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Poster presentation

Myocardial extracellular volume imaging allows quantitative assessment of atypical late gadolinium enhancement

Martin Ugander*, Abiola J Oki, Peter Kellman, Anthony H Aletras and Andrew E Arai

Address: National Institutes of Health, Bethesda, MD, USA
* Corresponding author

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Introduction

Late gadolinium enhancement (LGE) images by cardiovascular magnetic resonance (CMR) display relative differences in gadolinium concentration in the myocardium. There are many factors influencing signal intensity in LGE images such as: non-linearity between gadolinium concentration and signal intensity, inversion time, contrast dose, renal clearance, and timing of imaging after contrast injection. While these factors are not typically problematic in infarct imaging, conditions with more subtle changes in the myocardium can be more difficult to interpret.

Purpose

The specific aim of the study was to acquire quantitative pixel-wise parametric maps of the extracellular volume (ECV) fraction in subjects with a range of pathological and normal conditions. We hypothesized that ECV imaging could quantitatively differentiate between regions of atypical LGE and normal myocardium.

Methods

Consecutive clinically referred patients (n = 15) were scanned at 1.5 T (Siemens) with a Modified Look-Locker Inversion-recovery (MOLLI) sequence acquired before and at approximately 15 minutes after a 0.15 mmol/kg bolus of Gd-DTPA. T1 and R1 (1/T1) pixel maps were generated. DeltaR1 maps (R1 after - R1 before contrast) were divided by the DeltaR1 value of the LV blood pool and multiplied by [1-hematocrit], thus yielding a quantitative pixel map of the ECV fraction ranging from 0-100%.

Results

The normal myocardium had a mean ECV of 26% (n = 15, range 23-27%). ECV of focal abnormalities included lipoma, with a lower ECV than normal (n = 1, 8%), chronic myocardial infarction (n = 2, 45-53%), and non-ischemic atypical diffuse enhancement (n = 4, 36-53%), of which one also had a region with atypical confluent enhancement (n = 1, 82%). The left panel of Figure 1 shows quantitative ECV pixel map images and corresponding LGE images for two patients exhibiting atypical diffuse enhancement (arrow) and one instance of atypical confluent enhancement (arrowhead). The right panel of Figure 1 shows ECV for different abnormalities in patients with focal findings (circles) and patients with normal studies (diamonds).

Conclusion

Quantitative extracellular volume imaging is promising since it showed no overlap between ECV values for normal and abnormal myocardium. There are many potential benefits to ECV imaging. It is largely independent of inversion time, contrast dose, renal clearance, and timing of imaging after contrast injection. Thus, ECV imaging offers a potential to quantitatively define normal myocardium and improve confidence when identifying subtle abnormalities in the myocardial ECV such as atypical enhancement.

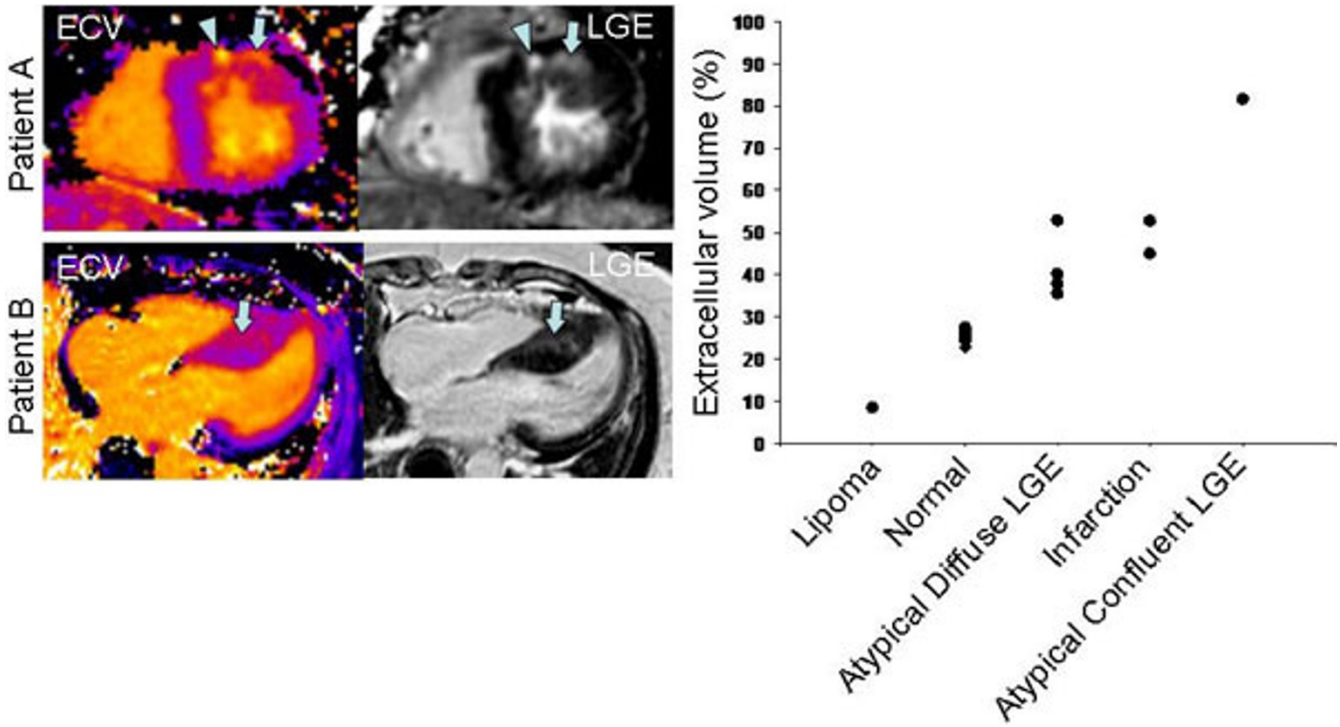

Figure 1