Intrapartum fetal surveillance

Karin Leslie
Sabaratnam Arulkumaran

Abstract
Labour is a time of fetal stress and whilst the vast majority of babies emerge from labour healthy and intact a small minority will be damaged in some way. When hypoxia in labour is prolonged and/or severe babies are at risk of being born with neurological damage and disability or even death. In the UK 500 babies each year die during or shortly after labour; a large number of these deaths occur in babies that enter labour apparently healthy. These cases represent a tragedy for the individual families concerned.

Uterine contractions may cause fetal hypoxia by the action of repeated cord compression or a reduction in retro placental perfusion. Profound fetal hypoxia may also occur with a sudden catastrophic intrapartum event such as cord prolapse, abruption or scar dehiscence. The aim of fetal surveillance in labour is to identify hypoxia and allow intervention to prevent the sequelae of asphyxia. Despite the extensive uptake of intrapartum fetal surveillance in the last 20–30 years, particularly in the form of CTG monitoring, the hope for impact on intrapartum asphyxia has not occurred.

This article aims to outline the principles of intrapartum fetal surveillance and recent changes in the field; highlight areas of shortfall and suggest future directions that could potentially reduce avoidable intrapartum morbidity and mortality.

Keywords birth asphyxia; cardiotocograph (CTG); fetal surveillance; hypoxia

Introduction
The last three national Centre for Maternal and Child Enquiries (CMACE) point out that intrapartum perinatal mortality remains unchanged, despite small declines in the overall perinatal mortality rate over the same period. The highest number of intrapartum-related neonatal deaths occurred at term in babies weighing between 2.5 and 4 kg.

These reports and the Chief Medical Officers report in 2006 ‘500 missed opportunities’ continue to identify problems with interpreting and acting on fetal surveillance. CMACE are now conducting a major perinatal enquiry into intrapartum deaths commencing in 2010/2011.

In the UK the incidence of hypoxic ischaemic encephalopathy (HIE) of all grades is 2–3 in 1000 and for grades II and III 1 in 1000. The total cost of maternity claims for 2007/08 was £163 million and 66% of this was in cerebral palsy claims. Obstetrics and Gynaecology is not the most claimed against specialty, there are double the number of surgical claims each year. However, obstetric litigation is extremely expensive due to the nature of the claims; neurological damage to a baby may result in costs for life long care which can amount to several of millions. This perception of soaring costs and a high risk, high claims culture can make the prospect of a career in obstetrics unattractive to many doctors.

A large proportion of birth asphyxia occurs before labour and the natural history and pathogenesis of cerebral palsy and neurological damage remain poorly understood. Even so, obstetricians are often held responsible for adverse outcome attributed to intrapartum asphyxia as evidenced by CTG abnormalities, meconium, low Apgar scores and cord blood acidosis. Many of these proxy markers have limitations in determining the cause and timing of brain injury and are a frequent cause of controversy in determining causation and liability. Although intrapartum fetal surveillance may not prevent a large proportion of cerebral palsy, used appropriately it is sensitive for the detection of fetal hypoxia and acidosis. The main problems lie in its non-specific nature and in failure to identify abnormal patterns and appropriately intervene.

Which method?
There is clear guidance in the UK that for low risk women the first choice of monitoring should be Intermittent auscultation (IA) and this is now the standard approach in most centres. This is based on evidence from meta-analysis that continuous electronic fetal monitoring (EFM) versus IA in low risk women does not reduce the incidence of HIE, cerebral palsy or perinatal mortality. There is a significant reduction in the incidence of neonatal seizures by 50%. There are unintended adverse outcomes that result from the use of continuous EFM; there are increases in the rates of instrumental delivery (relative risk 1.16, 95% confidence interval 1.01–1.32) and caesarean section (1.66, 1.3–2.1) These were thought to be offset by using an additional diagnostic test of fetal wellbeing such as fetal blood sampling (FBS), however, a recent Cochrane review by Alfirevic et al suggests this may not be the case.

Two trials in Denmark and Ireland of women’s views on monitoring found that both IA and EFM were acceptable but that EFM restricted mobility. There was a suggestion that women monitored with EFM were more likely to be left alone for periods of time in labour. This echoes the “shopfloor” experience of both obstetricians and midwives that all too often in busy and understaffed delivery suites the “machine in the corner” can end up being a poor substitute for the one to one care women need in labour.

