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[Intervention Review]

Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

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ABSTRACT

Background

Cardiotocography (CTG) records changes in the fetal heart rate and their temporal relationship to uterine contractions. The aim is to identify babies who may be short of oxygen (hypoxic) to guide additional assessments of fetal wellbeing, or determine if the baby needs to be delivered by caesarean section or instrumental vaginal birth. This is an update of a review previously published in 2013, 2006 and 2001.

Objectives

To evaluate the effectiveness and safety of continuous cardiotocography when used as a method to monitor fetal wellbeing during labour.

Search methods

We searched the Cochrane Pregnancy and Childbirth Group Trials Register (30 November 2016) and reference lists of retrieved studies.

Selection criteria

Randomised and quasi-randomised controlled trials involving a comparison of continuous cardiotocography (with and without fetal blood sampling) with no fetal monitoring, intermittent auscultation intermittent cardiotocography.

Data collection and analysis

Two review authors independently assessed study eligibility, quality and extracted data from included studies. Data were checked for accuracy.

Main results

We included 13 trials involving over 37,000 women. No new studies were included in this update.

One trial (4044 women) compared continuous CTG with intermittent CTG, all other trials compared continuous CTG with intermittent auscultation. No data were found comparing no fetal monitoring with continuous CTG. Overall, methodological quality was

mixed. All included studies were at high risk of performance bias, unclear or high risk of detection bias, and unclear risk of reporting bias. Only two trials were assessed at high methodological quality.

Compared with intermittent auscultation, continuous cardiotocography showed no significant improvement in overall perinatal death rate (risk ratio (RR) 0.86, 95% confidence interval (CI) 0.59 to 1.23, N = 33,513, 11 trials, low quality evidence), but was associated with halving neonatal seizure rates (RR 0.50, 95% CI 0.31 to 0.80, N = 32,386, 9 trials, moderate quality evidence). There was no difference in cerebral palsy rates (RR 1.75, 95% CI 0.84 to 3.63, N = 13,252, 2 trials, low quality evidence). There was an increase in caesarean sections associated with continuous CTG (RR 1.63, 95% CI 1.29 to 2.07, N = 18,861, 11 trials, low quality evidence). Women were also more likely to have instrumental vaginal births (RR 1.15, 95% CI 1.01 to 1.33, N = 18,615, 10 trials, low quality evidence). There was no difference in the incidence of cord blood acidosis (RR 0.92, 95% CI 0.27 to 3.11, N = 2494, 2 trials, very low quality evidence) or use of any pharmacological analgesia (RR 0.98, 95% CI 0.88 to 1.09, N = 1677, 3 trials, low quality evidence).

Compared with intermittent CTG, continuous CTG made no difference to caesarean section rates (RR 1.29, 95% CI 0.84 to 1.97, N = 4044, 1 trial) or instrumental births (RR 1.16, 95% CI 0.92 to 1.46, N = 4044, 1 trial). Less cord blood acidosis was observed in women who had intermittent CTG, however, this result could have been due to chance (RR 1.43, 95% CI 0.95 to 2.14, N = 4044, 1 trial).

Data for low risk, high risk, preterm pregnancy and high-quality trials subgroups were consistent with overall results. Access to fetal blood sampling did not appear to influence differences in neonatal seizures or other outcomes.

Evidence was assessed using GRADE. Most outcomes were graded as low quality evidence (rates of perinatal death, cerebral palsy, caesarean section, instrumental vaginal births, and any pharmacological analgesia), and downgraded for limitations in design, inconsistency and imprecision of results. The remaining outcomes were downgraded to moderate quality (neonatal seizures) and very low quality (cord blood acidosis) due to similar concerns over limitations in design, inconsistency and imprecision.

Authors' conclusions

CTG during labour is associated with reduced rates of neonatal seizures, but no clear differences in cerebral palsy, infant mortality or other standard measures of neonatal wellbeing. However, continuous CTG was associated with an increase in caesarean sections and instrumental vaginal births. The challenge is how best to convey these results to women to enable them to make an informed decision without compromising the normality of labour.

The question remains as to whether future randomised trials should measure efficacy (the intrinsic value of continuous CTG in trying to prevent adverse neonatal outcomes under optimal clinical conditions) or effectiveness (the effect of this technique in routine clinical practice).

