

Background: Mitral annular disjunction (MAD) is characterized by an abnormal insertion of the posterior mitral leaflet on the atrial wall. Despite its often subtle presentation, the presence of MAD is a potential warning sign of future ventricular arrhythmia (VA) and sudden cardiac arrest (SCA): recent studies have shown association among MAD-related imaging metrics and VA/SCA. Nevertheless, the precise mechanisms leading to VA/SCA in patients with MAD are poorly understood. A comprehensive 3D shape analysis of the left ventricles (LV) of patients with MAD may provide further insight and help to elucidate mechanisms.

Aims: To create a patient-specific 3D LV geometry modelling pipeline for patients with MAD, to enable future morphological studies based on cardiac short axis magnetic resonance imaging (MRI).

Methods: Short axis cardiac MRI scans were obtained for 25 patients presenting with MAD to Oslo University Hospital. The left ventricular endocardial and epicardial contours were traced with Segment software, and a simple polynomial fitting algorithm was applied to correct for possible slice shifts during image acquisition. An initial 3-D ellipsoid model was fitted via least squares to each patient's contours, and then warped to fit the patient contours using free form B-spline image registration.

Results: Patient-specific geometries were created for all patients, indicating a robust pipeline. An example 3D model and MRI contours is shown in Figure 1.

Conclusions: Personalized 3D left ventricular shape models can be constructed for patients with MAD, to enable morphological studies examining the relationship between LV shape in MAD, and VA/SCD.