Women should be given sufficient information antenatally to make informed decisions together with their midwife, obstetrician or GP about intrapartum surveillance. Individual risk factors should be discussed and a clear plan made. There should be open and clear communication between the woman in labour and her...
healthcare professionals; high levels of teamwork and communication amongst healthcare professionals are also fundamental.

**Intermittent Auscultation**

Intermittent auscultation (IA) involves listening to and documenting the FHR at predetermined intervals during labour either by a Pinard stethoscope or a hand-held Doppler device. The National Institute for Clinical Excellence (NICE) guideline on Intrapartum Care advises auscultation for the duration of 1 min after a contraction; at 15-min intervals in the first stage of labour and 5-min intervals in the second stage. The importance of listening after a contraction is to detect prolonged, atypical variable and late decelerations which are associated with acidosis and poor outcome. Abnormalities in IA or changes in the risk status of the labour should prompt discussion with the mother and conversion to EFM; this may also involve a transfer of planned birth place. Indications for continuous EFM are detailed in Table 1.

**Continuous EFM**

The Cardiotocograph (CTG) remains the most widely used method of fetal surveillance in a high risk labour. The CTG consists of a continuous recording of the fetal heart rate (FHR) and the uterine contractions. The FHR is monitored by either an abdominal Doppler ultrasound transducer or fetal scalp electrode and the uterine contractions are monitored by a pressure gauge transducer placed between the fundus and umbilicus. It is important that a good quality trace is obtained: we will all have experienced cases where “loss of contact” and poor quality pick up of uterine contractions mask evolving hypoxia and hyperstimulation. The recommended standards for EFM and record keeping set by the Royal College of Obstetricians and Gynaecologists (RCOG), the Clinical Negligence Scheme for Trusts (CNST) and NICE are detailed in Table 2.

**Admission CTG**

There is no evidence that an admission CTG in low risk pregnancies provides any beneficial effect on perinatal outcome. It is associated with an increase in intervention in the form of continuous EFM, augmentation of labour, epidural analgesia and operative delivery. Despite this, its use continues in many units and may be related to a lack of staff to perform IA every 15 min.

**Interpretation of the CTG**

The introduction of a standardized terminology has been enormously beneficial in the interpretation of EFM and communication amongst staff. Vague and unhelpful descriptors such as “sleepy trace”, “bad CTG”, “fetal distress” should be avoided. Continuous EFM should be systematically assessed at least once an hour and more often if indicated. It should be remembered

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**Indications for the use of continuous electronic fetal monitoring**

<table>
<thead>
<tr>
<th>Maternal problems</th>
<th>Fetal problems</th>
<th>Intrapartum risk factors</th>
<th>Abnormalities on IA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous caesarean section</td>
<td>Fetal growth restriction</td>
<td>Oxytocin augmentation</td>
<td>Fresh meconium stained liquor</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Prematurity</td>
<td>Epidural analgesia</td>
<td>Maternal pyrexia</td>
</tr>
<tr>
<td>Post-term pregnancy (≥42 weeks)</td>
<td>Oligohydramnios</td>
<td>Vaginal bleeding in labour</td>
<td>Maternal Request</td>
</tr>
<tr>
<td>Prolonged rupture of membranes (≥24 h)</td>
<td>Abnormal Doppler artery velocimetry</td>
<td>Maternal pyrexia</td>
<td>Maternal Request</td>
</tr>
<tr>
<td>Induced labour</td>
<td>Multiple pregnancy</td>
<td>Antepartum haemorrhage (placental abruption)</td>
<td>Abnormalities on IA</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Intrauterine infection</td>
<td>Medical disorders such as systemic lupus erythematosus</td>
<td>Abnormalities on IA</td>
</tr>
</tbody>
</table>

**Recommended standards for EFM and record keeping.**

**Based on NICE, RCOG and CNST guidance**

- Correctly set date and time clock on EFM machine
  - **Standardize settings to:**
    - Paper speed 1 cm/min
    - Sensitivity displays 20 bpm/cm
    - FHR range displays 50–210 bpm
  - **Check and document at the start:**
    - Patient name
    - Hospital number
    - Date and time of recording
    - Maternal pulse rate (ensure distinct from fetal)
    - Maternal temperature
    - Hourly systematic assessment of the CTG
    - Document all intrapartum events on the CTG
    - Vaginal examination, epidural, FBS etc
  - **When asked to give an opinion on a CTG:**
    - Note findings on both CTG trace and medical records
    - Document time, date and signature
  - **At birth document:**
    - Mode of delivery
    - Time and date
    - Signature of healthcare professional
  - **Risk management:**
    - Store CTGs for 25 years
    - Make adequate provision for safe storage and easy retrieval
    - Where possible store electronically
that the CTG has two parts ‘cardiac’ and ‘toco’; careful note should be taken of uterine activity.

