MIDIRS ReView

Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing

Devane D, Lalor JG, Daly S *et al* (2012). Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing.
Cochrane Database of Systematic Reviews, Issue 2.

Sara Wickham

This new Cochrane review looks at the use of admission cardiotocography (CTG) to monitor fetal well-being; the assessment of which is considered fundamental to maternity care. As the authors point out in their introduction, CTG monitoring is a screening test which is in common use throughout the world, and many practitioners consider it an important means of detecting fetal hypoxia. However:

'There is a lack of evidence of benefit supporting the use of the admission CTG in low-risk pregnancy. Despite recommendations that it should not be recommended for this group of women (Liston et al 2007; NCCWCH 2007; RCOG 2001), the admission CTG was used by approximately 79% of maternity units in the UK in 2000 (CESDI 2001), by 96% of units in Ireland in 2004 (Devane et al 2007) and by approximately 76% of Canadian hospitals (Kaczorowski et al 1998). More recently, the admission CTG was used in all (100%, n = 42) labour units in Sweden in 2008 (Holzmann & Nordstrom 2010).

'Although the admission CTG remains in widespread use, several issues remain controversial. These include whether the admission CTG (a) should be offered routinely to all women without risk factors for intrapartum hypoxia; (b) whether the admission CTG is effective at predicting those fetuses who will subsequently develop intrapartum hypoxia; and (c) the effect of the admission CTG on neonatal mortality and on maternal and neonatal morbidity.'

(Devane *et al* 2012:3)

There also exists another Cochrane review that considered admission tests other than cardiotocography for fetal assessment during labour (Khunpradit *et al* 2011). This review concluded that:

'There is not enough evidence to support the use of admission tests other than cardiotocography for fetal assessment during labour. Appropriate randomised controlled trials with adequate sample size of admission tests other than cardiotocography for fetal assessment during labour are required.'

(Khunpradit *et al* 2011:1).

This article considers the more recent review and looks at whether there is any evidence to support the use of admission CTGs in low-risk women in labour.

Objectives and methods

The objective of the review was:

'To compare the effects of admission cardiotocograph with intermittent auscultation of the FHR on maternal and infant outcomes' (Devane *et al* 2012:4).

As is the standard for Cochrane reviews, the authors searched widely for relevant studies, which in this case included randomised and quasi-randomised trials that had compared admission CTG with intermittent auscultation of the fetal heart. While acknowledging the difficulties and debates that exist around the concept of normality, they focused on trials which had included women '*…between 37 and 42 completed weeks of pregnancy and considered to be at low risk of intrapartum fetal hypoxia and of developing complications during labour'* (Devane *et al* 2012:4). This review included a number of primary and secondary outcome measures looking at factors relating to both maternal and infant well-being and the authors assessed all studies for a number of different types of possible bias, as discussed further below.

Seven papers were identified and these related to four completed studies (Mires *et al* 2001, Cheyne *et al* 2003, Impey *et al* 2003, Mitchell 2008) and one that was ongoing (Devane 2008). In the largest of the four completed trials that were included in the review (Impey *et al* 2003), women were only included if their membranes had ruptured (either spontaneously or artificially) and they were known to have clear liquor. This is important because not all women's membranes will have ruptured spontaneously by this point, and artificial rupture of the membranes carries a number of risks so, as the authors note towards the end of their review, it would be useful to have more studies that evaluate the use of the admission CTG where the colour of the liquor is not known. All of the studies focused on women who were already in labour, so it was not possible to compare women in labour with women who were not in labour, and all four were conducted within the United Kingdom or Ireland. These studies included a total of 13,296 women and other factors included were:

