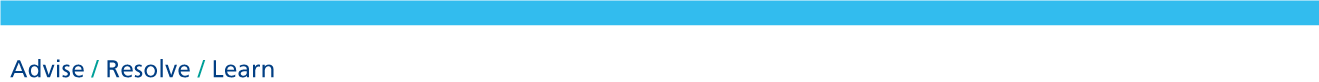


**Case story**

Antenatal Cardiotocograph (CTG) Interpretation



**Case Story**

This case story is illustrative, based on real events and NHS Resolution is sharing the experience of those involved to help prevent a similar occurrence happening to patients, families and staff. As you read about this incident, please ask yourself:

* Could this happen in my organisation?
* Who could I share this with?
* What can we learn from this?

**Topic:** Antenatal CTG interpretation

**Key points:**

* Accurate diagnosis of labour allows appropriate interpretation of CTGs and more effective detection of fetal distress
* Antenatal CTGs should not be interpreted using intrapartum guidelines, as this may delay delivery of compromised fetuses leading to poorer outcomes
* When interpreting fetal monitoring, utilise a holistic approach and particularly consider the maternal risk factors

**Maternity Story**

A mother in her late 20s booked for antenatal care at an uncertain gestation. She had a positive pregnancy test the week before, but was unsure of her dates. She had had one previous child by spontaneous vaginal delivery 8 years ago, following an uncomplicated pregnancy. She had a BMI of 39, but otherwise had no other medical problems.

She proceeded to have a straightforward pregnancy, with a normal oral glucose tolerance test and normal growth scans at 28 and 32 weeks. She had two attendances with reduced fetal movements, the first at 35+6; she already had a planned ultrasound arranged for 36+1, which showed an increase in growth velocity with an estimated fetal weight plotting just underneath the 90th centile. The second episode was at 36+5, when she had a normal CTG with a baseline rate of 120, good variability, and several accelerations. This was managed as per national guidance.

The mother attended the Maternity Assessment Suite at 40+1 at 0650 complaining of irregular tightenings and a third episode of reduced movements. She was noted to be contracting about 1-2 in 10, each lasting 30 seconds and mild on palpation. Her observations were normal, but she reported no fetal movements felt since around 2000 the previous day. She told the midwife she had previously felt like she was “wasting everyone’s time” when she attended with reduced movements, and admitted that the movements had been subjectively reduced since her last attendance, but as the CTG was normal at that point she did not feel like she needed to attend.

A CTG was commenced at 0705, which showed a baseline rate of 155bpm, variability of 5 bpm and no accelerations. Vaginal examination was performed at 0730, and the cervix was soft, central, 1cm dilated and 1cm long. The CTG continued, and after an hour without accelerations a medical review was requested by the day shift midwife.

The mother was reviewed by the obstetric registrar at 0825, and the CTG was classified as suspicious; uterine activity was 2:10, the baseline rate was 155, the variability was still 5bpm, there were no accelerations and two deep variable decelerations were noted within the last 30 minutes. A plan was made for intravenous (IV) access and IV fluids, and further review of the CTG after a litre of fluid.

Obtaining IV access was difficult, and was successful at 0855; one litre of IV Hartmann’s was administered over 30 minutes. It was felt that there was some improvement in variability, and there were no further decelerations. The ongoing plan was discussed with the mother, and in light of the reduced movement and CTG concerns a shared decision was made to induce with artificial rupture of membranes and possibly oxytocin infusion if needed.

Following transfer to the Delivery Suite, a vaginal examination and artificial rupture of membranes was performed by the obstetric registrar at 0945. There was no change from the previous examination, and the liquor was clear. The mother began to contract 2-3:10 lasting 45 seconds, and shallow variable decelerations were noted on the CTG from 1030 onwards; these were short but lacked shouldering and occurred with every contraction. The registrar classified the CTG as normal at 1100, as the decelerations were less than 90 minutes duration.

Further review at 1130 by the consultant classified the CTG as pathological, as the mother was not in established labour. Vaginal examination by the consultant revealed no change to the cervix, and a decision was made for a category 2 caesarean section. The mother was transferred to theatre and had a straightforward spinal anaesthetic. The CTG in theatre showed deeper decelerations, followed by a fetal bradycardia falling to 65 bpm for the four minutes prior to knife to skin.

