Cases of metabolic acidosis in CTG+ST group not requiring special neonatal care

Cases

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**Clinical data**
Para 0. Normal pregnancy, Spontaneous onset of labour after 38 weeks of gestation
Clear liquor, Epidural + Pethidine. Augmented labor. Maternal pyrexia of unknown origin, temp >38.5 °C.
Active pushing commenced at 01:08
NVD at 01:15

**Neonatal data**
Female: 3735 g

Apgar: 5-8-10
Cord artery:  
  - pH 6.93
  - PCO₂ 7.97 kPa
  - BDcef 17.5 mmol/l
Cord vein:  
  - pH 6.97
  - PCO₂ 9.3 kPa
  - BDcef 13.8 mmol/l

**Neonatal outcome**
Normal neonatal outcome.

**Assessment of recording**
Onset of recording: at 10:38
End of recording: at 01:15

Sample of recording at onset.

![Graph](image)

Tachycardia noted at approx 19:30 in conjunction with maternal pyrexia.
Biphasic ST changes were noted as the FHR pattern changed with the onset of complicated variable decelerations.

These ST changes continued until delivery. The FHR pattern showed a decrease in baseline FHR with reduced variability.

**Comments**

Normal pregnancy but maternal pyrexia of unknown cause. Approx 1 hour before delivery, onset of biphasic ST changes informing that the myocardium was affected. Cord artery PCO2 is lower than the cord vein PCO2 indicating late clamping. However, the cord vein sample appears accurate and indicates cord metabolic acidosis. Maternal pyrexia, fetal heart rate changes, biphasic ST and cord vein metabolic acidosis but an unaffected neonate may indicate a fetus responding to a situation of increased metabolic demand from increased temperature more than severe hypoxia per se.
Clinical data
Para 0. Normal pregnancy. Spontaneous onset of labour after 42 weeks of gestation
Meconium. Augmented labor
Active pushing commenced at 01:30
Mid cavity vacuum at 02:22 for failure to progress

Neonatal data
Male: 3850 g
Apgar: 5-8-8
Cord artery: pH 6.92
PCO₂ 8.30 kPa
BDecf 17.6 mmol/l
Cord vein: pH 7.05
PCO₂ 7.30 kPa
BDecf 13.5 mmol/l

Neonatal outcome
Normal neonatal outcome.

Assessment of recording
Onset of recording at 07:10.
End recording at 02:10.
Frequent uterine contractions during active pushing in 2nd stage. Normal ST with variable deceleration occurring during end of 1st stage.

Comments
Nothing to indicate marked intrapartum hypoxia. Obviously, events after discontinuation of recording – 12 minutes without data might have been the cause for the acidemia.
MAD 213

Clinical data
Para 1. Spontaneous onset of labour after 37 weeks of gestation.
Clear liquor
Active pushing commenced at 14:40
Outlet vacuum for threatening asphyxia according to CTG+ST at 20:23.

Neonatal data
Female:
Apgar: 4-8-9
Cord artery: pH 6.92
PCO₂ 12.18 kPa
BDcef 12.2 mmol/l
Cord vein: pH 6.98
PCO₂ 10.29 kPa
BDcef 11.9 mmol/l

Neonatal outcome
Normal neonatal outcome.

Assessment of recording
Normal FHR pattern until active pushing starts. At this point in time, variable decelerations commence. Normal baseline FHR.
Comments

Events occurring during 2nd stage of labor indicating intermittent cord compression. Such patterns would be associated with a reduction of peripheral blood flow and a metabolic acidosis predominantly generated from those tissues. The high PCO2 readings are associated with these decelerations and intermittent cord occlusions. The T/QRS data show an increase during the last 10 min of labor. The staff responded accurately to the situation.
**MAD 317**

**Clinical data**

Para 0. Normal pregnancy, Spontaneous onset of labour after 41 weeks of gestation
Clear liquor.
Active pushing commenced at 23:20
Mid cavity vacuum for threatening asphyxia according to CTG at 23:44

**Neonatal data**

Male: 3370 g  
Apgar: 6-10-10  
Cord artery: pH 6.93  
PCO$_2$ 10.67 kPa  
BDecf 13.8 mmol/l  
Cord vein: pH 7.13  
PCO$_2$ 7.82 kPa  
BDecf 8.4 mmol/l

**Neonatal outcome**

Normal neonatal outcome.