The four features of the heart rate — the baseline rate, baseline variability, accelerations and decelerations should be described. Standard definitions of these features are given in Table 3. Individual features can be classified as being reassuring, non-reassuring or abnormal. (Table 4) Based on the contribution of all the features the whole CTG can be classified as normal, suspicious or pathological. (Table 5).

It is not enough to accurately review and classify the current segment of a CTG; the acid base status of the fetus is something that changes dynamically in response to labour. Changes over time in the FHR pattern need to be identified if we are to detect gradually evolving hypoxia.

Normal CTG

In a normal CTG all four parameters should fall within the reassuring category. Normal baseline variability of 5 bpm or more indicates an intact autonomic nervous system and accelerations, as they usually occur in association with fetal movements, appear to indicate an intact somatic nervous system. The risk of fetal hypoxia or acidosis with a normal CTG is extremely small. False negatives (poor outcome despite a normal CTG) may be due to factors other than hypoxia such as intrauterine infection and fetal congenital or metabolic abnormalities.

Suspicious or Pathological CTG

NICE states that most FHR features in isolation, with the exception of late decelerations, are poor at predicting poor neonatal outcome. Whilst the CTG is highly sensitive for the detection of fetal hypoxia and acidemia, its specificity is low. False positive rates are high even in the presence of multiple abnormalities: Nelson et al found a false positive rate as high as 99.8% even in the presence of late decelerations or reduced variability.

The following features in isolation are unlikely to be associated with significant acidosis:
- Moderate bradycardia (100–109)
- Moderate uncomplicated tachycardia (161–180) with accelerations present
- Absence of accelerations
- Variable decelerations without complicating features (Figure 1)

The following features may be associated with acidosis:
- Fetal tachycardia >180 bpm or a rising baseline even within normal range (Figure 2)
- Reduced baseline variability <5 bpm for longer than 90 min
- Complicated or atypical variable decelerations (Figure 3)
- Late decelerations
- Prolonged decelerations <80 bpm for longer than 3 min (Figure 4)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline fetal heart rate (FHR)</td>
<td>The mean FHR when this is stable, excluding accelerations and decelerations. It is determined over a period of 5–10 min and expressed in beats/min (bpm)</td>
</tr>
<tr>
<td>Normal baseline FHR</td>
<td>110–160 bpm</td>
</tr>
<tr>
<td>Moderate bradycardia</td>
<td>100–109 bpm</td>
</tr>
<tr>
<td>Moderate tachycardia</td>
<td>161–180 bpm</td>
</tr>
<tr>
<td>Abnormal bradycardia</td>
<td>&lt;100 bpm</td>
</tr>
<tr>
<td>Abnormal tachycardia</td>
<td>&gt;180 bpm</td>
</tr>
<tr>
<td>Baseline variability</td>
<td>Minor fluctuations in baseline FHR occurring at 3.5 cycles/min. It is measured by estimating the difference in bpm between highest peak and lowest trough of fluctuation in a 1-min segment of the trace</td>
</tr>
<tr>
<td>Normal baseline variability</td>
<td>&gt;5 bpm between contractions</td>
</tr>
<tr>
<td>Non-reassuring baseline variability</td>
<td>&lt;5 bpm for 40 min or more but &lt;90 min</td>
</tr>
<tr>
<td>Abnormal baseline variability</td>
<td>Abnormal baseline variability &lt;5 bpm for 90 min or more</td>
</tr>
<tr>
<td>Accelerations</td>
<td>Accelerations Transient increase in FHR of 15 bpm or more and lasting 15 s or more</td>
</tr>
<tr>
<td>Decelerations</td>
<td>Transient episodes of slowing of FHR below the baseline level of &gt;15 bpm and lasting 15 s or more</td>
</tr>
<tr>
<td>Early decelerations</td>
<td>Uniform, repetitive, periodic slowing of FHR with onset early in the contraction and return to baseline at end of contraction</td>
</tr>
<tr>
<td>Late decelerations</td>
<td>Uniform, repetitive, periodic slowing of FHR with onset mid to end of contraction and nadir &gt;20 s after the peak of the contraction and ending after the contraction. In the presence of a non-accelerative trace with baseline variability &lt;5 bpm the definition would include decelerations of &lt;15 bpm</td>
</tr>
<tr>
<td>Variable decelerations</td>
<td>Variable, intermittent, periodic slowing of FHR with rapid onset and recovery. Time relationships with contraction cycles are variable and they may occur in isolation</td>
</tr>
<tr>
<td>Prolonged decelerations</td>
<td>An abrupt decrease in FHR &lt;80 bpm. It is suspicious if it is &lt;3 min and is pathological if it is &gt;3 min</td>
</tr>
<tr>
<td>Sinusoidal pattern</td>
<td>A regular oscillation of the baseline long-term variability resembling a sine wave. This smooth, undulating pattern, lasting at least 10 min, has a relatively fixed period of 3.5 cycles/min and amplitude of 5–15 bpm above and below the baseline</td>
</tr>
</tbody>
</table>