Along with the need for further investigations into long-term effects of operative births for women and babies, much remains to be learned about the causation and possible links between antenatal or intrapartum events, neonatal seizures and long-term neurodevelopmental outcomes, whilst considering changes in clinical practice over the intervening years (one-to-one support during labour, caesarean section rates). The large number of babies randomised to the trials in this review have now reached adulthood and could potentially provide a unique opportunity to clarify if a reduction in neonatal seizures is something inconsequential that should not greatly influence women's and clinicians' choices, or if seizure reduction leads to long-term benefits for babies. Defining meaningful neurological and behavioural outcomes that could be measured in large cohorts of young adults poses huge challenges. However, it is important to collect data from these women and babies while medical records still exist, where possible describe women's mobility and positions during labour and birth, and clarify if these might impact on outcomes. Research should also address the possible contribution of the supine position to adverse outcomes for babies, and assess whether the use of mobility and positions can further reduce the low incidence of neonatal seizures and improve psychological outcomes for women.

PLAIN LANGUAGE SUMMARY

Continuous cardiotocography (CTG) as a form of electronic fetal monitoring (EFM) for fetal assessment during labour

What is the issue?

Is continuous cardiotocography (CTG) to electronically monitor babies' heartbeats and wellbeing during labour better at identifying problems than listening intermittently?

Why is this important?

Monitoring babies' heartbeats is used to check wellbeing during labour. Listening and recording the baby's heartbeat aims to identify babies who are becoming short of oxygen and may benefit from an early delivery by caesarean section or instrumental vaginal birth.

A baby's heartbeat can be monitored intermittently using a special trumpet-shaped device, or hand-held Doppler device. The heartbeat can also be checked continuously using a CTG machine. Continuous CTG produces a paper recording of the baby's heart rate and the mother's labour contractions. Although continuous CTG provides a written record, mothers cannot move freely during labour, change positions easily, or use a birthing pool to help with comfort and control during labour. It also means that some resources tend to be focused on the need to constantly interpret the CTG and not on the needs of a woman in labour.

What evidence did we find?

We searched for evidence on 30 November 2016, but found no new studies for this update. We included 12 trials that compared continuous CTG monitoring with intermittent listening, and one trial compared continuous CTG with intermittent CTG. Together, the trials involved over 37,000 women. No trial compared continuous CTG with no monitoring. Most studies were undertaken before 1994, and apart from two, were not high quality. The review was dominated by one large, well-conducted trial from 1985 which involved almost 13,000 women who received one-to-one care throughout labour. The mothers' membranes were ruptured artificially as early as possible and about a quarter received oxytocin to stimulate contractions.

Overall, there was no difference in numbers of babies who died during or shortly after labour (about one in 300) (low quality evidence). Fits in babies were rare (about one in 500 births) (moderate quality evidence), but occurred less often when continuous CTG was used to monitor the baby's heart rate. There was no difference in the rate of cerebral palsy (low quality evidence); however, other possible long-term effects have not been fully assessed and need further study. Continuous monitoring was associated with significantly more deliveries by caesarean section (low quality evidence) and instrumental vaginal births (low quality evidence). Although both procedures carry risks for mothers, these were not assessed in the included studies.

There was no difference in numbers of cord blood acidosis (very low quality evidence), or women using any drugs for pain relief (low quality evidence) between groups.

Compared with intermittent CTG, continuous CTG made no difference to how many women had caesarean sections or instrumental births. There was less cord blood acidosis in women who had intermittent CTG but this result could have been due to chance.

What does this mean?

Most studies were undertaken many years ago and showed benefits and problems with both methods of monitoring the baby's wellbeing in labour. Continuous CTG was associated with fewer fits for babies although there was no difference in cerebral palsy; both were rare events. However, continuous CTG was also associated with increased numbers of caesarean sections and instrumental births, both of which carry risks for mothers. Continuous CTG also makes moving and changing positions difficult in labour and women are unable to use a birthing pool. This can impact on women's coping strategies. Women and their doctors need to discuss the woman's individual needs and wishes about monitoring the baby's wellbeing in labour.

Future research should focus on events that happen in pregnancy and labour that could be the cause of long term problems for the baby.