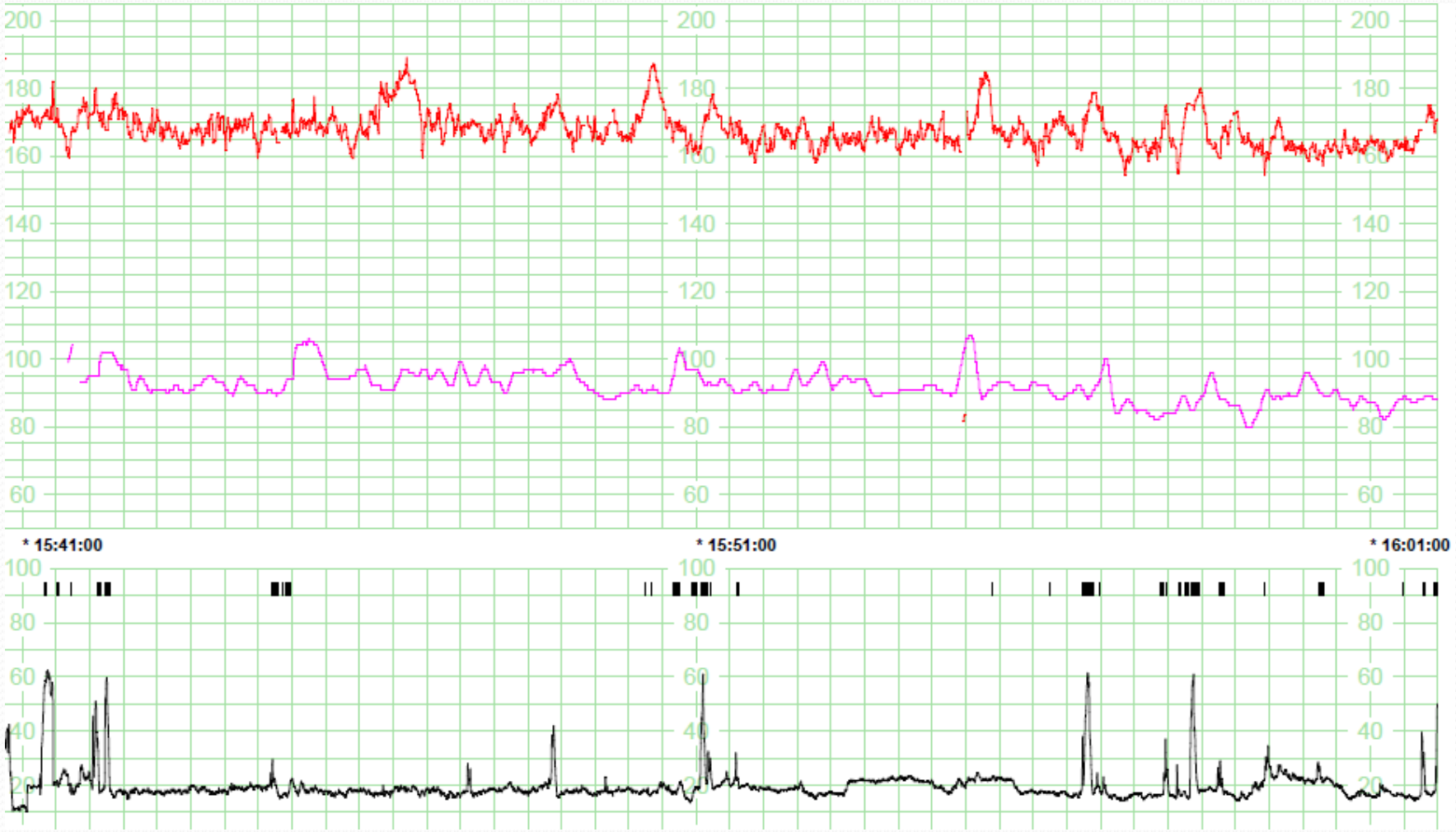
CTG during IOL



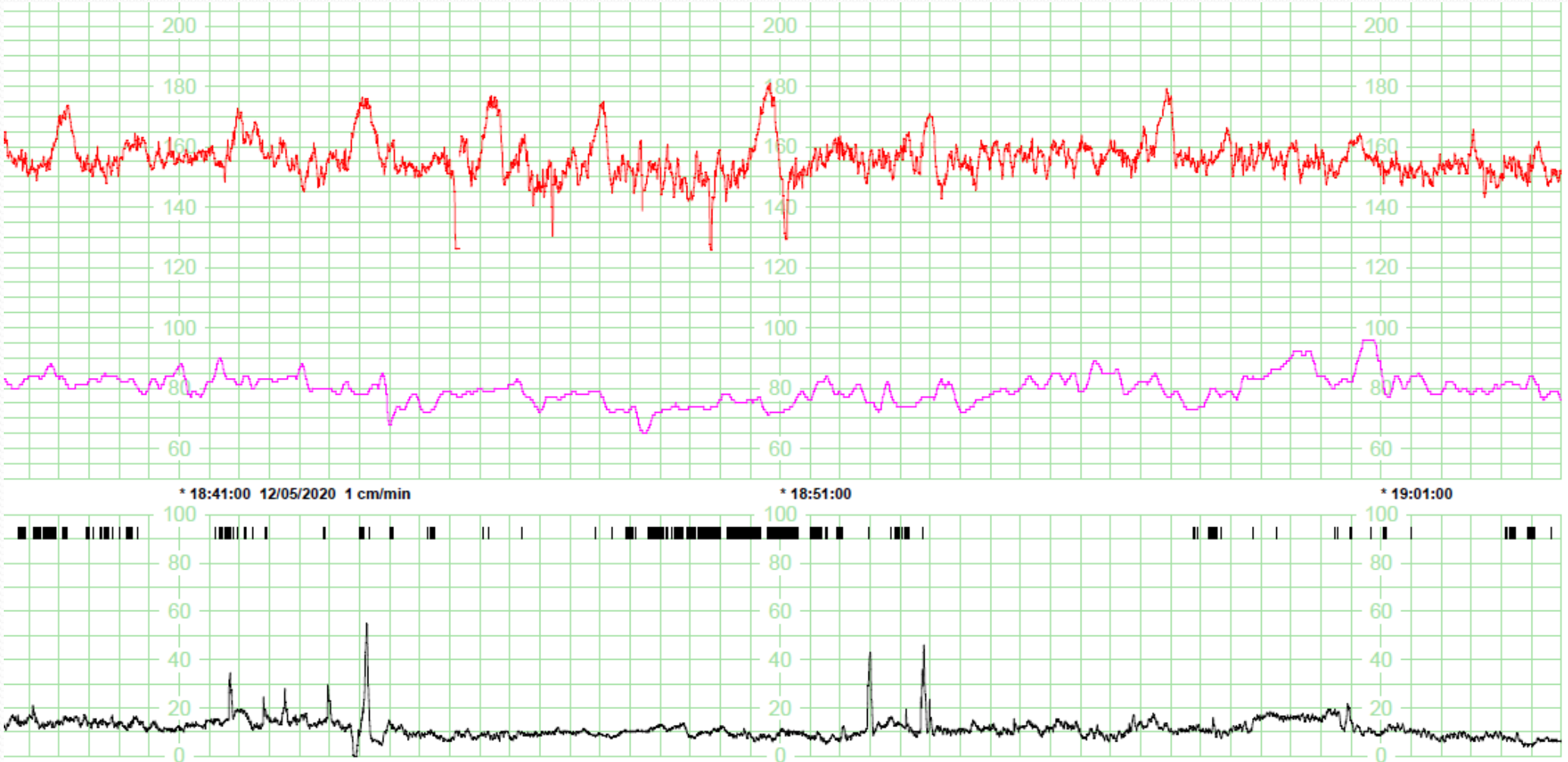
Case 3

- Primigravida
- 38 weeks, BMI 48
- Reduced fetal movements
- Known fetal macrosomia and polyhydramnios
- OGTT x 2 times- Normal
- BSL fasting at admission 11.3
- Urine ketones negative

Admission CTG



CTG- continued



