Identifying newborns with umbilical cord blood metabolic acidosis by intrapartum cardiotography combined with fetal ECG ST analysis (STAN): comparison of the new and old FIGO systems to classify cardiotocograms

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ABSTRACT

INTRODUCTION:
The intrapartum cardiotocography (CTG) classification system by FIGO in 2015 (FIGO2015) was introduced to simplify CTG interpretation, but it is not harmonized with the fetal ECG ST analysis (STAN) algorithm from 2007 (STAN2007), which is based on the FIGO CTG system from 1987. The study aimed to determine time courses and sensitivity between the systems in classifying CTG + ST events to indicate metabolic acidosis at birth.

MATERIAL AND METHODS:
Forty-four cases with umbilical cord artery metabolic acidosis were retrieved from a European multicenter database. CTG patterns and timing of the first occurring significant ST events were evaluated post hoc in consensus by an expert panel and sensitivity statistics were performed. Wilcoxon's matched-pairs signed-ranks test and McNemar's test were used with a two-tailed $p < 0.05$ regarded significant.

RESULTS:
STAN2007 had a higher sensitivity (73 versus 43%, $p = 0.0002$) and alarmed for metabolic acidosis in mean 34 minutes earlier than the FIGO2015 system did ($p = 0.002$). In every fourth case the time difference was 20 minutes or more.

CONCLUSIONS:
In this simulation study, surveillance with STAN2007 combined with fetal ECG ST analysis had

a significantly higher sensitivity and would have alarmed for metabolic acidosis significantly earlier than the new FIGO system would have.

We recently in a simulation study demonstrated that the new FIGO system from 2015 (FIGO2015) would classify cardiotocography (CTG) traces and ST events indicated by fetal ECG ST analysis (STAN) discrepantly from the current CTG classification system used in the STAN interpretation algorithm from 2007 (STAN2007). The new system then seems not exchangeable against the old system in the STAN interpretation algorithm. In the present simulation study, we investigated the performance of FIGO2015 versus STAN2007 in a retrospective series of 44 cases with umbilical cord blood arterial metabolic acidosis. CTG traces and ST events were classified post hoc in consensus by three CTG and STAN experts and the time from the first occurring significant CTG + ST event till delivery was calculated for both systems in each case. Other clinical information than metabolic acidosis were hidden. Of the 44 cases, STAN2007 first alarmed for metabolic acidosis in 32 cases (73%) and FIGO2015 in 19 cases (43%). This difference in sensitivity was significant ($p = 0.0002$). There was no case where FIGO2015 indicated a significant CTG + ST event and STAN2007 did not. In mean, STAN2007 alarmed 34 minutes earlier than FIGO2015 ($p= 0.002$), and in 25% of cases the time difference was more than 20 minutes. When the time aspect of significant CTG + ST events was not considered, the sensitivity of STAN2007 was still higher (73 versus 59%, $p = 0.03$). This simulation study then indicates that FIGO2015 cannot replace STAN2007 in the STAN interpretation algorithm because of being later in alarming for impending metabolic acidosis.

In this simulation study, the modified FIGO CTG classification system from 1987 combined with fetal ECG ST analysis (STAN) would have alarmed for metabolic acidosis significantly earlier than if combined with the new FIGO system from 2015.