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Fetal cardiac function in maternal diabetes: a speckle tracking echocardiography study

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Introduction:
Intrauterine exposure to a diabetic environment is associated with adverse fetal myocardial remodeling. The aim of this study was to assess systolic and diastolic function of fetuses exposed to maternal diabetes when compared with controls, using speckle tracking echocardiography. We hypothesized that fetuses exposed to maternal diabetes present signs of biventricular dysfunction which can be detected by deformation analysis.
Methods:
Cross-sectional study of 129 structurally normal heart fetuses, including 76 fetuses of diabetic mothers and 53 of non-diabetic mothers. Maternal baseline characteristics and echocardiographic data were prospectively collected at 30-33 weeks of gestation.
Results:
Fetuses of diabetic mothers had a significantly thicker interventricular septum when compared to controls [median (IQR): 4.25(3.87-4.50)mm Vs 3.67(3.40-3.93)mm, p<0.001], however no effect modification was demonstrated on myocardial deformation. Deformation analysis showed a significantly lower early and late diastolic strain rate for both ventricles in the maternal diabetes group, suggesting a biventricular diastolic impairment. Additionally, a lower global longitudinal strain was observed for the right ventricle in the study group. (Table 1) Multivariate analysis revealed that maternal age is an independent predictor of left and right ventricle global longitudinal strain (p<0.05), with a significant effect only in maternal diabetes after group stratification.
Conclusions:
Fetuses of diabetic mothers present signs of biventricular diastolic dysfunction and right ventricle systolic dysfunction by deformation analysis at the third-trimester of pregnancy. They may represent a special indication group for functional cardiac assessment, independently of septal hypertrophy.

Table 1. Deformation analysis of left and right ventricles

	Control Group (n=53)	**Maternal Diabetes Group (n=76)**	**p value**
Frame rate (fps)	110 (96-126)	110 (91-124)	0.73
Fetal heart rate (bpm)	134±12	137±12	0.14
LEFT VENTRICLE			
GLS (%)	-16.99±2.42	-16.01±3.45	0.076
Systolic SR (1/s)	-1.73±0.34	-1.62±0.39	0.10
Diastolic SR			
Early diastolic (1/s)	2.26±0.68	1.85±0.72	**0.001**
Late diastolic (1/s)	1.78±0.57	1.50±0.52	**0.005**
RIGHT VENTRICLE			
GLS (%)	-15.52±3.86	-13.67±4.18	**0.012**
Systolic SR (1/s)	-1.49±0.39	-1.42±0.45	0.35
Diastolic SR			
Early diastolic (1/s)	1.97±0.73	1.57±0.73	**0.002**
Late diastolic (1/s)	2.00±0.77	1.68±0.79	**0.021**

Data presented as mean ± standard deviation or median (interquartile range). GLS - Global Longitudinal Strain, SR – Strain Rate.