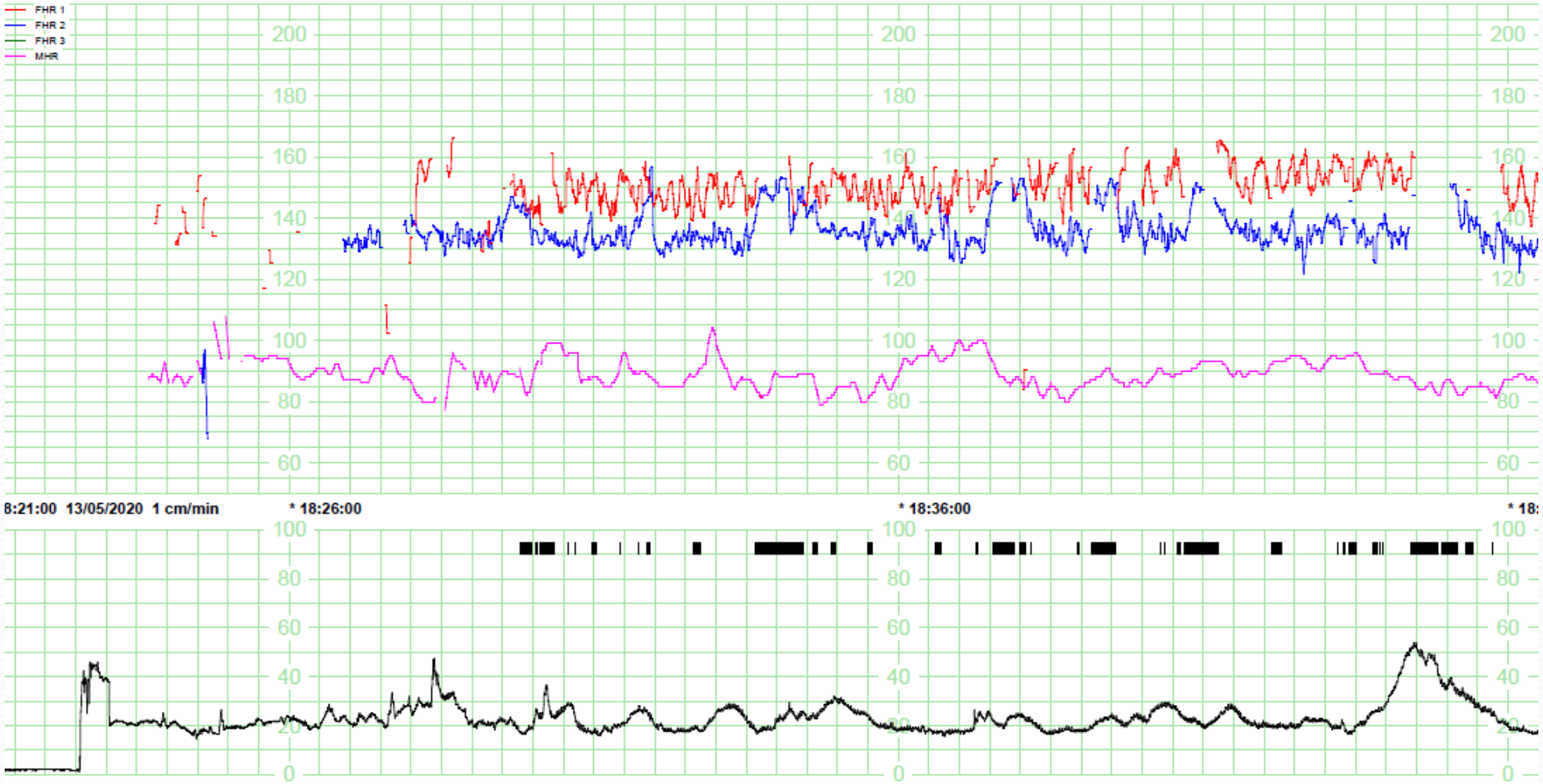
Management

- Fluids
- Caesarean section
- Fetus 4.8.Kg, pads of fat ++
- Copious liquor
- PPH 1.1.litres
- Normal cord gases

Case 4

- Dichorionic - diamniotic twins
- 34 weeks and 4 days
- IUGR
- Abnormal fetal dopplers
- Normal Amniotic fluid index
- Management- Steroids and elective CS

