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Preclinical detection of cardiac dysfunction in obese diabetic patients

Background: The prevalence of obesity and diabetes has reached epidemic proportions, and in terms of the extent of its negative impact on the health has been compared to those of tobacco and hypercholesterolemia. One of the first medical consequences of obesity and diabetes mellitus to be recognized was cardiovascular disease (CVD). Obesity and diabetes are independent predictors of coronary heart disease, heart failure and stroke.

Aim: The aim of the study was to evaluate whether tissue Doppler imaging (TDI) and global longitudinal strain (GLS) detects a pre-clinical impairment of diastolic and systolic functions in obese subjects with type 2 diabetes with short duration of disease and normal cardiac function with conventional echocardiography (CE), and whether echocardiographic parameters are related to metabolic abnormalities.

Patients & Methods: We studied 240 obese (body mass index (BMI>30 kgm2), uncomplicated type 2 diabetic subjects with short duration of disease and 93 control subjects. All participants underwent CE, GLS and TDI echocardiography. With TDI, early mitral annular septal velocity (Ea), pre systolic conventional mitral flow atrial Doppler velocity (Aa), their ratio (Ea/Aa) and systolic velocity (Sa) were measured at the lateral corner of mitral annulus. Glycosylated haemoglobin, fasting plasma glucose and insulin were determined and homeostasis model assessment (HOMA-IR), as an index of insulin resistance, was calculated.

Results: Cardiac function with CE was similar in the two groups. Using TDI, diabetic obese subjects showed a lower Ea velocity (15.5+/-3.9 vs. 19.4+/-3.5 cm/s, P<0.0001), an increased Aa velocity (15.5+/-2.4 vs. 14.1+/-2.4 cm/s, P<0.05) and a reduced Ea/Aa ratio (1.00+/-0.2 vs. 1.39+/-0.3, P<0.0001), compared with control subjects. Interestingly, diabetic women had increased left ventricular (LV) wall thickness (18.8 vs. 16.1 mm, p<0.001). Trans thoracic echocardiography, myocardial Doppler-derived systolic (sm) and early diastolic velocity (em) and strain imaging (GLS) were obtained in obese diabetic subjects and 93 referents (BMI <25 kg/m2). BMI correlated with left ventricular (LV) mass and wall thickness (P<0.001). Severely obese subjects (BMI >35) had reduced LV systolic and diastolic function compared with referents, evidenced by lower average longitudinal peak systolic strain, sm, and reduced em, whereas LV ejection fraction remained normal. Differences in regional and global strain (-14.5%+/-1.4) were identified between the severely obese diabetic (BMI>35) and the referent patients (-17.6%+/-2.1), P<0.001.

Conclusion: An early stage of cardiac dysfunction and dilated cardiomyopathy can be evidenced by TDI and myocardial strain imaging in type 2 diabetic obese subjects even in the presence of a normal cardiac function with CE. This abnormality is associated with cardiac hypertrophy in one third of our studied patients.

Biography

Galal Eldin Nagib El-kilany is an Assistant Clinical Professor and Consultant of Cardiology at Gulf Medical University (GMU), UAE. He is a distinguished Fellow at International Society of Cardiovascular Ultrasound (ISCU), USA; President of ISCU; Fellow of European Society of Cardiology, France; Associate Editor of Journal of Molecular and Translational Research and Editor of World Heart Journal.

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