# Quantification of the Anatomical Remodelling of the Ventricles of ARVC Patients, an MRI Based Imaging Study

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**Key finding**: We perform a high-resolution computational quantification of ventricular dilation and mass enlargement in human Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC) patients, and find major anatomical remodelling in the early stages of ARVC progression.

**Background:** ARVC is a potentially lethal form of cardiomyopathy, with a high incidence of mortality amongst the young and in competitive athletes. No ARVC specific treatments exist to date and the biological mechanisms, which lead to a deterioration of the anatomical and electrophysiological states of the ventricles, remain to be elucidated. To this purpose, we seek to quantify the extent of anatomical remodelling in a group of early stage ARVC human patients from magnetic resonance imaging (MRI) data.

**Method:** Personalised anatomical reconstructions of control and ARVC patients' ventricles were generated from manually segmented cardiac MRI datasets. Contour alignment effectively corrected respiration and motion MRI artifacts prior to surface fitting. Our previously published algorithm is able to fit to sparse, heterogeneous, non-parallel, cross sectional, non-coincidental contours and produce a patient-specific tetrahedral volumetric mesh. Our meshes, shown in Figure 1, keep contour to mesh discrepancy under 5mm and provide an accurate fit to the contours, creating a realistic representation of the patient's ventricles.

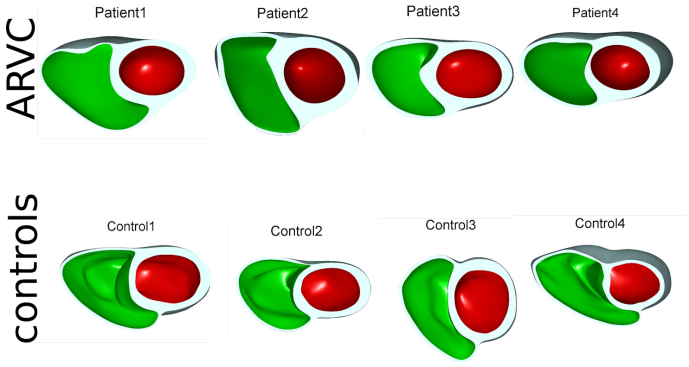


Figure 1. The anatomically detailed set of meshes of an ARVC and a control group. Each mesh is patient specific. Right ventricular dilation is very prominent in ARVC patients one and two. All ARVC patients have a thick left ventricular lateral free wall, a feature not previously reported in ARVC.

**Results:** Using our algorithm, we find right ventricular end diastolic volume is significantly increased (+44%) in ARVC patients with respect to control. The ventricular muscle volume, comprising of the left ventricle, right ventricle and septum, is drastically higher (+79%) than in our control group. These findings suggest a need to better understand the role of anatomical deformations in ARVC disease progression.