'Three studies included women in spontaneous labour only (Cheyne et al 2003; Mitchell 2008; Mires et al 2001) and one included women who were in spontaneous or induced labour (Impey et al 2003). All studies included women who were regarded as being at 'low risk' of maternal and fetal complications with the exception of Impey et al (2003) who included a relatively small (approximately 5%) proportion of women with a previous caesarean section and prior to 37 completed weeks' gestation … Women allocated to admission CTG received a routine 15-minute (Mitchell 2008) or 20-minute (Cheyne et al 2003; Impey et al 2003; Mires et al 2001) tracing. Women allocated to intermittent auscultation received intermittent auscultation of the fetal heart for at least one full minute (Cheyne et al 2003, Impey et al 2003, Mires et al 2001, Mitchell 2008) during and after a contraction (Cheyne et al 2003, Mires et al 2001) or after a contraction only (Impey et al 2003, Mitchell 2008).'

(Devane *et al* 2012:8).

"One of the reasons for using meta-analysis is that it becomes possible to pool findings and see whether differences become significant when larger numbers of women and/or babies are taken into account"

Risk of Bias

Overall, the studies were at low risk of bias, with a couple of exceptions:

- **Clearly, it is extremely difficult to 'blind' women and their caregivers so that they don't know whether they are having an admission CTG or intermittent auscultation! This is an ongoing issue where trials are evaluating interventions (which are often very hard to blind) rather than pharmaceutical treatments, where it is usually very easy for a pharmacist to make a placebo product that looks, feels and (if necessary) tastes like the intervention product but has no possible therapeutic value. Consequently, the authors noted that it was unreasonable to expect blinding of participants and caregivers. The risk of blinding of outcome assessors was low in two studies, unclear in one and high in the fourth.**
- **One of the four studies (Mires *et al* 2001) randomised women before they were in labour, which meant that some of the women developed a complication between randomisation and labour which meant that they were perceived to need continuous CTG monitoring. In addition, some of the women who were going to be receiving intermittent monitoring were deemed in need of an admission CTG. The review authors discovered that this affected women equally in both groups, so this was not considered to be a significant problem as it was unlikely to have led to a differential in the treatment of women after randomisation had occurred.**

Key findings

Some of the key findings of this review included that:

- **admission CTG appeared to increase the caesarean section rate by approximately 20%**
- **admission CTG significantly increases the likelihood of a woman having continuous monitoring and fetal blood sampling**
- **there were no significant differences in the rates of amniotomy, synthetic oxytocin use or epidural analgesia.**
- **There were also no significant differences in the rates of**
  - **apgar score less than seven, at or after five minutes**
  - **hypoxic ischaemic encephalopathy**
  - **admission to neonatal intensive care units**
  - **neonatal seizures**
  - **evidence of fetal multi-organ compromise within the first 24 hours after birth**
  - **length of stay in neonatal intensive care (in hours or days).**

The first of these (relating to the increase in caesarean section rate) may be worthy of a little more explanation. All four studies found that women receiving intermittent auscultation were less likely to have a caesarean section than women who had admission CTGs, but these differences were not statistically significant in the individual studies. One of the reasons for using meta-analysis is that it becomes possible to pool findings and see whether differences become significant when larger numbers of women and/or babies are taken into account. While the authors acknowledge that these statistics and the calculation of a number-needed-to-treat (NNT) are somewhat controversial in relation to meta-analysis, they estimated that, '*…overall, one additional caesarean section was performed for every 136 women monitored continuously*' (Devane *et al* 2012:11).

One of the key questions here is whether admission CTG monitoring reduces perinatal mortality. This review found no difference in perinatal mortality rates, but the authors are careful to explain that it might be necessary to look at the outcomes of trials involving 100,000 or more women and babies - nearly eight times as many women as have already been involved in the four trials included in this review - in order to assess whether a difference exists:

> *'Such sample sizes are unlikely, except perhaps in the largest of mega-trials and, therefore, typical randomised trials and systematic reviews of these trials, including this review, have insufficient power to evaluate the effects of different fetal monitoring modalities on fetal and neonatal mortality measures. Therefore, while this review found no evidence of an effect for admission CTG on perinatal mortality, this should not be confused with evidence of no effect.'*
>
> (Devane *et al* 2012:11).