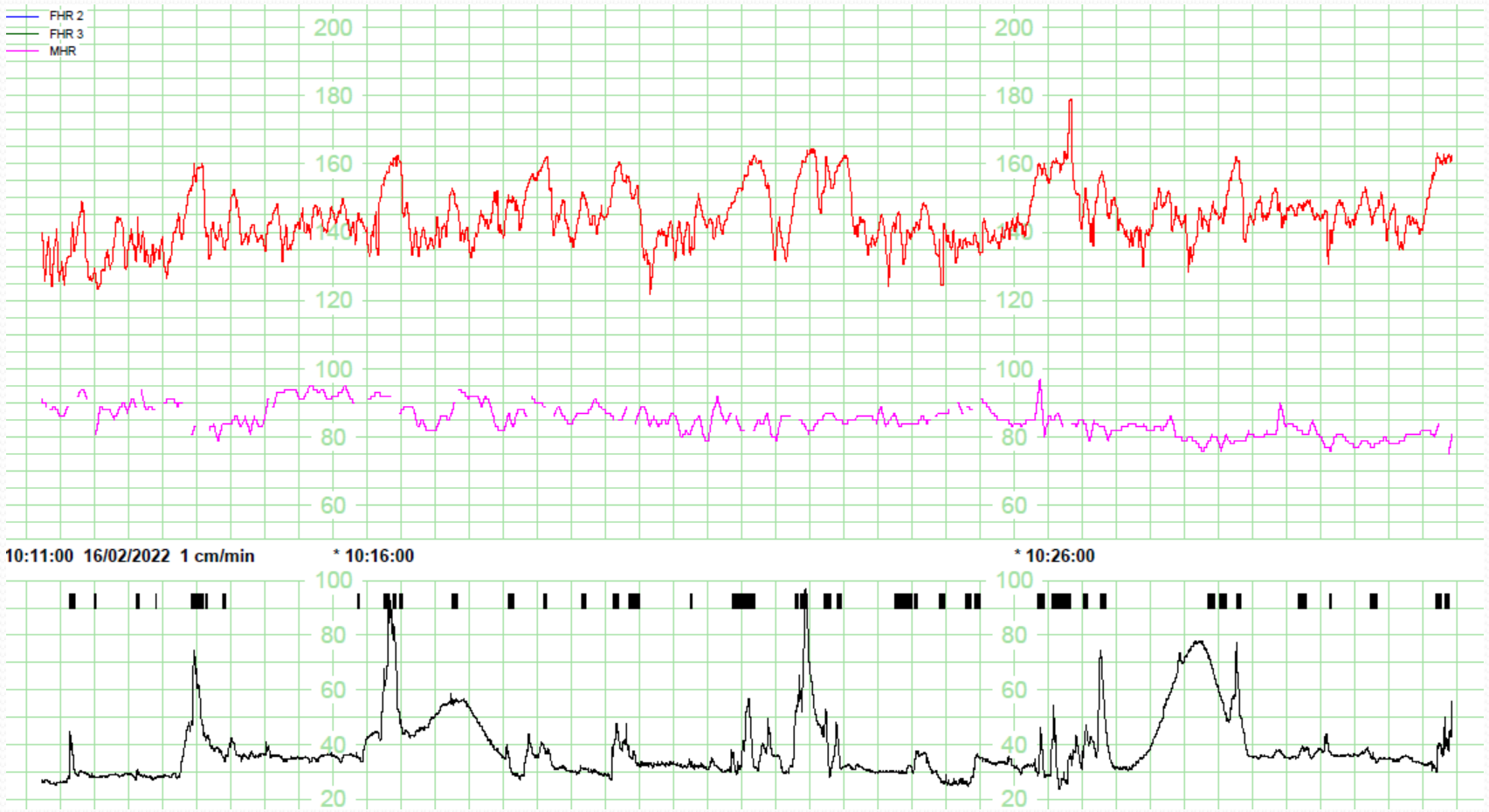
Twin CTG


FHR 1
FHR 2
FHR 3
MHR
200
180
160
140
120
100
80
60
8:21:00 13/05/2020 1 cm/min
* 18:26:00
* 18:36:00
* 18:
100
80
60
40
20
0

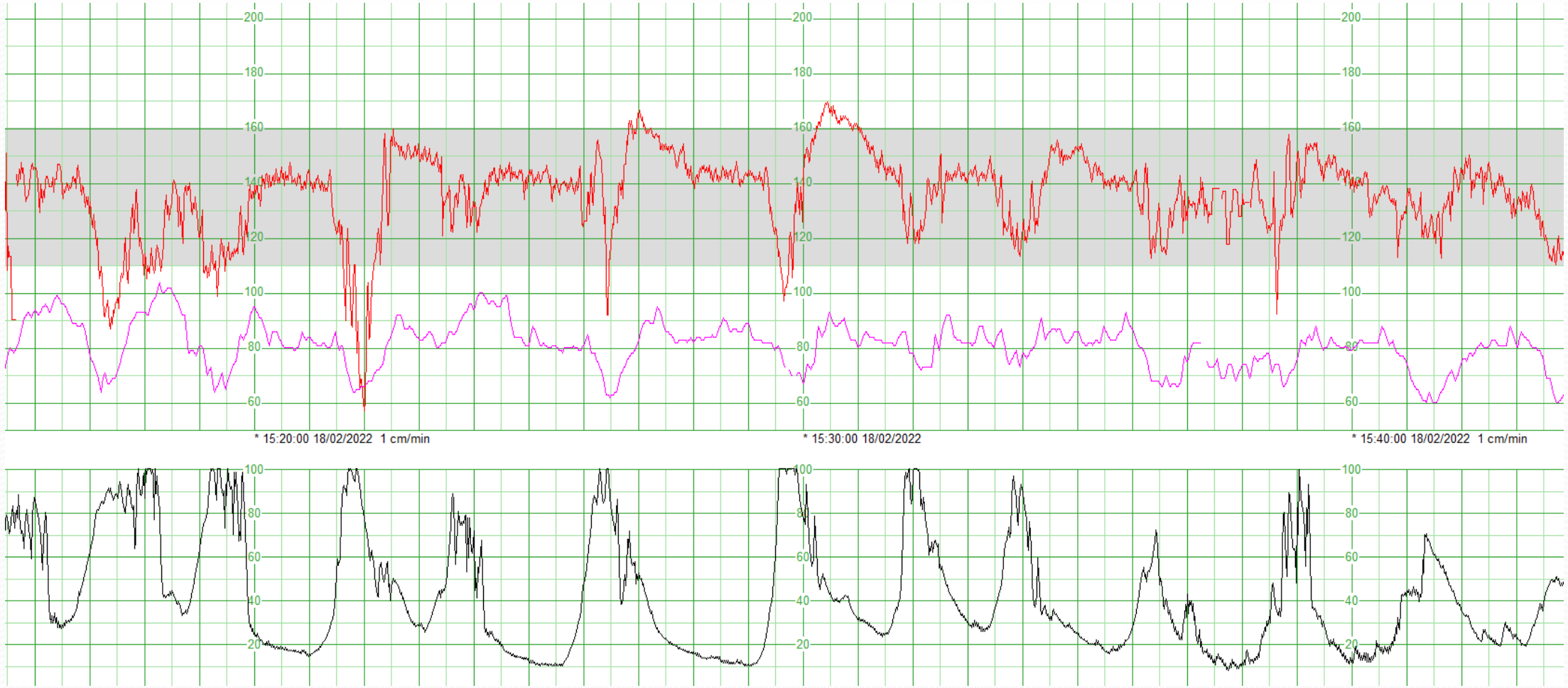
Case 5

- 38 weeks and 5 days
- Maternal age 40
- GDM on Insulin, Hypertension on Labetolol
- Fetal growth- satisfactory, small uterine fibroids
- Bishop score 4 at admission
- For Induction of labour
- Cervidil (Prostaglandin) x 12 hours
- Artificial rupture of membranes when Bishop Score 8
- Augmented with Syntocinon