**Assessment of recording**

Five minute recording during 2$^{nd}$ stage. Inadequate duration and finishing 18 min before delivery.

![Fetal Heart Rate (FHR) Trace]

**Comments**

The FHR trace indicates recovery after a prolonged deceleration. T/QRS show a return from high values (T/QRS >0.25), which would indicate that a significant event occurred immediately prior to the onset of the recording.
**Clinical data**
Para 1. Induction of labour for maternal reasons after 41 weeks of gestation
Clear liquor, TNS + Pethidine.
Active pushing commenced at 03:50
Outlet Vacuum for threatening asphyxia according to CTG+ST at 04:29

**Neonatal data**
Male: 3960 g
Apgar: 7-9-10
Cord artery:  
- pH 7.02
- PCO₂ 6.85 kPa
- BDeolf 15.7 mmol/l
Cord vein:  
- pH 7.17
- PCO₂ 9.22 kPa
- BDeolf 2.7 mmol/l

**Neonatal outcome**
Normal neonatal outcome.

**Assessment of recording**
Normal FHR pattern until onset of active pushing. At this point in time, variable decelerations are noted, becoming complicated at 04:02. Baseline FHR show a bradycardia pattern during the last 15 minutes.
The ST log indicated a sign T/QRS rise at 03:38, (baseline T/QRS rise of 0.11) in association with an intermediary FHR pattern.

Comments

Firstly, one should notice that cord acid base data indicate late clamping with loss of PCO₂ from the cord artery (6.85 vs 9.22 kPa) thereby overestimating the degree of metabolic acidosis in the cord artery (BDecefi 15.7 vs 2.7 mmol/L). Secondly, there was a delay in responding to the CTG+ST information by approx 20 minutes.
Clinical data
Para 0. Normal pregnancy. Spontaneous onset of labour after 38 weeks of gestation.
Active pushing commenced at 02:10
Outlet vacuum for threatening asphyxia according to CTG+ST at 03:28

Neonatal data
Female: 3700 g
Apgar: 6-8-10
Cord artery: pH 6.99
PCO₂ 7.78 kPa
BDecf 15.4 mmol/l
Cord vein: pH 7.02
PCO₂ 9.71 kPa
BDecf 10.7 mmol/l

Neonatal outcome
Normal neonatal outcome.

Assessment of recording
Normal FHR pattern until 01:50 when a marked deceleration occurred in association with frequent contractions. A T/QRS baseline rise was indicated as well.

This pattern was repeated at approx 02:20 with the onset of active pushing.
Thereafter late decelerations were recorded followed by a persistent bradycardia.

End recording showing persistent bradycardia with ST rise.

Comments
Firstly, one should notice that cord acid base data indicate late clamping with loss of PCO₂ from the cord artery (7.78 vs 9.71 kPa) thereby overestimating the degree of metabolic acidosis in the cord artery (BDecf 15.4 vs 10.7 mmol/L). Secondly, there was a delay in responding to the CTG+ST information by approx 1 hour. Although, these initial events did not persist, they indicated a reduced ability of the fetal placental unit to meet with the demand of labor and an intervention was required.
Clinical data
Para 0. Normal pregnancy. Spontaneous onset of labour after 39 weeks of gestation
Clear liquor, pethidine, augmented labor.
Active pushing commenced at 17:30
Normal vaginal delivery at 18:23.

Neonatal data
Male: 3655 g
Apgar: 8-9-10
Cord artery: pH 7.01
PCO₂ 8.42 kPa
BEcf 13.4 mmol/l
Cord vein: pH 7.15
PCO₂ 6.04 kPa
BEcf 11.5 mmol/l

Neonatal outcome
Normal neonatal outcome.

Assessment of recording
The recording starts with a bradycardia followed by a recovery in baseline FHR. In parallel there is a rise in T/QRS indicating a significant hypoxic episode that was partly missed.
Final part of the recording showing a normal FHR pattern in 2nd stage with stable ST.

