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Dynamic fetal cardiac MRI using Doppler ultrasound gating in the assessment of the fetal aortic arch

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Objective

To investigate the diagnostic performance of dynamic fetal cardiac MRI using a MR compatible Doppler Ultrasound (DUS) device for fetal cardiac gating to evaluate the diagnostic performance in the evaluation of the fetal aortic arch in comparison to fetal echocardiography.

Methods

This is a prospective study including 17 fetuses with a normal aortic arch and two with a suspicion of coarcation of the aorta (CoA) at a median age of 33 weeks (range 26-38). Dynamic fetal cardiac MRI was performed using a DUS device for direct fetal cardiac gating using a 1.5 T scanner. The aortic arch was evaluated in sagittal planes and the visualization of the left subclavian artery was studied. Image evaluation was assessed by a 4-point scale. Fetal echocardiography and postnatal diagnoses were considered as the standard reference.

Results

Direct cardiac gating allowed continuous triggering of the fetal heart showing high temporal and spatial resolution. One case was excluded due to fetal movements and loss of a gating signal. Both, fetal cardiac MRI and echocardiographic detected the CoA and enabled the visualization of the aortic arch in 16/18 cases. Qualitative evaluation revealed overall consistency for echocardiography and MRI. Overall image quality assessed in the 18 data sets was high with no or only few artifacts with a mean value of 3.1. Agreement in overall image quality between the two observers was good (kappa = 0.75).

Conclusion

For the first time, this study shows that dynamic fetal cardiac using external cardiac gating allowed evaluation of the fetal aortic arch in agreement to fetal echocardiography. Dynamic fetal cardiac MRI may be useful as a second step investigation if conditions for fetal echocardiography are unfavorable.