Admission CTG



CTG during augmentation with syntocinon at full dilatation



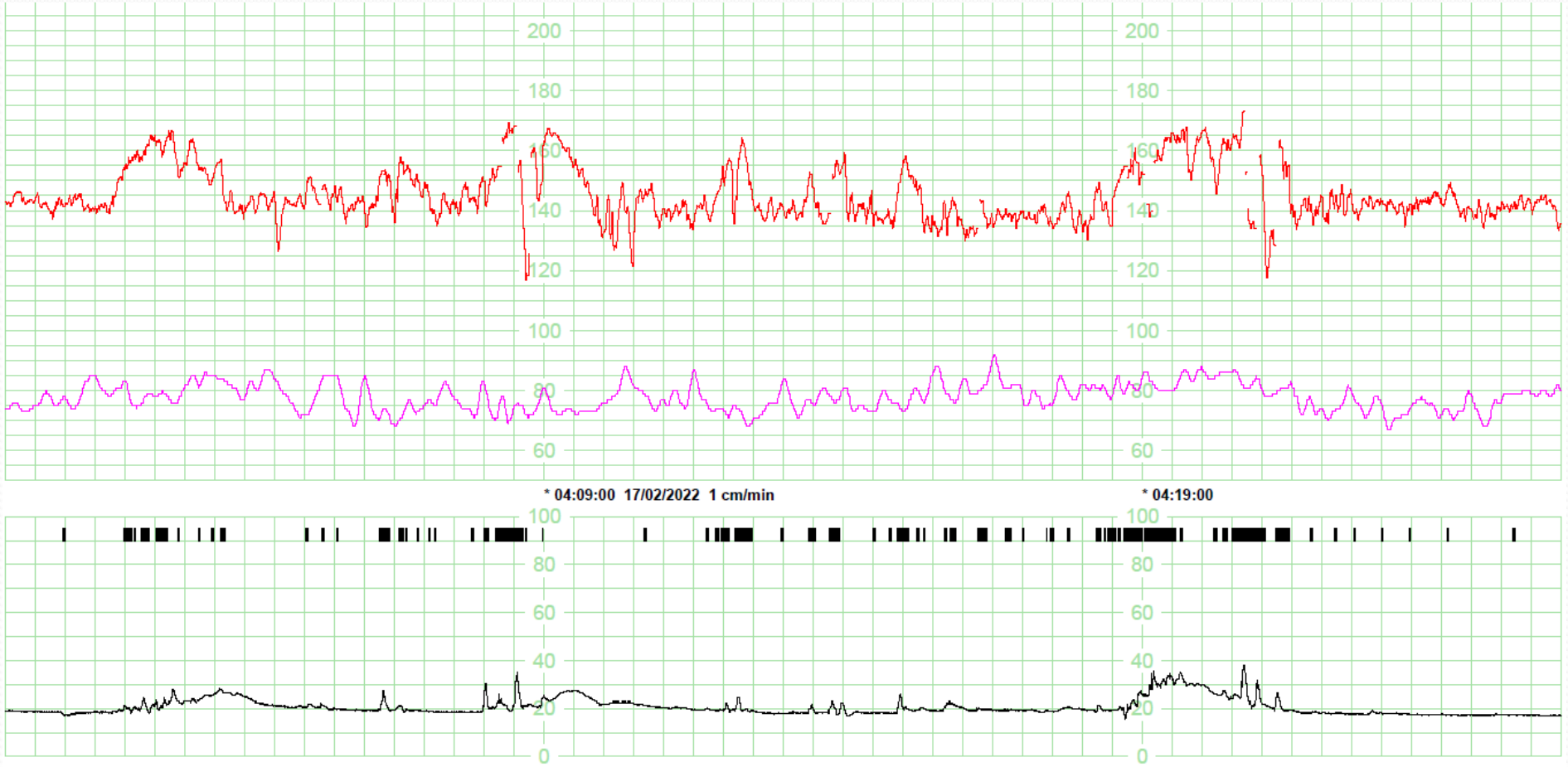
Management

- Fully dilated with satisfactory progress
- Vertex at 1+ Left occipital - anterior
- Manual rotation to Occipito Anterior and forceps delivery
- Baby cried at birth, normal Apgar score and cord blood gases

