**Title:** Automated 3D biventricular assessment of remodelling from cardiac magnetic resonance imaging discriminates between left ventricular hypertrophy phenocopies

**Background:**

Structural remodelling of the heart can reflect key mechanisms of cardiac disease. Cardiac magnetic resonance (CMR) imaging enables assessment of the type and degree of remodelling. However, differentiating between left ventricular hypertrophy (LVH) phenocopies remains challenging. Differences in right ventricular (RV) remodelling have been suggested to aid discrimination between LVH phenocopies. 3D biventricular assessment from CMR may support differential diagnosis between LVH phenocopies.

**Method:**

56 subjects (12 cardiac amyloidosis (CA), 11 hypertrophic cardiomyopathy (HCM), 13 hypertensive heart disease (HHD), and 20 control) underwent CMR examinations (17/CEN/226) consisting of short- and long-axis cine images spanning the LV and RV. A fully automated deep-learning pipeline for CMR analysis was developed to generate dynamic 3D biventricular meshes from DICOM images alone. Global indices implicated in cardiac remodelling, including indexed LV and RV volumes, masses, and mass/volume ratios, were computed from the 3D meshes.

**Results:**

Significant elevation of LV mass index and mass/volume ratio was observed in each disease group compared to controls (p<0.0001). RV mass/volume ratios were also significantly elevated in HCM and CA patients, but not HHD (p<0.01) compared to controls. Indexed LV and RV masses were significantly greater in CA patients compared to HCM patients (p<0.05). RV mass/volume ratio was significantly elevated in HCM patients compared to HHD patients (p=0.02), but LV mass/volume ratio was not.

**Conclusion:**

Automated 3D biventricular assessment of remodelling demonstrates potential to discriminate between LVH phenocopies. Analysis of region-specific remodelling from 3D biventricular meshes may provide further diagnostic value.