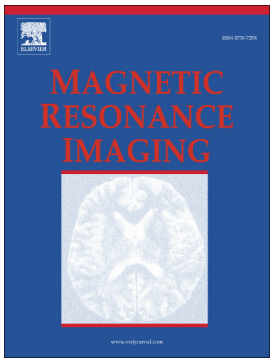

Simulation-based quantification of native T1 and T2 of the myocardium using a modified MOLLI scheme and the importance of Magnetization Transfer

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Title: Simulation-based quantification of native T1 and T2 of the myocardium using a modified MOLLI scheme and the importance of Magnetization Transfer

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Abstract

Quantitative cardiovascular Magnetic Resonance Imaging techniques are gaining wide acceptance within the MR community due to their potential to diagnose non-localized disease, guide therapy and improve patient outcome. During the last decade, there has been an increasing interest for developing new techniques that allow for simultaneous quantification of both T1 and T2 maps of myocardium. Newer studies demonstrated that the incorporation of MRI simulations could yield similar results to conventional mapping techniques in the myocardium. However, these simulation-based quantitative MR techniques usually compare the in-vivo T1 estimates against less accurate T1 techniques, whereas they present inconsistencies between simulation studies, phantom and in-vivo measurements. Moreover, these studies do not investigate the effect of Magnetization Transfer on the myocardial T1 and T2 estimates but are usually validated on phantoms where the MT effect is small.

The main aim of this study was to perform simultaneous mapping of the native T1 and T2 of the myocardium through the utilization of a modified MOLLI pulse sequence and the incorporation of advanced MR simulations through the SQUAREMR framework. A second aim of this study was to investigate the effect of MT on simulation-based quantitative MR techniques.

A conventional MOLLI pulse sequence was modified so as to present combined high T2 sensitivity and low MT effect. The new technique was applied in healthy volunteers and demonstrated an improved T1 accuracy compared to the conventional MOLLI and a T2 accuracy similar to the one provided by the T2prep-bSSFP method. The effect of MT on T1 and T2 estimates was also investigated in the current study. Phantoms with an increasing MT effect as well as phantoms without an MT effect were included in this work whereas