Table 3

Definitions and descriptions of individual features of fetal heart trace

Reproduced from NICE/RCOG guidelines.
Intervening in a labour with suspicious or pathological trace does not always demand urgent delivery. The underlying cause of the abnormal FHR pattern should be identified. Simple measures such as changing maternal position, treating hypotension or pyrexia, hydration, reducing or stopping oxytocin or tocolysis with hyperstimulation may help to restore a normal CTG.

CTG interpretation involves pattern recognition and identifying normal and severely abnormal pre-terminal traces is easy. Problems and difficulties are more likely to arise with suspicious traces and pathological traces with one or two non-reassuring features. Treading the difficult path between avoiding fetal compromise and over intervention remains a challenge in obstetrics.

Common pitfalls in CTG interpretation

Recording maternal FHR

Be suspicious of ‘accelerations’ occurring with uterine contractions; these are very likely to be maternal in origin. This often occurs in the late first stage or second stage as the head descends and the probe is located near the maternal iliac vessels. If there is doubt, ultrasound will help locate the fetal heart and can also rule out fetal demise. A fetal scalp electrode may be a better option.

The rising baseline associated with reduced variability: this may be an ominous sign of fetal hypoxia where the fetus tries to increase oxygen delivery to vital organs by increasing cardiac output. Subsequent cardiac decompensation may eventually occur with a fall in the baseline.

‘Early’ decelerations in early labour: most decelerations in labour are variable, true early decelerations are rare and benign. They are due to fetal head compression and are thus unlikely to occur in early labour. Such decelerations are far more likely to be atypical variable or late decelerations and may represent fetal hypoxia.

Periods of reduced variability can be normal where associated with fetal sleep: an overview of the CTG in this situation will show a previously normal CTG and periods of ‘fetal cycling’ between rest and activity.

Pre-terminal CTGs

Prolonged deceleration

Prolonged decelerations of <80 bpm for longer than 3 min require urgent intervention. Possible causes include abruption, cord prolapse and scar rupture; in the event of a catastrophic ‘accident’, immediate delivery should occur. In the absence of these, the ‘3,6,9,12,15 minute’ guidance can be followed. Interventions such as cessation of oxytocin and treatment of maternal hypotension should commence. If there are no signs of recovery at 6 min preparations should be made to transfer to theatre by 9 min. Caesarean section (CS) should commence by 12 min with the aim of delivery by 15 min. If instrumental delivery is possible this should be achieved within 15–20 min, a difficult instrumental delivery should be avoided.

A large number of cases will recover by 9 min and CS is not necessary unless there are additional reasons for concern. The experience is often extremely upsetting and frightening for the mother and her partner and a careful and sensitive explanation of her management is essential.