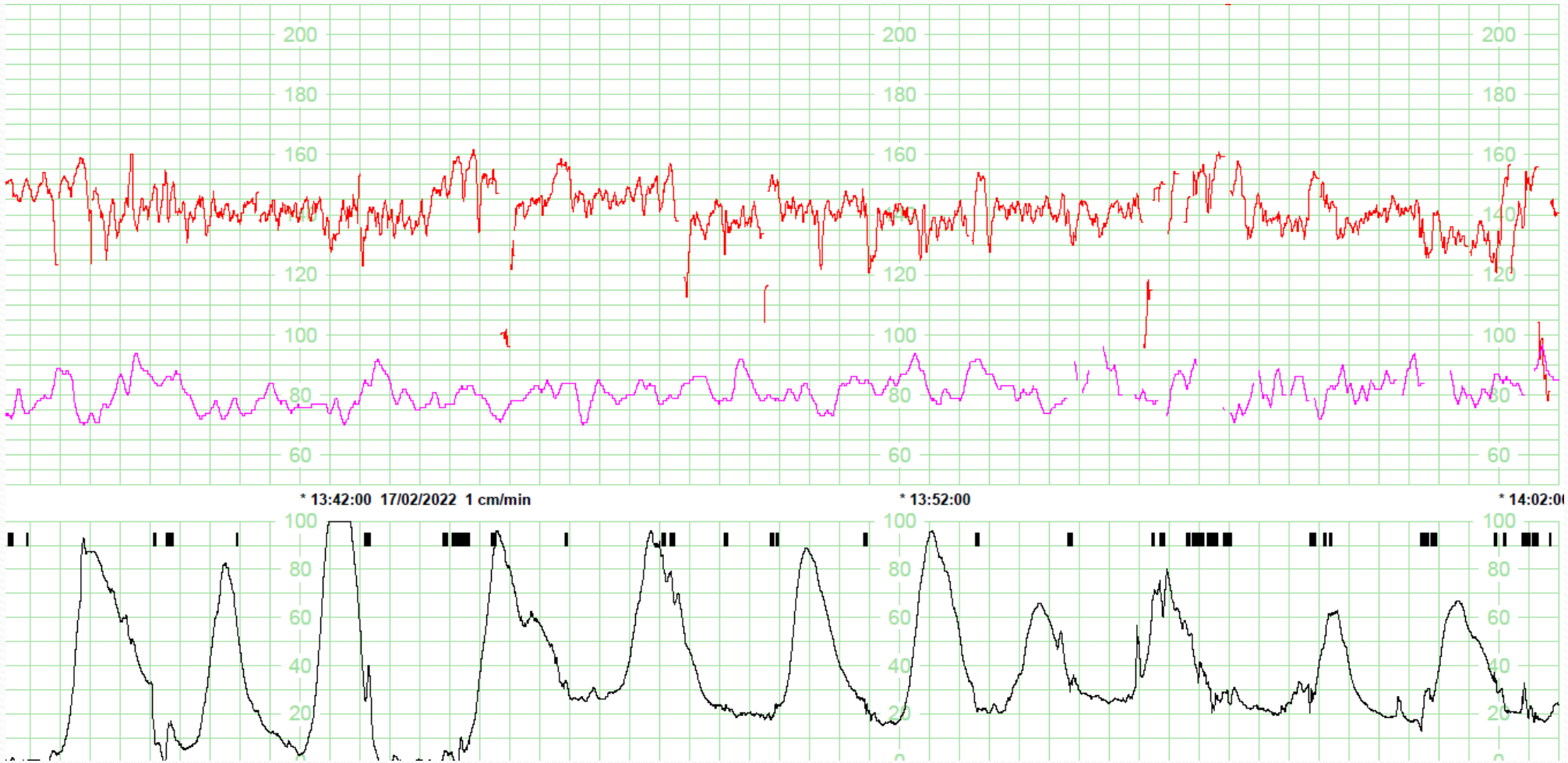
Case 6

- G1P0
- 39 weeks and 4 days
- Hepatitis B positive, low viral load, On Tenofovir
- Prolonged spontaneous rupture of membrane
- Admitted for induction of labour

