Comparison of fetal echocardiography with fetal cardiac MRI in the human fetus

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Objective
Discordances of up to 30% between pre- and postnatal diagnosis of congenital heart diseases (CHD) using fetal echocardiography encourages the development of new techniques to improve accuracy of prenatal diagnosis. This study was performed to compare fetal echocardiography with fetal cardiac MRI in the human fetus.

Methods
For fetal cardiac anatomy assessment, a 1.5 - Tesla machine with fast field echo sequences was used. Trigger signals were generated with a newly developed MRI compatible Doppler ultrasound (DUS) device. 8 fetuses (30 - 37 gestational weeks) were examined. Two of them had abnormal fetal echocardiography (tetralogy of fallot and pulmonary stenosis with right ventricular failure respectively). The other six had normal findings.

Results
The trigger signals of the fetal heart beat could be recorded throughout the whole MRI examination. In all cases, the synchronous contraction of the ventricles was clearly visualised from the apex to the base. Furthermore, the four chamber cardiac view and the short cardiac axis for all cases, the overriding aorta in the first case of CHD, as well as the impairment of the contractility of the right ventricle, in the second case of CHD, were clearly seen.

Conclusion
Fetal cardiac MRI is feasible using Doppler ultrasound as a gating method and it shows good agreement with fetal echocardiography. Fetal cardiac MRI may have the potential to gain additional information in cases with CHD.