Comments
A case of cord artery metabolic acidosis and a vigorous neonate. CTG+ST indicates the possibility of some hypoxic episode at onset of recording.
Cases of metabolic acidosis in CTG+ST group not requiring special neonatal care

Cases

LDA 0219 ...........................................................................................................2
MAB 261 ............................................................................................................4
MAD 213 ............................................................................................................6
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OEE 307 ...........................................................................................................15
OEE 362 ...........................................................................................................17
OEE 367 ...........................................................................................................19
Tachycardia noted at approx. 19:30 in conjunction with maternal pyrexia.

Assessment of recording:

Normal neonatal outcome.

Neonatal data:

At birth:

- Cord venal:
  - pH: 6.97
  - BD: 13.8 mmol/L
  - Pco²: 9.3 kPa

- Cord arterial:
  - pH: 7.97
  - BD: 7.5 mmol/L
  - Pco²: 7.3 kPa

Cerebral huegion: Epidural + Epidural: Augmented labor. Maternal pyrexia of unknown origin, temperature >38.5° C.

Clinical data:

LDA 0219
Hypoxia per se

Situation of increased metabolic demand from increased temperature more than severe metabolic acidosis but an unaffected oxygen may indicate a focus responding to a microcirculatory problem. However, the cold vein sample appears adequate and indicates cold microcirculatory arrest. Pco2 was lower than the cold vein pco2 indicating the changing delivery. Most of the changes in the myocardium were abolished. Normal pregnancy but no major pericardial or unknown cause. Approx 1 hour before

Comments

Baseline HR with reduced variability.

These changes continued to delivery. The HR pattern showed a decrease in

Complexed variable detection.

Diaphragm ST changes were noted as the HR pattern changed with the onset of
Assessment of Recording

Normal neonatal outcome:

**Neonatal data**

- **Bilateral 13.5 mmmol/l**
- **pCO₂ 7.30 KPa**
- **pH 7.05**

**Cardiac arrest:**
- **Apnex: 5-8 bpm**
- **Mare: 3850 g**

**Neonatal death**

Mid cavity vacuum at 02:22. For failure to progress.
- Active pushing commenced at 01:30.
- Membrane rupture is not noted.
- Initial delivery forceps after 42 weeks of gestation.

**Clinical data**

MAA 261
Frequent uterine contractions during active pushing in 2nd stage. Normal ST with variable deceleration occurring during end of 1st stage.

Comments
Nothing to indicate marked intrapartum hypoxia. Obviously, events after discontinuation of recording — 12 minutes without data might have been the cause for the acidemia.
Assessment of Recording

Normal neonatal outcome.

**Clinical data**

Clinical data:

**Neonatal data**

Premature birth
Clinical data

Spontaneous onset of labour after 37 weeks of gestation

**Normal FHR pattern until active pushing starts at this point in time, variable decelerations common, Normal baseline FHR**

**Normal neonatal outcome.**

Sex: Female

Maternal data:

D-dimer 11.9 mg/ml

**PaCO2** 10.29 kPa

**PaO2** 18.7 kPa

**pH** 6.92

**Appendix:**

Patient 1: Spontaneous onset of labour after 37 weeks of gestation.

**MAP 213**
The staff responded accurately to the situation.

The I/OMS data show an increase during the last 10 min of labor.

Readings are associated with these decelerations and demonstrate good conclusions. The
metabolic acidosis predominately generated from placental issues. The high PO2
such patients would be associated with a reduction of peripheral blood flow and a
abnormal occurring during 3rd stage of labor indicating intramural cord compression.

Comments

Final part of the recording ending 2 minutes before delivery.
occurred immediately prior to the onset of the recording.

The fetal heart rate indicates recovery after a protracted deceleration. T/GRS show a

WeP l-1u!l3

Blood glucose levels were adequate during the phase of induced labor and delivery.