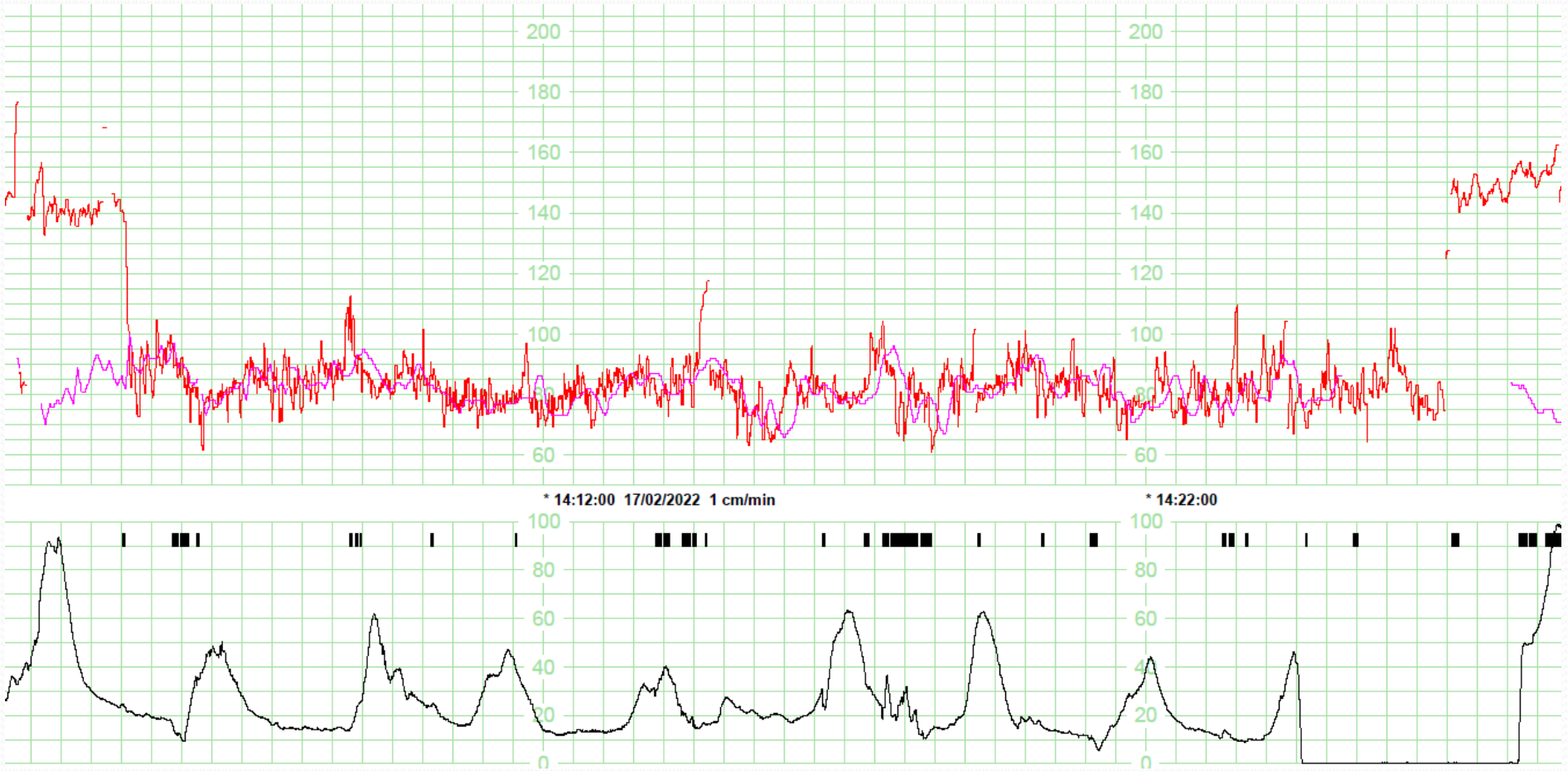
CTG at admission



CTG during augmentation



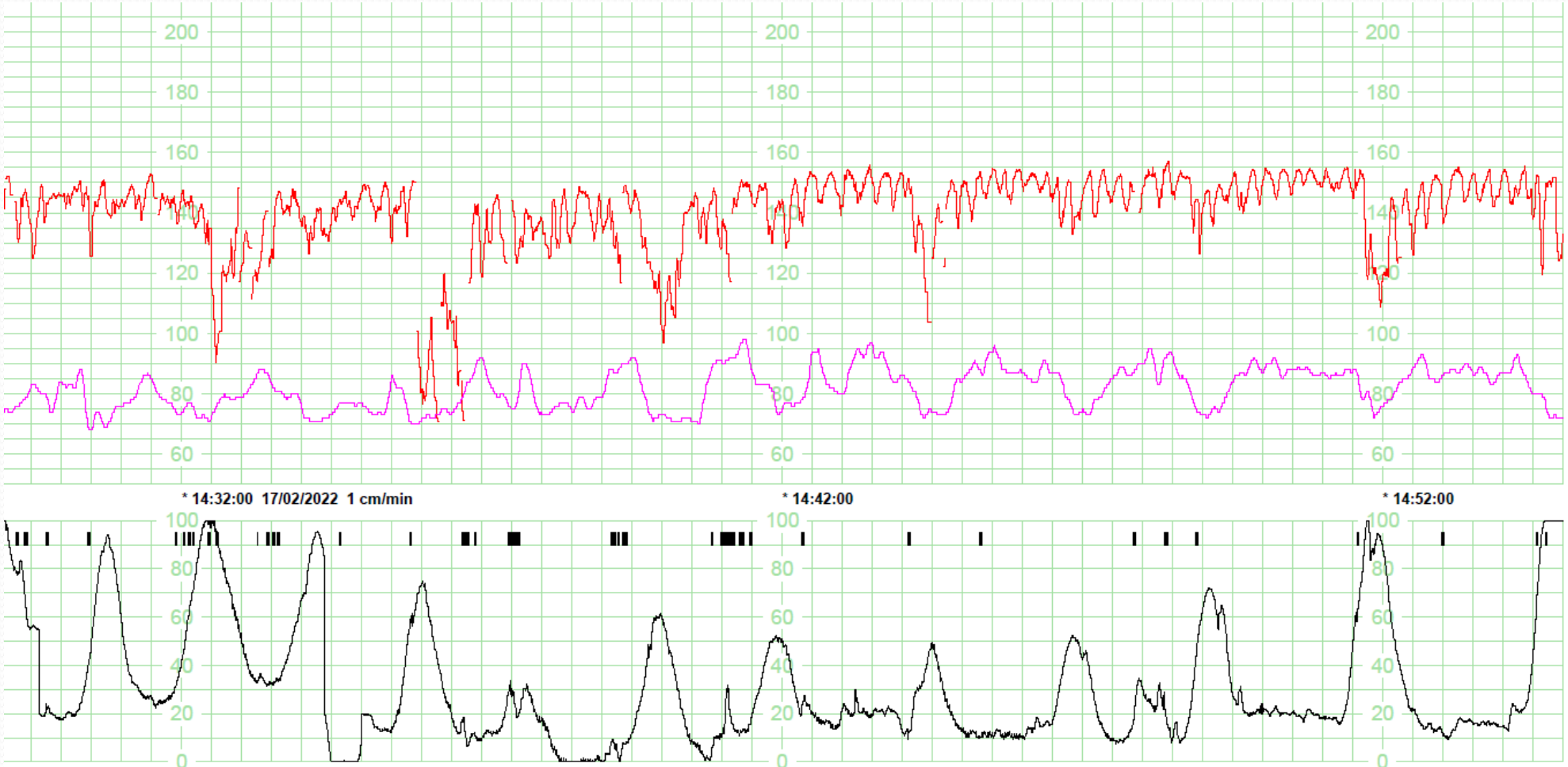
CTG- continued



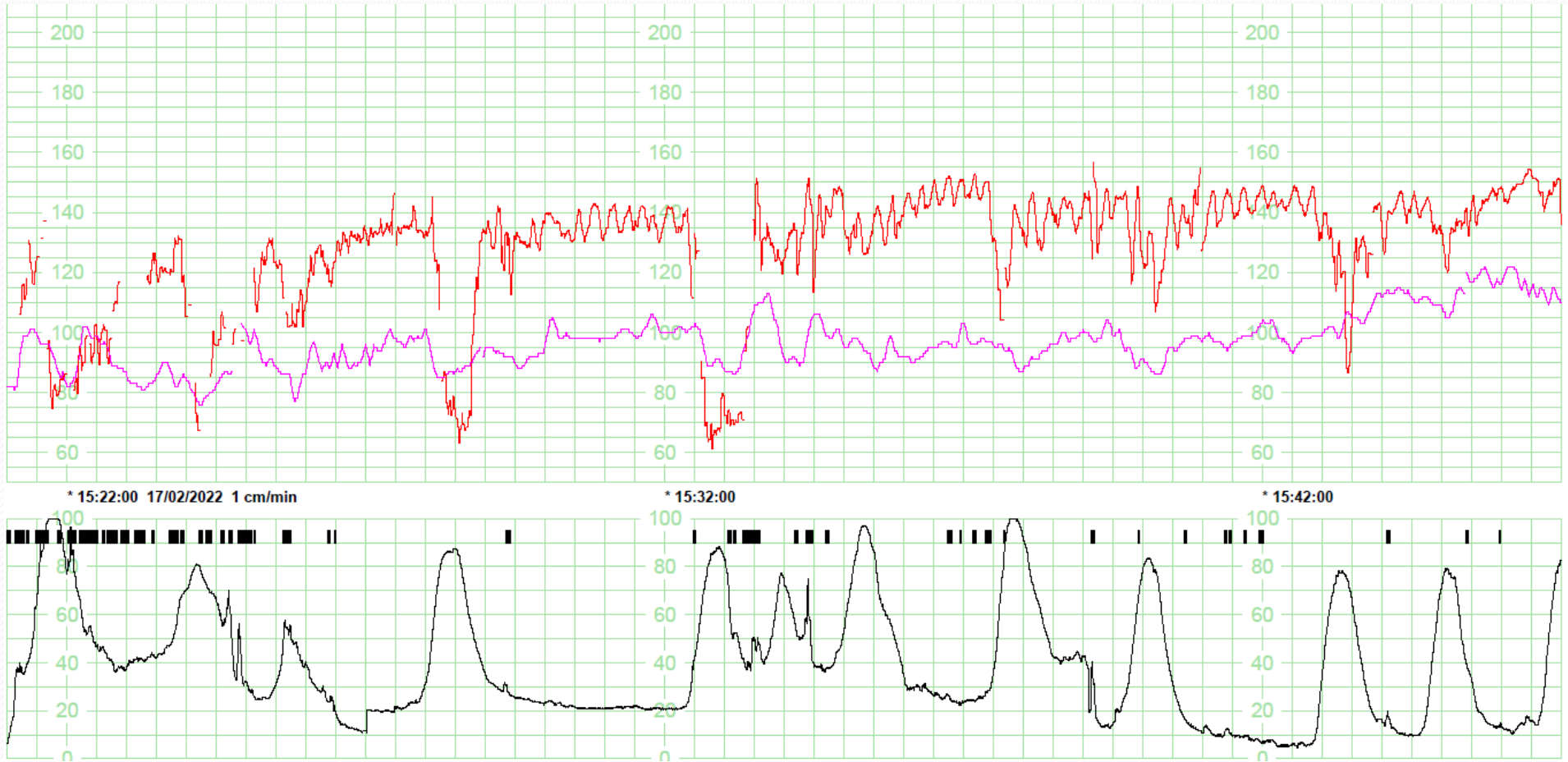
Case progress

- Contracting 4 :10 on syntocinon
- Cervix 5 cm dilated
- Bradycardia relieved on change of maternal position

