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Early changes in cardiac morphology and function in individuals with diabetes and preserved ejection fraction detected by cardiovascular magnetic resonance tagging - The UK Biobank

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Topic(s):
Cardiac Magnetic Resonance: Dimensions, Volumes and Mass

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BACKGROUND
More than 400 million individuals globally have diabetes. Diabetes is associated with increased cardiovascular (CV) morbidity and mortality. Early detection of cardiac changes before manifest disease develops is vitally important.

OBJECTIVES
To investigate early alterations in cardiac structure and function associated with diabetes using cardiac magnetic resonance imaging (CMR) and feature-tracking (FT) global circumferential strain (GCS) imaging.

METHODS
Participants from the CMR substudy of the UK Biobank, a cohort study of community participants in the United Kingdom, were included. Only participants without known CV disease and left ventricular ejection fraction (LVEF) =50% were included. DM was assessed by self-report or by medication use. CMR images were analysed to derive cardiac volumes and mass, and FT-CMR was performed to assess GCS. The relationships between CMR-derived measures and DM were analysed in uni- and multivariable linear regression model including possible confounding factors. The investigators were blinded to DM status.

RESULTS
A total of 3984 individuals (mean (SD)) age 61.3 (7.5) years, 45% men, BMI 25.8 (4.1) kg/m², and systolic blood pressure 135.9 (17.9) mmHg were included of which 143 individuals (3.6%) had DM. Mean (SD) LVEF 59.7% in DM and 60.2% in No DM (n=3984). In full, multivariable models, there was no difference in LVEF (DM vs. No DM; Coef. (95%CI): -0.86 (-1.8; 0.5), p=0.065), LV mass (-0.13 g/m² (-1.6; 1.3), p=0.86), or right ventricular (RV) EF (-0.23% (-1.2; 0.8), p=0.65). However, both LV and RV volumes were significantly smaller in DM compared to No DM, (LV end-diastolic volume/m²: -3.46 ml/m² (-5.8; -1.2), p=0.003, RV end-diastolic volume/m²: -4.22 ml/m² (-6.8; -1.7), p=0.001, LV stroke volume/m²: -3.00 ml/m² (-4.5; -1.5), p<0.001; RV stroke volume/m²: -3.83 ml/m² (-6.5; -1.1), p=0.005).

FT-CMR mid GCS was significantly higher in DM vs. No DM (Figure) in both univariable (0.65% (0.28; 1.0), p=0.001) and multivariable models (0.38 (0.01; 0.7), p=0.045). In the full, multivariable models, there was a trend towards greater LV torsion (0.28 degree (-0.08; 0.64), p=0.13) and torsion rate (1.16 degree/s (-0.17; 2.49), p=0.086) in DM vs. No DM.

CONCLUSION
In a low risk general population without known heart disease and with preserved LV ejection fraction, diabetes is associated with early subclinical changes in both LV function and LV morphology. Furthermore, diabetes is associated with early changes in RV morphology, which is, so far, a largely unexplored complication in diabetes.
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