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Fetal cardiac remodeling at patients with gestational diabetes mellitus

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Objective

The aim of our study was to determine remodeling of the fetal heart through changes of fetal cardiac morphometry and cardiac functions in the fetuses from mothers with gestational diabetes mellitus (GDM) and to show that there is a significant difference between the fetuses from mothers with and without GDM.

Methods

The study design involved a prospective cohort including 25 singleton pregnancies with Gestational diabetes and control group of 25 singleton normal pregnancies (at third trimester of pregnancy) from the Fetal Medicine Department at Danat Al Emarat Hospital, Abu Dhabi, United Arab Emirates in period of 4 months-November 2022-February 2023. All of them were at gestational age from 28 to 37 weeks. The study protocol included the collection of baseline and perinatal characteristics and the performance of routine Growth scan in third trimester (28-37 weeks of gestational age) with assessment of estimated fetal weight (EFW), conventional feto-placental Doppler and echocardiography (with functional echocardiography). The fetal cardiac morphometry withmeasurements of sphericity indices, diameters, area for atria, ventricles and heart with 2 D mode has been done. Thickness of ventricular walls and interventricular septum has been evaluated with M mode. Fetal cardiac function was evaluated with measurements of myocardial performance index (MPI), tricuspid and mitral valve E/A ratio, left ventricle shortening fraction, TAPSE and MAPSE. Baseline maternal and fetal parameters, fetal echocardiographic parameters were compared between GDM and control group of normal pregnancies.

Results

In fetuses of mothers with GDM, Cardiac area (CA), thoracic area (TA), longitudinal cardiac diameter (LCD), transverse cardiac diameter (TCA), right atrial area (RAA), left atrial area (LAA) were significantly larger ($P < 0.05$) compared to the control group. Left ventricular wall thickness (LVWT), right ventricular wall thickness (RVWT), septal wall thickness (SWT) and fractional shortening (FS) of left ventricle were significantly different between the group of GDM and control group ($P < 0.05$). Myocardial performance index (MPI) -reflecting global cardiac function was significantly different between the group with GDM and the control group ($P < 0.05$). All parameters of MPI (ICT, IRT and ET) were statistically significantly different (($P < 0.05$) with higher ICT, IRT and lower ET in the group of fetuses from GDM mothers.

Conclusion

Our study demonstrates that GDM is associated with remodeling of the fetal heart with changes of morphometry and impairment of cardiac function - global and left ventricular function, compared to controls. Further studies are needed to determine whether fetuses with the observed alterations in cardiac function are those at highest risk for subsequent development of cardiovascular disease.