Significant reduction in umbilical artery metabolic acidosis after implementation of intrapartum ST waveform analysis of the fetal electrocardiogram

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Abstract

Background

Although the evidence regarding the benefit of using ST waveform analysis of the fetal electrocardiogram is conflicting, ST waveform analysis is considered as adjunct to identify fetuses at risk for asphyxia in our center. Most randomized controlled trials and meta-analyses have not shown a significant decrease in umbilical metabolic acidosis while some observational studies have shown a gradual decrease of this outcome over a longer period of time. Observational studies can give more insight into the effect of implementation of the ST technology in daily clinical practice.

Objective

To evaluate the change in frequency of perinatal intervention and adverse neonatal outcome after the implementation of ST waveform analysis of the fetal electrocardiogram from 2000 to 2013.

Study design

This retrospective longitudinal study was conducted in a tertiary referral center. A total of 19,664 medium- and high-risk singleton pregnancies with fetuses in cephalic presentation, a gestational age of ≥36 weeks and the intention to deliver vaginally were included. ST waveform analysis of the fetal electrocardiogram was implemented in the year 2000 and by 2010 all deliveries were monitored using this technology. Data was collected on the following perinatal outcomes: fetal blood sampling, mode of delivery, umbilical cord blood gases, Apgar scores, neonatal encephalopathy and perinatal death. Longitudinal trend analysis was used to detect changes over time in all deliveries monitored by either CTG alone or in adjunct to ST waveform analysis of the fetal electrocardiogram. Logistic regression was used to correct for possible confounders.

Results

The umbilical artery metabolic acidosis rate declined from 2.5% (average rate of 2000+2001+2002) to 0.4% (average of 2011+2012+2013) ($p<0.001$), which represents an 84% decrease. This decrease largely occurred between 2006 and 2008, during the Dutch randomized trial on fetal electrocardiogram ST waveform analysis. At this time, approximately 20% of deliveries were monitored using this method. Furthermore, there were significant reductions in fetal blood sampling rate ($p<0.001$). Overall cesarean and vaginal instrumental deliveries decreased significantly ($p<0.001$), but not for fetal distress. There were no changes in the Apgar scores. The incidence of neonatal encephalopathy was significantly lower in the second part of the study (OR 0.39, 95% CI 0.17-0.89).

Conclusion

There was an 84% decrease in the incidence of umbilical artery metabolic acidosis in all deliveries between 2000 and 2013. The neonatal encephalopathy rate, fetal blood sampling rate and the total number of cesarean and vaginal instrumental deliveries also decreased.