

POSTER PRESENTATION

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Inline myocardial $t2^*$ mapping with iterative robust fitting

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Introduction

Myocardial $T2^*$ measurement is a valuable tool for non-invasive assessment of iron overload, and is clinically employed for planning and monitoring iron-chelating treatments for transfused thalassemia major patients [1]. Presently, for $T2^*$ assessment, dark-blood prepared gradient echo (GRE) images are acquired at multiple echo times (TEs). Thereafter, these images are analyzed within offline software such as CMRTools: ThalassaemiaTools[®], in which the septal signal of a full thickness ROI is fitted to a monoexponential decay curve to estimate myocardial $T2^*$ [2]. The goal of this study was to develop and test a $T2^*$ measurement technique with automated inline $T2^*$ -map generation. Availability of such a technique on commercial MR systems may further utilization of such measurements in this patient group.

Methods

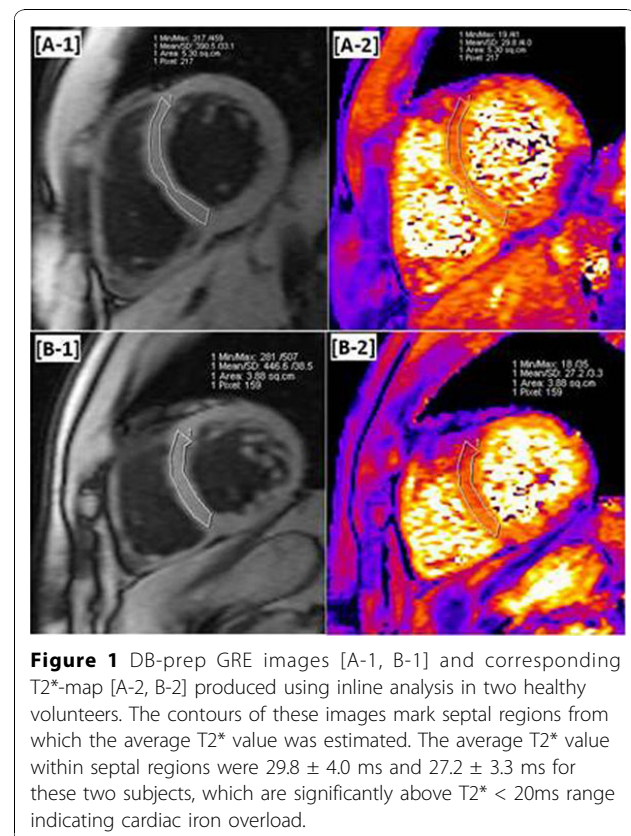
An ECG-triggered 2D multi-echo GRE sequence was implemented on a 1.5T MR scanner (MAGNETOM Espree, Siemens AG) with support for dark-blood preparation. To generate an inline $T2^*$ -map, an integrated image reconstruction performs pixel-wise $T2^*$ estimation using a robust fit, in which the signal at each TE is iteratively weighted to reflect its fidelity to monoexponential decay curve. Points farther from the ideal relaxation curve are weighted lower, reducing their influence on the fit.

In five healthy volunteers, the method was used to acquire short axis images of the heart, accompanied by inline $T2^*$ -map computation. Additionally, to compare the accuracy of the robust-fit with a validated method, $T2^*$ -maps were retrospectively computed using multi-echo

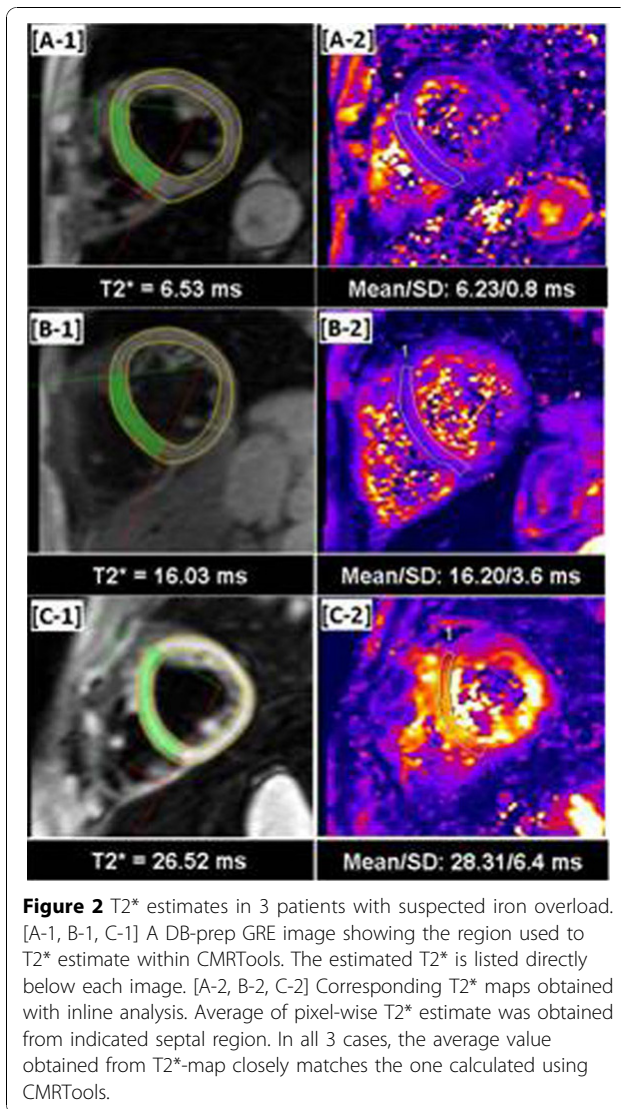
images of 32 patients. In all cases, a septal region-of-interest was manually drawn to obtain an average $T2^*$ value.

Results

Fig. 1 shows the $T2^*$ -maps obtained in two volunteers. Fig. 2 demonstrates $T2^*$ estimates using the inline $T2^*$ -maps in 3 patients with suspected iron overload, which



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match closely with the values obtained using CMRTTools. Fig. 3 illustrates statistical comparison of T2* estimates using CMRTTools and inline analysis in all 32 patients.

Conclusions

The proposed technique computes pixel-wise T2* estimate which differs from region-based T2* assessment within CMRTTools; however, the average T2* values within septum are highly correlated ($R^2=0.996$) with the region-based estimates obtained using CMRTTools. This is an encouraging result given that T2*-map is generated on the scanner without any need for user intervention to eliminate outliers, and that assessment of myocardial T2* is possible immediately following data acquisition. Prospective clinical studies are warranted to thoroughly validate this proposed method.

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