Feasibility study to detect abnormal rhythmic elements in fetal congenital heart disease using fetal electrocardiography

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Objective
To identify the relation between fetal congenital heart disease (CDH) and autism spectrum disorders (ASD).

Methods
From several studies, children with congenital heart diseases (CDH) were more likely to be diagnosed with autism spectrum disorders (ASD) compared to those without CDH. In children with ASD, the abnormal-arousal of autonomic nerve activities during tasks is reported. In this feasibility study, we investigated the CHD fetal autonomic nerve activities by measuring fetal heart rate and precise variability from fetal electrocardiography. We enrolled 10 women who presented as outpatients in our hospital. The range of estimated gestational ages was from 20 to 37 weeks. The fetuses of 5 patients were diagnosed with CHD, and the rest were normal. Electrodes were placed on the maternal abdomen and fECG signals were obtained for at least 10 minutes. Fetal heart rates were calculated precisely from RR intervals. Power spectral density was calculated and compared between these two groups.

Results
High frequency area (HF) was increased and Low frequency area (LF) tended to decrease in fetuses with CDH.

Conclusion
We can speculate that the abnormality of heart rate regulation in ASD with CHD start in the intrauterine life. Non-invasive maternal abdominal fetal electrocardiography is a powerful tool to evaluate fetal heart rhythm.