Discussion

The authors' comments on implications for practice are shown in the box below. Although the authors had identified other areas to look at, data were not available to explore the following issues:

1. **'Incidence of serious maternal complications (e.g. admission to intensive care unit, septicaemia (a form of blood infection), organ failure).**
2. **Mobility during labour.**
3. **Perceived control and/or self-confidence during labour.**
4. **Incidence of use of non pharmacological methods of coping with labour, e.g. transcutaneous electrical nerve stimulation, hydrotherapy.**
5. **Satisfaction with labour experience.**
6. **Length of hospital stay' (Devane *et al* 2012:10).**

Experience in practice would suggest that several of these issues may be very pertinent. It seems very reasonable that being attached to a CTG machine (which generally entails sitting on a bed) within minutes of arrival on the labour ward may affect a woman's mobility and sense of control during labour. Apart from anything else, this immediately indicates to a woman that her place is on the bed (or wherever else the test is being carried out) and this may directly impact her choice of birthing equipment and positions. Even in those areas where women sit on chairs while the admission CTG is carried out, this renders the woman – who may well be experiencing intense sensations by the time she arrives on the labour ward – relatively immobile; unable to move or change position in response to her labour because she has quickly picked up that her movement affects the readout. It is little wonder that, by the time some of the women in this situation have been attached to the monitor for the suggested 20 minutes (plus however many additional minutes it has taken for their busy midwife to return and remove the CTG), they are desperate for the pain relief which will lead to the cascade of intervention that culminates in their 'needing' caesarean section. It is entirely possible that admission CTGs may also impact upon all of the things mentioned in the list above, which includes the woman's satisfaction and sense of control. It is also likely that the use of such technologies undermines women's and midwives' knowledge of babies' well-being and their confidence in this, but all of these things are difficult to measure by quantitative means and have not been the focus of studies in this area.

The authors of the review directly address this in their report, noting that,

> *'This reflects a widespread tendency among the clinical and research community to frame outcomes in a non-salutogenic or pathological manner (e.g. operative birth) rather than in a salutogenic, wellbeing orientated manner (e.g. normal birth). It may also reflect the relative difficulty of quantifying outcomes that are subjective and difficult, although important, to 'measure".*
>
> (Devane *et al* 2012:11)

One of the great strengths of a number of recent Cochrane reviews is that reviewers such as Devane *et al* (2012) are taking the opportunity to raise wider questions about the nature of research into childbearing. While this may not lead to immediate change, it is to be hoped that these debates will continue and lead to increased awareness of these issues. It is pretty clear from this review that admission CTG increases the likelihood of caesarean sections and other interventions without there being evidence of benefit in relation to neonatal outcomes. This was also the conclusion of the systematic reviews by Blix *et al* (2006) and Gourounti & Sandall (2007) and of the survey carried out by Devane *et al* (2007). It is also clear that there are deeper issues to explore – including why this practice still persists despite a lack of evidence to support it – but it is to be hoped that the existence of a Cochrane review will be of assistance to those wishing to challenge this practice and offer evidence-based care in this area.

"It is also clear that there are deeper issues to explore – including why this practice still persists despite a lack of evidence to support it – but it is to be hoped that the existence of a Cochrane review will be of assistance to those wishing to challenge this practice and offer evidence-based care in this area"

Reviewers' implications for practice

'Contrary to continued use in some clinical areas, we found no evidence of benefit for the use of the admission cardiotocograph (CTG) for low-risk women on admission in labour. Furthermore, the probability is that admission CTG increases the caesarean section rate by approximately 20%. The data lacked power to detect possible important differences in perinatal mortality. However, it is unlikely that any trial, or meta-analysis, will be adequately powered to detect such differences. The findings of this review supports recommendations that the admission CTG not be used for women who are low risk on admission in labour (Liston et al 2007; NCCWCH 2007; RCOG 2001). Women should be informed that admission CTG is likely associated with an increase in the incidence of caesarean section without evidence of benefit. It is important to note that all four trials included in this review were conducted in developed Western European countries. The usefulness of the findings of this review for developing countries will depend on FHR monitoring practices. However, an absence of benefit and likely harm associated with admission CTG will have relevance for countries where questions are being asked about the role of the admission CTG.'

