2D Strain Analysis: A Novel Robust and Fast Method for Assessment of Fetal Cardiac Function

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Purpose : Functional assessment of the fetal heart has always been a challenge. 2D strain analysis (2DSA) measures myocardial deformation regardless of angle of interrogation. We studied the utility of 2DSA in segmental and global assessment of myocardial function in the fetus.

Methods: 2DSA-based myocardial deformation parameters including segmental tissue velocity, strain and strain rate as well as biventricular global strain and strain rate were measured in 28 normal fetuses (20-38, median 28 gestational weeks). 2DSA data were compared to analogous Doppler derived tissue velocity imaging (TVI) parameters.

Results: 2DSA was feasible and highly reproducible in 94% of the fetuses. 2DSA-based tissue velocity (3.9±1cm/sec) was comparable to TVI-based velocity (4±1.6 cm/sec) in the right ventricle as well as in the left ventricle (2DSA velocity 3.3±0.6 versus TVI 3.1±0.9 cm/sec). Strain rate obtained by these 2 methods was also similar. Biventricular global strain and strain rate measured 16 ± 4 % and 1.6 ± .5 sec^{-1} respectively. Tissue velocity increased whereas segmental strain rate decreased throughout gestation. Strain remained unchanged. Global strain rate significantly decreased with gestational age (r = -0.7).

Conclusion: 2DSA allows fast and accurate quantification of segmental and global myocardial function in the fetus. 2DSA-based tissue velocity increases with gestational age whereas segmental and global strain rate decrease throughout gestation.