Absent variability and shallow decelerations in a non-reactive CTG (Figure 5)

This picture is highly suggestive of a hypoxic fetus and neurological damage may already have occurred in some babies. Urgent delivery should take place as delay in intervention may aggravate existing hypoxia, particularly if there are uterine

Table 4

Classification of fetal heart rate features according to NICE

<table>
<thead>
<tr>
<th>Feature</th>
<th>Baseline rate (bpm)</th>
<th>Variability</th>
<th>Decelerations</th>
<th>Accelerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reassuring</td>
<td>110–160 bpm</td>
<td>5–25 bpm</td>
<td>None</td>
<td>Present</td>
</tr>
<tr>
<td>Non-reassuring</td>
<td>100–109 bpm</td>
<td>&lt;5 bpm for 40–90 min</td>
<td>Typical variable decelerations with over 50% contractions, occurring for over 90 min</td>
<td>The absence of accelerations with an otherwise normal CTG is of uncertain significance</td>
</tr>
<tr>
<td>Abnormal</td>
<td>161–180 bpm</td>
<td>&lt;5 bpm for &gt;90 min</td>
<td>Either atypical variable decelerations with over 50% contractions, or late decelerations; both for over 30 min</td>
<td>Single prolonged deceleration for up to 3 min</td>
</tr>
</tbody>
</table>

Table 5

Classification of cardiotocograph (CTG) according to NICE

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>A CTG where all four features fall into the ‘reassuring’ category</td>
</tr>
<tr>
<td>Suspicious</td>
<td>A CTG where one of the features falls into ‘non-reassuring category’ and the remainder of the features are reassuring</td>
</tr>
<tr>
<td>Pathological</td>
<td>A CTG whose features fall into two or more non-reassuring categories or one or more abnormal categories</td>
</tr>
</tbody>
</table>
Typical variable decelerations

Figure 1

Fetal tachycardia

Figure 2
Atypical variable decelerations

Figure 3

Prolonged deceleration

Figure 4
contractions. There is often additional clinical evidence of compromise such as growth restriction, bleeding, infection, meconium, reduced fetal movements or prolonged pregnancy.

Central monitoring

Some units now use a system of central fetal monitoring enabling a simultaneous review of CTGs from different women without entering the room. Advantages potentially include a higher degree of surveillance and greater privacy for the woman. However, there is no evidence that there is any improvement in outcomes, indeed Weiss et al concluded that intervention rates increased.

Computerized CTG

There are now several available software packages that enable standardized computer assessment of CTG traces. The latest NICE guideline concluded that there is insufficient evidence to support their routine use at present.

Additional tests of fetal wellbeing

FBS

Fetal blood sampling (FBS) is a well established adjunct to EFM but is an invasive procedure. A sample of blood (approx 35 µl) is taken from the fetal scalp using a sterile lance and capillary tube via an amnioscope. The sample is then subjected to blood gas analysis for pH and Base Excess (BE). The NICE Intrapartum care guideline advised that samples are taken with the woman in a left lateral position to avoid supine hypotension. FBS should not be undertaken until the underlying causes of the CTG abnormality have been considered and corrected such as iatrogenic hyperstimulation or maternal hypotension secondary to epidural top up.

The evidence base to support scalp pH measurement has been called into question; the Cochrane review in 2006 by Alfirevic et al found no reduction in CS rates or neonatal seizures with access to scalp sampling in addition to EFM. The latest NICE guideline advises its continued use on the basis of clinical experience and indirect research.

However, the test is not without shortcomings: it requires technical skill and access to a calibrated blood gas analyzer, is difficult to perform at cervical dilations <4 cm and can be stressful and uncomfortable for the mother. There is failure to obtain a result in 11–20% of cases. The median time from decision to undertake FBS to obtaining a result has been shown to be 18 min and in 9% cases takes longer than 30 min.

Contraindications to FBS or invasive fetal monitoring are:
- Maternal infection HIV, Hepatitis B and C, active Herpes simplex
- Fetal bleeding disorders Haemophilia (male fetus in carrier)
- Premature gestation less than 34 weeks

Normal and abnormal values of pH and BE are shown in Table 6. A pH of less than 7.20 should prompt urgent delivery. NICE have produced an algorithm for the management of FBS results (Figure 6). The NICE guideline advises that if the FBS result is stable and the CTG remains unchanged after the second result then a third/further sample can be deferred unless additional abnormalities develop on the trace. If a third sample is indicated then consultant obstetric input should be sought.

The clinical context of the labour should always be considered including parity, progress, stage of labour and maternal wishes. It should be remembered that fetal infection or thick meconium
associated with an abnormal CTG may result in an adverse neonatal outcome even in the absence of fetal acidosis. A normal FBS result in these circumstances does not give the same reassurance.