(Devane *et al* 2012:12)

References

Blix E, Reinar LM, Klovning A *et al* (2006). Prognostic value of the labour admission test and its effectiveness compared with auscultation only: a systematic review. *BJOG: An International Journal of Obstetrics and Gynaecology* 112(12):1595-604.

Cheyne H, Dunlop A, Shields N *et al* (2003). A randomised controlled trial of admission electronic fetal monitoring in normal labour. *Midwifery*19(3):221-9.

Devane D, Lalor J, Bonnar J (2007). The use of intrapartum electronic fetal heart rate monitoring: a national survey. *Irish Medical Journal* 100(2):360-2.

Devane D (2008). A randomised controlled trial comparing the effect of admission cardiotocography versus intermittent auscultation of the foetal heart rate on low risk women on admission to labour ward showing signs of possible labour. *Current Controlled Trials*. www.controlled-trials.com [Accessed 27 March 2012].

Devane D, Lalor JG, Daly S *et al* (2012). Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing. *Cochrane Database of Systematic Reviews*, Issue 2.

Gourounti K,Sandall J (2007). Admission cardiotocography versus intermittent auscultation of fetal heart rate: effects on neonatal Apgar score, on the rate of caesarean sections and on the rate of instrumental delivery - a systematic review. *International Journal of Nursing Studies* 44(6):1029-35.

Holzmann M, Nordstrom L (2010). Follow-up national survey (Sweden) of routines for intrapartum fetal surveillance. *Acta Obstetricia et Gynecologica Scandinavica* 89(5):712-4.

Impey L, Reynolds M, MacQuillan K (2003). Admission cardiotocography: a randomised controlled trial. *Lancet* 361(9356):465-70.

Kaczorowski J, Levitt C, Hanvey L (1998). A national survey of use of obstetric procedures and technologies in Canadian hospitals: routine or based on existing evidence? *Birth* 25(1):11-8.

Khunpradit S, Lumbiganon P, Laopaiboon M (2011). Admission tests other than cardiotocography for fetal assessment during labour. *Cochrane Database of Systematic Reviews*, Issue 6.

Liston R, Sawchuck D, Young D (2007). Fetal health surveillance: antepartum and intrapartum consensus guideline. *JOGC (Journal of Obstetrics & Gynaecology Canada)* 29(9 Suppl 4):S3-56.

Maternal and Child Health Research Consortium (2001). *Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI): 8th Annual Report*. London: Maternal and Child Health Research Consortium.

Mires G, Williams F, Howie P (2001). Randomised controlled trial of cardiotocography versus doppler auscultation of fetal heart at admission in labour in low risk obstetric population. *BMJ* 322(7300):1457-60.

Mitchell K (2008). The effect of the labour electronic fetal monitoring admission test on operative delivery in low-risk women: a randomised controlled trial. *Evidence Based Midwifery* 6(1):18-26.

National Collaborating Centre for Women's and Children's Health (NCCWCH) (2007). *Intrapartum care: care of healthy women and their babies during childbirth*. London: RCOG Press.

Royal College of Obstetricians and Gynaecologists (RCOG) (2001). *The use of electronic fetal monitoring: the use and interpretation of cardiotocography in intrapartum fetal surveillance*. London: RCOG.

Sara Wickham

is a midwife, teacher, author and researcher who divides her time between working as the Editor of *Essentially MIDIRS* and as an independent midwifery lecturer and consultant. She has lived and worked in the US and New Zealand as well as the UK and is the author of more than 200 books and articles relating to birth and midwifery.