Camargo et al. Journal of Cardiovascular Magnetic Resonance 2013, 15(Suppl 1):W8
http://www.jcmr-online.com/content/15/S1/W8

Journal of Cardiovascular Magnetic Resonance

WORKSHOP PRESENTATION Open Access

Myocardial iron quantification using modified Look-Locker inversion recovery (MOLLI) T1 mapping at 3 Tesla

GC Camargo[1*], T Rothstein[1], FP Junqueira[1], E Fernandes[1], RL Lima[1], A Greiser[4], R Strecker[5], JA Lima[2], SS Xavier[3], I Gottlieb[1]

From 16th Annual SCMR Scientific Sessions
San Francisco, CA, USA. 31 January - 3 February 2013

Background

Quantification of myocardial iron overload is critical for the management of patients with hemochromatosis. The effects of excess iron on T1 and T2* relaxation times correlate directly with tissue iron concentration. T2* became the clinical standard at 1.5T as it can be easily obtained in a fast one breath-hold ECG gated multi-echo GRE sequence. At 3T, however, T2* quantification can be limited by pronounced susceptibility artifacts and signal sampling restraints due to shorter T2* times at higher iron concentrations . Since myocardial T1 time is up to thirty times longer than T2*, it can be quantified with short echo-time inversion-recovery sequences even at high iron concentrations, and is less sensitive to susceptibility artifacts. We aimed to validate a recently developed modified Look-Locker inversion recovery (MOLLI) sequence to quantify myocardial T1 in healthy controls and patients with iron overload at 3T, comparing to standard GRE based multi-echo T2* times at 1.5T.

Methods

A total of 15 normal volunteers and 7 chronic anemia patients (with a myocardial T2* measure <20 ms at 1.5T in the last 2 years, five of these on iron chelating therapy) were prospectively enrolled. Myocardial T2* and T1 times were quantified in the same day, the former using a breath-hold multi-echo GRE sequence at 1.5T (Symphony, Siemens, Erlangen, Germany) and the latter using the T1 mapping -MOLLI sequence at 3T (Verio, Siemens, Erlangen, Germany). All ROIs were placed at mid-interventricular septum, carefully avoiding the blood pool (Fig 1). All analyses were blinded.

Results

All patients had regular heart rhythm and all MRI exams showed diagnostic image quality. Volunteers and patients had significantly different mean myocardial T2* (27.2 ms +/- 3.9 vs. 15.4 ms +/- 6.3 $p<0.05$ respectively) and T1 times 1175.7 ms +/- 22.8 vs. 952.1 ms +/- 173.2 $p<0.05$ respectively). 3T T1 times strongly correlated with 1.5T T2* times ($r=0.95$ and Fig 2). Using the 3T T1 cut-off of 1130 ms, sensitivity and specificity for 3T

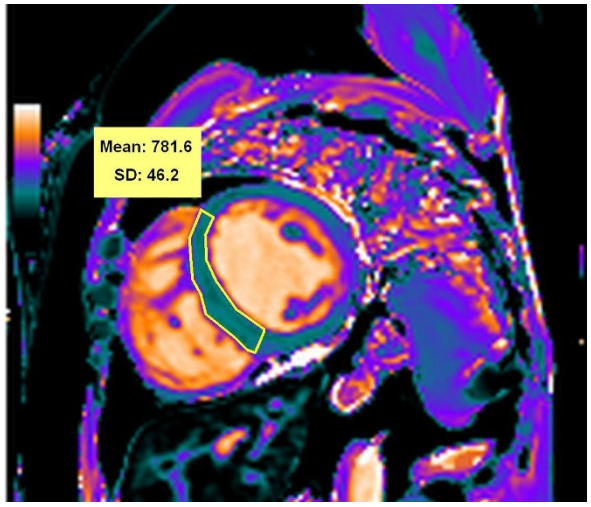

Figure 1 T1 map at 3T of a patient with iron overload showing reduced T1 time within the interventricular septum (781.6 ms), in agreement with a significantly reduced T2* time at 1.5T (8.5 ms - not shown).

[1]CDPI - Clínica de Diagnóstico por Imagem, Rio de Janeiro, Brazil
Full list of author information is available at the end of the article

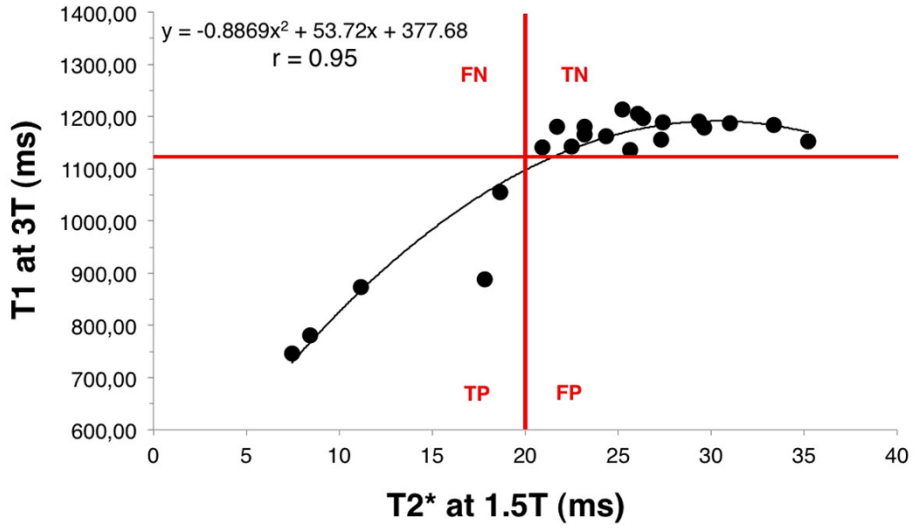

Figure 2 Correlation curve between T1 at 3T and T2* at 1.5T. The whole data were best fitted by a quadratic curve with r=0.95. Red lines delimitate true positives (TP), true negatives (TN), false positives (FP) and false negatives (FN) based on a T1 cutpoint of 1130 ms for the prediction of a T2* < 20 ms.

T1 to predict a T2*<20 ms at 1.5T (standard reference) were both 100%.

Conclusions

Myocardial T1 value obtained with a MOLLI sequence has excellent iron quantification capability at 3T.

Funding

Internal.

Author details

[1]CDPI - Clínica de Diagnóstico por Imagem, Rio de Janeiro, Brazil. [2]Medicine/Cardiology, Johns Hopkins University, Baltimore, MD, USA. [3]Cardiology, Hospital Universitário Clementino Fraga Filho - UFRJ, Rio de Janeiro, RJ, Brazil. [4]Siemens Healthcare, Erlangen, Germany. [5]Siemens LTDA, Sao Paulo, SP, Brazil.

Published: 30 January 2013

doi:10.1186/1532-429X-15-S1-W8
Cite this article as: Camargo *et al.*: Myocardial iron quantification using modified Look-Locker inversion recovery (MOLLI) T1 mapping at 3 Tesla. *Journal of Cardiovascular Magnetic Resonance* 2013 **15**(Suppl 1):W8.