The baby girl was delivered in poor condition two minutes later, at 1214. Arterial cord pH was 6.87, with a base excess of -18.3, and venous pH was 7.00, with a base excess of -17.2. Her birthweight was just below the 10th centile, which was consistent with static growth since her last scan. She required extensive resuscitation, and displayed abnormal neurological symptoms so underwent 72-hours of therapeutic hypothermia. On days 2 and 3, she displayed clinical signs of seizure activity, and this correlated with the results of her cerebral function monitoring. An MRI scan on day 6 of life showed changes consistent with Grade 3 hypoxic ischaemic encephalopathy, and she was discharged on day 19 with nasogastric feeding and ongoing input from community paediatrics and neurology.

**Learning Points**

This case highlights the importance of:

* Reviewing CTGs as part of the overall clinical picture: in this case there is a clear red flag related to persistent reduced movements, and these were not elicited on medical review and so were not considered when interpreting the CTG and making ongoing plans
* Ensuring that CTGs of non-labouring women are not assessed using intrapartum guidance: this mother was not in labour, but because of her tightenings her CTG was interpreted according to NICE intrapartum guidance.1 It is important to accurately diagnose labour prior to using this classification system, as the changes described above in an antenatal CTG can indicate significant fetal compromise, and necessitate an expedited delivery. The Saving Babies’ Lives Care Bundle (Version 2)2 advises using computerised antenatal CTG interpretation to reduce the risks of human error.
* Ensuring attention is paid to presence of any concerning characteristics and frequency of decelerations: the registrar categorised the CTG as normal as the decelerations occurred for less than 90 minutes, but the decelerations lacked shouldering, which NICE intrapartum guidance1 classifies as a concerning characteristic, along with duration over 60 seconds, reduced variability within the deceleration, failure to return to baseline, and biphasic (W) shape. Additionally, the decelerations occurred with over 50% of contractions, which would alter the classification of the CTG to pathological, and therefore prompt different management.
* Comparison with previous CTGs: this CTG demonstrated a raised baseline heart rate compared to previous CTGs, although it still classified within the normal range. In the context of other abnormal CTG findings, it is important to consider this more subtle finding as an indicator of fetal distress.
* Senior input in obstetric management: the consultant in this case felt that the CTG had been pathological since arrival, as they identified that this woman was not in labour, and therefore the abnormal features were more concerning than if she had been actively labouring. It is important for the safety of mothers and babies that senior support is available and review is sought to guide decision-making, and this is recognised in the Ockenden reports3 recommendation for twice daily consultant-led MDT ward rounds.

**Considerations for your hospital**

* Does your CTG training for all obstetric and midwifery staff include antenatal CTG interpretation?
* Do you employ computerised analysis of antenatal CTGs, as recommended by the Saving Babies’ Lives Care Bundle (Version 2)2 and included in the Maternity Incentive Scheme?4
* Could you use this case story, or similar cases from your own trust, to highlight the importance of accurately identifying whether a CTG should be interpreted using the antenatal or intrapartum criteria?

**What has happened as a result?**

Cases similar to this are referred to NHS Resolution’s Early Notification (EN) scheme, which aims to provide a more rapid, caring response to families whose baby may have suffered severe harm.

NHS Resolution works in partnership with the Healthcare Safety Investigation Branch, who perform an initial safety investigation. The EN clinical team then review any cases where there is evidence that a baby has a hypoxic brain injury that could potentially result in compensation, and aim to determine whether there are any concerns about the care provided. If appropriate NHS Resolution will work with the family to ensure that they are fully compensated and that they and the staff involved are fully supported throughout the process.

It is very important to note that no amount of money is comparable with the loss of a child or a child living with lifelong neurological injuries. Where poor outcomes occur as a result of deficiencies in care and families are entitled to be compensated, NHS Resolution aims to resolve all such fairly and as quickly as possible.

The current compensation cost to the NHS for a baby who has long term severe brain injury is on average £12 million. The human costs to the baby, families and clinical teams involved as a result of such cases are immeasurable.

**Resources:**

1. Intrapartum Care for Healthy Women and Babies. National Institute for Clinical Excellence. December 2014. <https://www.nice.org.uk/guidance/cg190>.

2. Saving Babies’ Lives Care Bundle (Version 2). NHS England. March 2019. <https://www.england.nhs.uk/wp-content/uploads/2019/03/Saving-Babies-Lives-Care-Bundle-Version-Two-Updated-Final-Version.pdf>.

3. Ockenden, D. Emerging Findings and Recommendations from the Independent Review of Maternity Services at the Shrewsbury and Telford Hospital NHS Trust. December 2020. <https://www.donnaockenden.com/downloads/news/2020/12/ockenden-report.pdf>.

4. Maternity Incentive Scheme- Year Three. NHS Resolution. March 2021. <https://resolution.nhs.uk/wp-content/uploads/2021/04/Maternity-Incentive-Scheme-year-3-guidance-FINAL-revised-April-2021.pdf>.