CTG- continued



CTG- Continued



Case progress

- On going CTG abnormalities- sinusoidal trace with variable decelerations
- Cervix 5 cm dilated
- Fetal heart rate did not accelerate on scalp stimulation
- Fetal blood sampling not possible owing to Hepatitis B positive
- Hence Category 1 Caesarean section

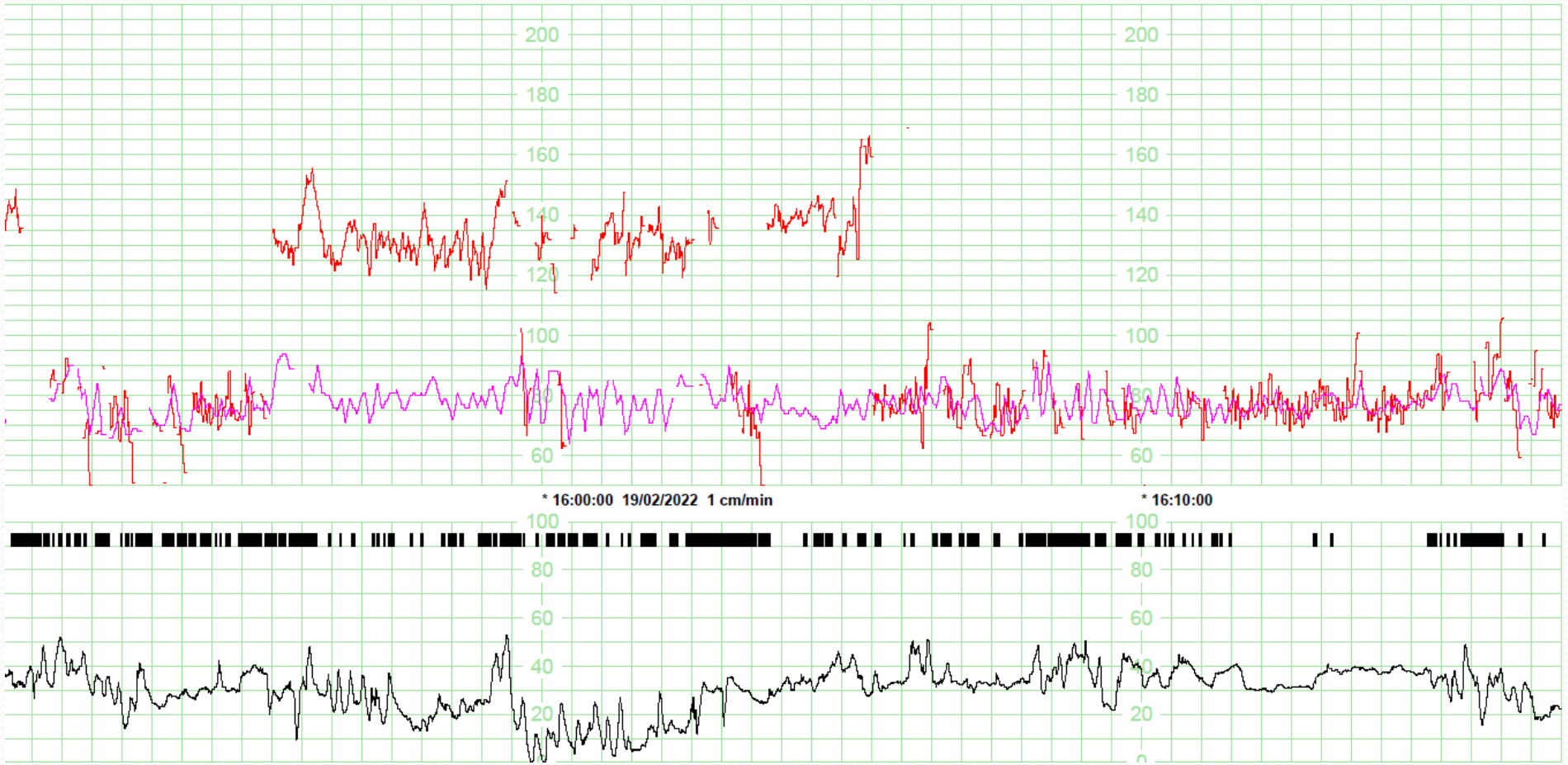
Cord blood gases

	Ph	Base Excess	Lactate
Arterial	7.29	2	2.1
Venous	7.37	-1	1.6

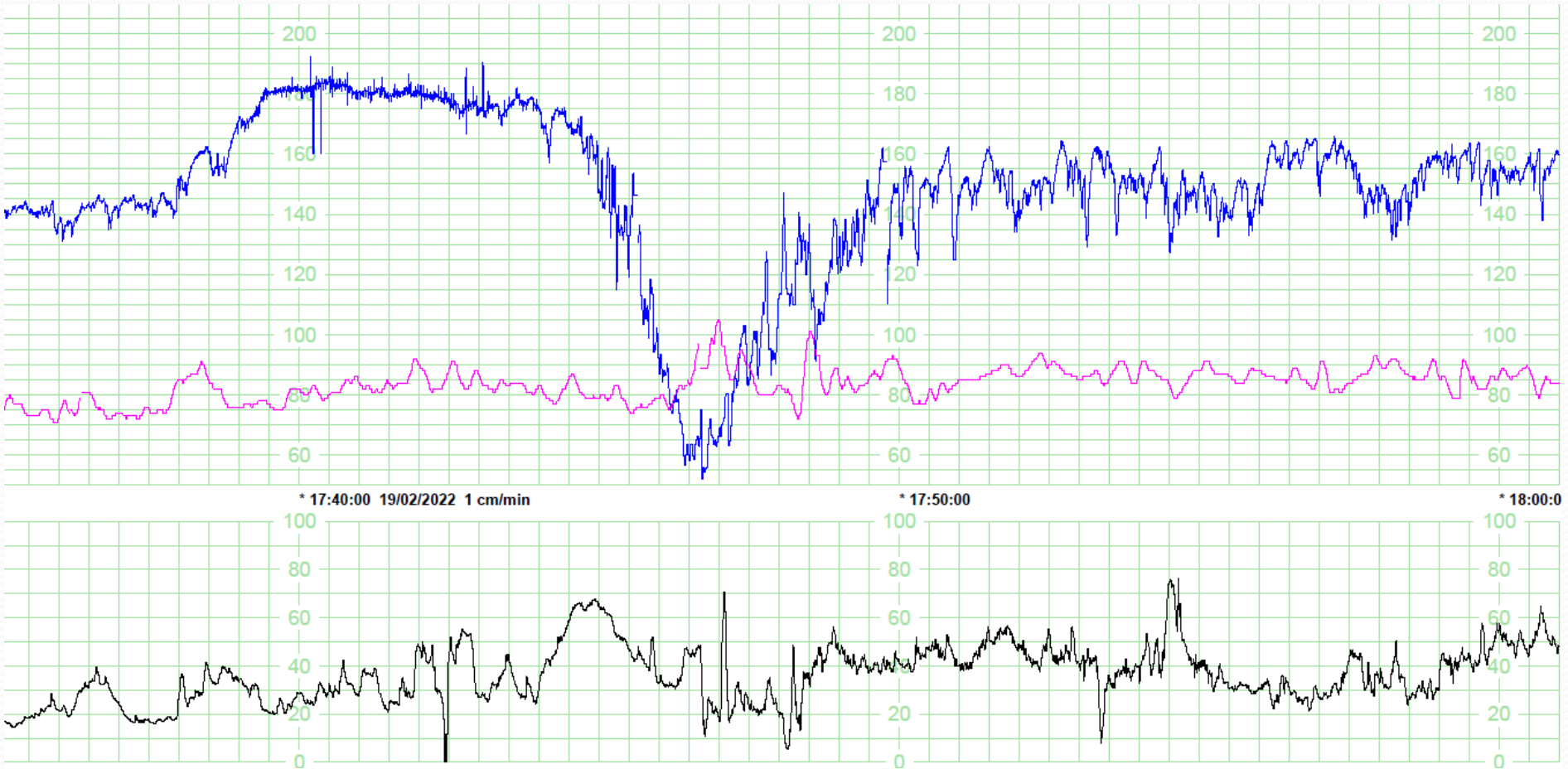
Case 7

- G2P0
- 40 weeks and 2 days
- Antepartum haemorrhage 10mls
- Placenta upper segment
- Admitted for induction of labour but was spontaneously contracting
