Fetal myocardial deformation measured with two-dimensional speckle-tracking echocardiography

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Objective
Two-dimensional speckle-tracking echocardiography (2D-STE) is a promising technique which allows assessment of fetal cardiac function, and can be used in the evaluation of cardiac and non-cardiac diseases in pregnancy. However, reliable fetal reference values for deformation parameters measured using 2D-STE are needed before it can be introduced into clinical practice. This study aimed to obtain reference values for fetal global longitudinal strain (GLS) and GLS rate (GLSR) measured using 2D-STE and compare right and left ventricular values.

Methods
This was a prospective longitudinal cohort study of uncomplicated pregnancies that underwent echocardiography every 4 weeks from inclusion at 18-21 weeks until delivery to obtain four-chamber loops of the fetal heart. Left and right ventricular GLS and GLSR were measured using 2D-STE at each examination. Using Bayesian mixed-effects models, reference values with lower and upper 5% prediction limits were calculated according to gestational age. Right and left ventricular GLS values according to gestational age were compared using the Wilcoxon signed-rank test.

Results
A total of 592 left ventricular and 566 right ventricular GLS and GLSR measurements were obtained from 124 women with uncomplicated pregnancy and non-anomalous, appropriately grown fetuses. Reference values were obtained for both fetal ventricles according to gestational week. GLS and GLSR values of both ventricles increased (i.e. became less negative) significantly during pregnancy. Right ventricular GLS values were significantly higher (i.e. less negative) than the respective left ventricular values at every gestational week.

Conclusion
Reference values were obtained for fetal GLS and GLSR measured using 2D-STE. GLS and GLSR values increased significantly for both ventricles from the second trimester until delivery. GLS values were significantly higher for the right ventricle compared with the left ventricle. Future studies are needed to assess whether the obtained reference values are helpful in clinical practice in the assessment of pregnancy complications, such as fetal growth restriction or cardiac anomaly.

Figure 1 Two-dimensional speckle-tracking analysis, showing marked myocardial region of interest in the left (LV) and right ventricle (RV) (A), deformation vectors in the LV and RV (B) and LV and RV global longitudinal strain analysis (C).

Figure 2 Mean global longitudinal strain (GLS) with 5% and 95% prediction limits in the left ventricle (LV), according to gestational age.
Figure 3 Mean global longitudinal strain (GLS) with 5% and 95% prediction limits in the right ventricle (RV), according to gestational age.