Fetal lactate

Fetal lactate measurement has been proposed as an alternative to scalp pH. Lactate levels reflect anaerobic respiration and thus tissue hypoxia and metabolic acidosis. The invasive procedure for sampling is similar to FBS but requires a smaller volume of blood of 5 μl. Available data indicate that levels >4.8 mmol/L are abnormal and require delivery and levels of 4.2–4.8 mmol/L should be regarded as borderline. A recent randomized Swedish study found that scalp pH and lactate were no different in diagnosing fetal acidosis, however, lactate sampling had lower failure rates (1.2% vs 10.4%).

Fetal Electrocardiogram (ECG): ST analysis

A number of centres are now using fetal ECG in combination with continuous EFM for routine monitoring of high risk labours or as an additional test of fetal wellbeing. The fetal ECG is recorded continuously from a specialized scalp electrode and analyzed by computer technology. Fetal hypoxia can act on the fetal myocardium and cause alterations to ST segment of the fetal ECG.

A recent meta-analysis conducted by NICE concludes that ST analysis reduces instrumental vaginal delivery (relative risk 0.87, 95% CI 0.78–0.96), neonatal encephalopathy (0.33, 0.11–0.95) and the need for scalp sampling (0.69, 0.48–1.00). There was no reduction in the CS rate. The technology relies considerably on human interpretation of the CTG to indicate the appropriate action when ST segment alteration occurs. This may go some way to explaining cases of false negative ST analysis (poor outcome despite normal ST analysis) and the variation in results from centres. Further research and economic analysis in this area continues.

Scalp oximetry

An oximeter probe is passed transcervically and placed against the fetal scalp. Deoxygenated and oxygenated haemoglobin absorb light at different wavelengths and by using standard curves the oximeter is able to determine the fetal oxygen saturation. The probe is connected to a standard FHR monitor and displays a continuous signal. Although a normal saturation supports fetal wellbeing there is insufficient data available to support its routine use.

Fetal stimulation

The ability of a fetus to respond to stimulation with an acceleration in FHR implies a well oxygenated intact nervous system. Stimulation can take the form of digital stimulation at the time of vaginal examination or the scalp laceration during FBS. A reassuring response in the form of an acceleration is a simple and useful additional test of fetal wellbeing.

### Normal and abnormal values of pH and base excess

<table>
<thead>
<tr>
<th></th>
<th>pH</th>
<th>Base excess</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&gt;7.25</td>
<td>&lt;−8 mmol/L</td>
</tr>
<tr>
<td>Borderline</td>
<td>7.21–7.24</td>
<td></td>
</tr>
<tr>
<td>Abnormal</td>
<td>&lt;7.20</td>
<td>&gt;−12 mmol/L</td>
</tr>
</tbody>
</table>

Table 6

Management of fetal blood sampling results

Based on NICE algorithm

**Figure 6**

<table>
<thead>
<tr>
<th>FBS Pathological CTG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woman in left lateral position</td>
</tr>
</tbody>
</table>

- **Normal**
  - pH > 7.25
  - Repeat FBS within 1 hr if CTG remains pathological

- **Borderline**
  - pH 7.21–7.24
  - Repeat FBS within 30 min if CTG remains pathological

- **Abnormal**
  - pH < 7.20
  - Deliver

- **Repeat FBS stable**
  - Monitor CTG and clinical situation
  - Repeat FBS only if further abnormalities

- **Third FBS needed**
  - Seek Consultant opinion

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The use of a fetal acoustic stimulation test (FAST) has also been reported to predict an acidic pH. An artificial electronic larynx is used near the region of the fetal head to startle and wake up the fetus. If accelerations are noted in the CTG following the test, a pH of <7.2 is unlikely.

Conclusion

The challenge of correctly identifying and intervening in those labours where fetal hypoxia and acidosis occur remains in obstetrics and is likely to become greater as the women we care for become more complex and intervention rates rise. It is important to minimize unnecessary intervention as the vast majority of babies will cope well with labour and hypoxia is rare. The commonly available methods of fetal surveillance are not specific and have high false positive rates though new technologies such as ST analysis are promising. A large proportion of asphyxial damage begins before labour and intrapartum surveillance and intervention sadly may not benefit these babies.

FURTHER READING


(RCT of 3007 women, demonstrating similar performance of scalp pH and lactate in detection of acidaemia).

Practice points

- Concise, accurate and contemporaneous documentation is essential.
- The use of a standardized terminology and approach in the interpretation of EFM is advised.
- Interpretation of challenging CTGs demands a high level of clinical expertise: senior input should be sought in difficult cases and all health professionals should receive regular training in CTG interpretation.