Cardiac Image Modeller Right and Left Ventricle

Kathleen Gilbert, Brett Cowan, Avan Suinesiaputra, Chris Occleshaw, Alistair Young

Magnetic Resonance Imaging (MRI) is the gold standard for right ventricular evaluation[1]. The analysis of left (LV) and right ventricular (RV) function from MRI images takes a significant amount of time. Manual analysis involves drawing contours on the endocardium and epicardium of both chambers on short axis slices at end-diastole and end-systole[2].

Our software, Cardiac Image Modeller RVLV, uses a template method to allow for quick and accurate evaluation of LV and RV function from MRI images. After initial markers are placed, contours are drawn on the images. These can be edited in real time using a guidepoint modelling method, allowing the model to be fitted to almost any anatomy. The software automatically calculates clinical values of heart function such as mass and ejection fraction. This model uses information from both the short and long axis images to gauge a more accurate depiction of shape.

The 3D model, which includes all four valves, is time-varying, and hence, accurately describes the volume and mass of both ventricles at each frame in the cardiac cycle, not only end-diastole and end-systole. The software allows the user to visualise the customised 3D heart beating.
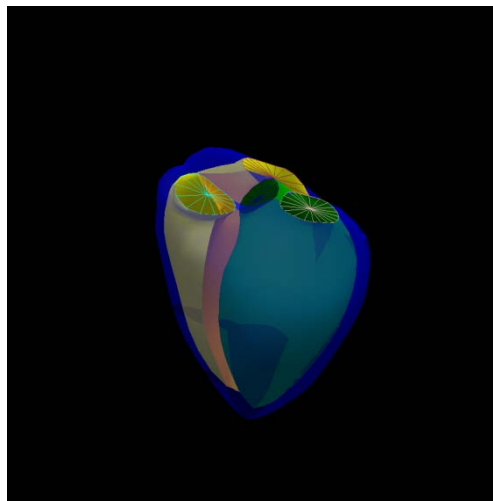

Figure 1: 3D model of the left (green) and right (yellow) ventricles and all four valves. The blue surface represents the epicardium of both ventricles.

A routine biventricular assessment with this software takes clinicians approximately 12 -15 minutes.

1. Grothues F, Moon JC, Bellenger NG, Smith GS, Klein HU, Pennell DJ. Interstudy reproducibility of right ventricular volumes, function, and mass with cardiovascular magnetic resonance. *Am Heart J*. 2004;147(2):218–23.

2. Hudsmith L, Petersen S, Francis J, Robson M, Neubauer S. Normal Human Left and Right Ventricular and Left Atrial Dimensions Using Steady State Free Precession Magnetic Resonance Imaging. *J Cardiovasc Magn Reson*. 2005;7(5):775–782.