Assessment of recording

Normal neonatal outcome:

Neonatal data

Mid-cavity vacuum for intrauterine asphyxia according to CTC at 23:44
Active pushing commenced at 22:20

Para 0, Normal presentation, Spontaneous onset of labour after 41 weeks of gestation

Clinical data

MAD 31.7
Assessment of recording

Normal neonatal outcome:

Neonatal data

Cord vein:
BD: 2.7 mmol/l
PCO₂: 9.2 KPa
Ha: 77

Cord artery:
BD: 11.7 mmol/l
PCO₂: 6.85 KPa
Ha: 70.2

Apgar: 7 - 10
Male: 3960 g

Clinical data

MAD 386
Firstly, one should notice that cord and fetal data indicate fetal compromise with loss of

association with an immediate FHR pattern:

The ST loss indicates a shift in T/QRS time at 0.38 (baseline T/GRS time of 0.11) in
This pattern was repeated at approx. 02:20 with the onset of active pushing.

Assessment of Recording

Normal neonatal outcome:

Neonatal data

Cord vein:
- pH: 7.02
- Base deficit: 1.5 mmol/L
- PCO₂: 7.78 kPa

Cord artery:
- pH: 6.99
- Base deficit: 6.2 mmol/L
- PCO₂: 7.78 kPa

Apgar: 6-8-10

Female: 3700 g

Outlet vacuum for breech delivery according to CTG at 02:10.
Although, there was delay in responding to the CTS-1 by approx 1 hour. Alternatively, metabolic acidosis in the cord artery (Blodgett 1.14 vs 1.07 mmol/L) secondarily, there was a delay in responding to the CTS-1 by approx 1 hour. Although, there was delay in responding to the CTS-1 by approx 1 hour. 

**Comments**

- End recording showing persistent bradycardia with SI rise.
- Thereafter, late decelerations were recorded followed by persistent bradycardia.
Assessment of recording

Normal neonatal outcome.

Neonatal data

Cord vein:
- pH: 7.01
- HCO3: 8.42 mEq/L
- Base: 36.27
- HCO3: 20.35 mEq/L
- PO2: 6.40 kPa
- PCO2: 7.15 kPa
- BE: 1.15 mmol/L

Cord artery:
- pH: 7.01
- PO2: 8.9-10
- BE: 3.65

Normal vaginal delivery at 18:23.
Active pushing commenced at 17:30.
Cerebral palsy: no significant abnormality.
Para 0, Normal pregnancy. Spontaneous onset of labour after 39 weeks of gestation.

MAF 218
The possibility of some hypoxic episode at onset of recording.

A case of cord artery metathesis and a villous nomenclature CTG+ST indices.
NormaI neonatal outcome.

Assessment of Recording

Normal neonatal outcome.

Neonatal data

Normal vaginal delivery at 07:25.
Active pushing commenced at 07:05.
Clear liquor.


Clinical data

OEE 307
Comments
A case of cord artery metabolic acidosis and a vigorous neonate. FHR changes illustrating some cord compression also indicated by the accumulation of CO₂. Normal ST.
The FHR pattern is normal, and the fetal movements continue. Only intermittent ST.

A recording of the fetal heart shows a normal pattern in association with the fetal movements at 15:15.

**Assessment of Recording**

**Neonatal outcome**

- Cord vein:
  - pH 7.04
  - SaO2 70.8
  - Hb 4.21g

**Neonatal data**

- Normal vaginal delivery at 18:20
- Apgar score 7/8/8
- Normal fetal condition at 17:15
- Birth weight 3620 g
- Normal pregnancy and spontaneous onset of labor after 39 weeks of gestation

**Clinical data**

- OEE 362
Comments

The last part of the recording finished 9 minutes before delivery.

Possibility for delayed assessment of ST waveform changes. 
Susdictions and increases in sympathetic tone. Poor signal quality limiting the 
Second stage of labor lasting < 2 hrs and a large baby causing a need for meperidine.
Assessment of Recording

Normal fetal outcome.

Neonatal data

Normal vaginal delivery at 13:00.
Active pushing commenced at 12:10.
Clear liquor.

Para 0. Normal pregnancy. Spontaneous onset of labour after 40 weeks of gestation.

OEE 367
Uncompleted acute hypoxia during the final part of 2nd phase.

Comments

Normal ST until the last 10 minutes where there is a marked rise in T/PBS.