- PA Cephalic 3/5ths palpable
- VE- Cervix 4 cm dilated

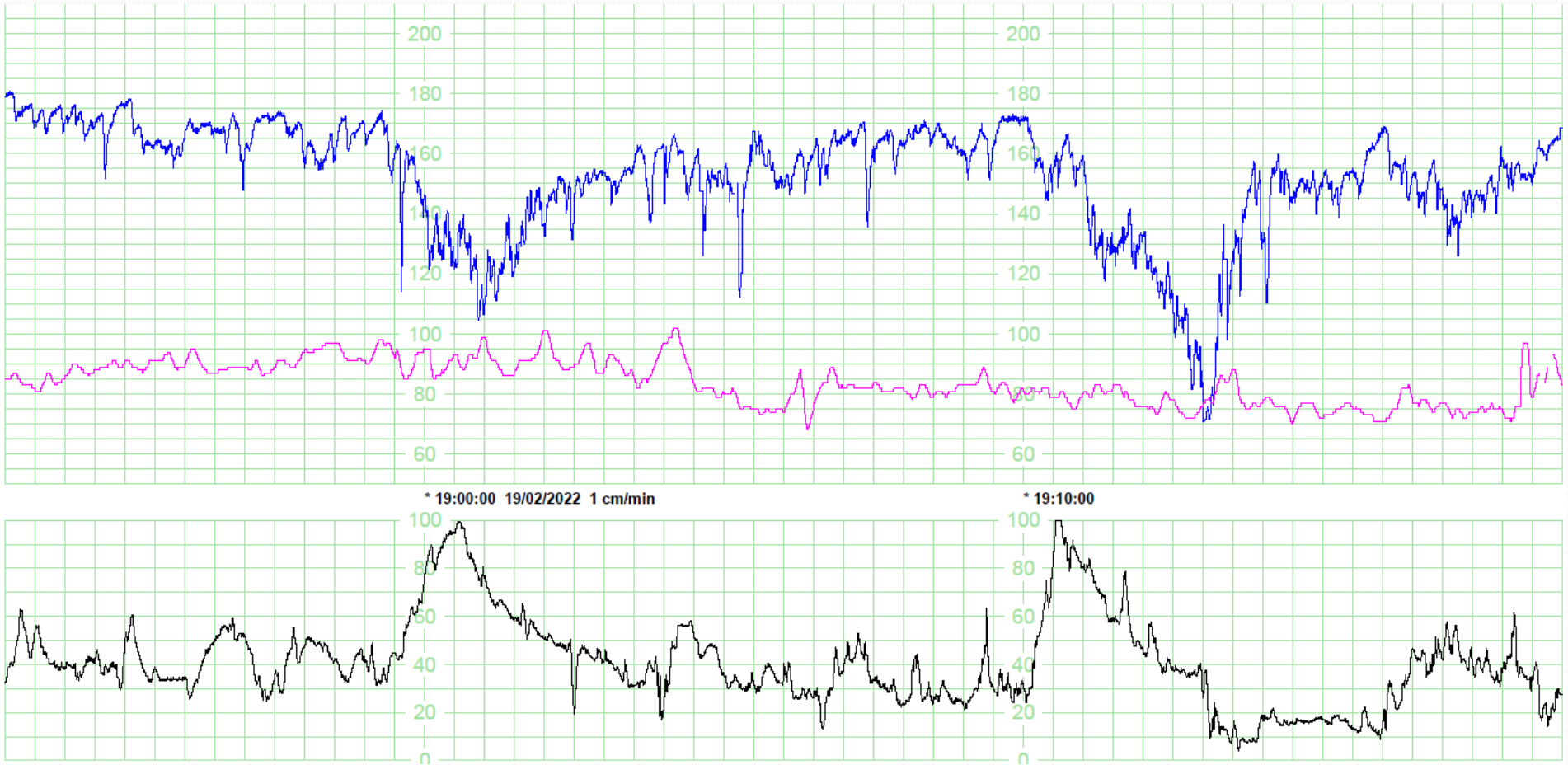
CTG


200
180
160
140
120
100
80
60
* 16:00:00 19/02/2022 1 cm/min
* 16:10:00
100
80
60
40
20

CTG


200
180
160
140
120
100
80
60
* 17:40:00 19/02/2022 1 cm/min
* 17:50:00
* 18:00:0
100
80
60
40
20
0

CTG


200
180
160
140
120
100
80
60
* 19:00:00 19/02/2022 1 cm/min
* 19:10:00
100
80
60
40
20
0

Progress

- Progressed in labour rapidly to full dilatation with ongoing intrapartum bleeding
- Forceps delivery with episiotomy
- Placenta complete
- Cord gases: Normal PH and lactate
- Apgars: 9 and 9