

Semiautomatic Quantification of Left and Right Ventricular Functions in Magnetic Resonance Imaging

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The objective of this study is twofold: first, to develop a semiautomatic segmentation method to quantify left and right ventricular (LV and RV, respectively) functions in cardiac magnetic resonance (MR) imaging, and second, to compare this method with manual contour tracing (Argus, release Syngo; Siemens AG, Medical Solutions; Erlangen, Germany).

Twenty patients with cardiovascular diseases were examined using a 1.5-T MR Imaging unit (Magnetom Symphony Quantum; maximum gradient, 30 mT/m; slew rate, 125 T/m/s- Siemens Medical Systems, Erlangen, Germany). Twelve contiguous short axis slices with a thickness of 6-mm were planned to cover the entire LV and RV volumes from the base to the apex. Acquisition was performed with breath-hold cine steady-state free precession (SSFP) sequences. Several parameters such as end-diastolic and end-systolic volumes (EDV and ESV, respectively), stroke volume (SV), and ejection fraction (EF) of both ventricles were quantified using both semiautomatic and manual contour tracing methods. To start the semiautomatic method, a seed point per patient is set by hand inside the ventricular region. Next, the computer automatically segments the ventricle by means of edge detection, dynamic thresholding and region growing processes.



Semiautomatic segmentation of the right ventricle.

No statistically significant differences were found for the quantification of LV and RV parameters by the two methods ($p > 0.05$). Correlation to estimate RV function was good ($r > 0.7$) and turned to be excellent for LV function ($r > 0.9$). Bland-Altman plots were used to assess the agreement between both methods.

In conclusion, semiautomatic segmentation procedures, applied to the quantification of cardiac parameters, can achieve similar results than manual procedures. Furthermore, the segmentation of the heart is less time consuming.