

MODERATED POSTER PRESENTATION

Open Access

Free-breathing T_2 mapping at 3T for the monitoring of cardiac allograft rejection: initial results

Ruud B van Heeswijk^{1,2*}, Gabriella Vincenti^{3,4}, Pierre Monney^{3,4}, Jihen Kourda⁵, Samuel Rotman⁵, Matthias Stuber^{1,2}, Juerg Schwitler^{3,4}, Roger Hullin³

From 17th Annual SCMR Scientific Sessions
New Orleans, LA, USA. 16-19 January 2014

Background

After orthotopic heart transplantation, acute allograft rejection can lead to loss of function. Histological reading of endomyocardial biopsy remains the “gold standard” for guiding immunosuppression, despite its methodological limitations (sampling error and interobserver variability). The measurement of the T_2 relaxation time has been suggested for detection of allograft rejection, on the

pathophysiological basis that the T_2 relaxation time prolongs with local edema resulting from acute allograft rejection. Using breath-held cardiac magnetic resonance T_2 mapping at 1.5T, Usman et al. (CircCardiovascImaging2012) detected moderate allograft rejection (grade 2R, ISHLT 2004). With modern immunosuppression grade 2R rejection has become a rare event, but the need remains for a technique that permits the discrimination of absent

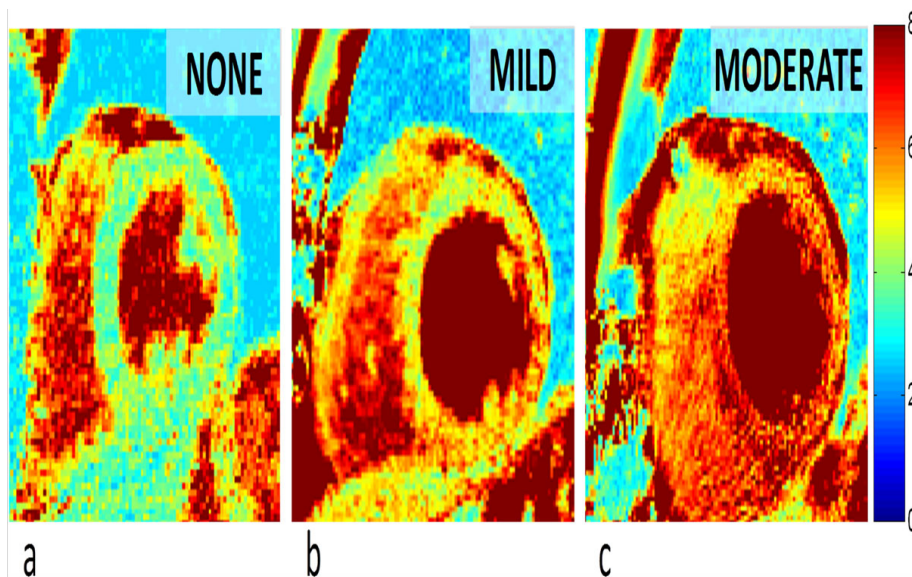


Figure 1 Mid-ventricular short-axis T_2 maps of varying degrees of rejection. The color bar (right side) indicates the T_2 values in ms. a) No rejection (0R) in a 39-year-old female. b) Mild rejection (1R) in a 61-year-old male. c) Moderate rejection in a 66-year-old male.

¹Department of Radiology, University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland

Full list of author information is available at the end of the article

(grade 0R) and mild rejection (grade 1R). We therefore investigated whether an increase of magnetic field strength to 3T and the use of real-time navigator-gated respiration compensation allow for an increase in the sensitivity of T_2 relaxation time detection that is necessary to achieve this discrimination.

Methods

Eighteen patients received EMB (Tan et al., ArchPathol-LabMed2007) and cardiac T_2 mapping on the same day. Reading of T_2 maps was blinded to the histological results. For final analysis, 3 cases with known 2R rejection at the time of T_2 mapping were added, yielding 21 T_2 mapping sessions. A respiration-navigator-gated radial gradient-recalled-echo pulse sequence (resolution 1.17 mm², matrix 2562, trigger time 3 heartbeats, T_2 preparation duration $TET_2Prep = 60/30/0$ ms) was applied to obtain 3 short-axis T_2 maps (van Heeswijk et al., JACCCardiovascImaging2012), which were segmented according to AHA guidelines (Cerqueira et al, Circulation2001). The highest segmental T_2 values were grouped according to histological rejection grade and differences were analyzed by Student's t-test, except for the non-blinded cases with 2R rejection. The degree of discrimination was determined using the Spearman's ranked correlation test.

Results

The high-quality T_2 maps allowed for visual differentiation of the rejection degrees (Figure 1), and the correlation of T_2 mapping with the histological grade of acute cellular rejection was significant (Spearman's $\rho = 0.56$, $p = 0.007$). The 0R ($n = 15$) and 1R ($n = 3$) degrees demonstrated

significantly different T_2 values (46.9 ± 5.0 and 54.3 ± 3.0 ms, $p = 0.02$, Figure 2). Cases with 2R rejection showed clear T_2 elevation ($T_2 = 60.3 \pm 16.2$ ms).

Conclusions

This pilot study demonstrates that non-invasive free-breathing cardiac T_2 mapping at 3T discriminates between no and mild cardiac allograft rejection. Confirmation of these encouraging results in a larger cohort should consider a study able to show equivalency or superiority of T_2 mapping.

Funding

Emma Muschamp Foundation (RBvH), Swiss National Science Foundation (RH, 320030_147121/1).

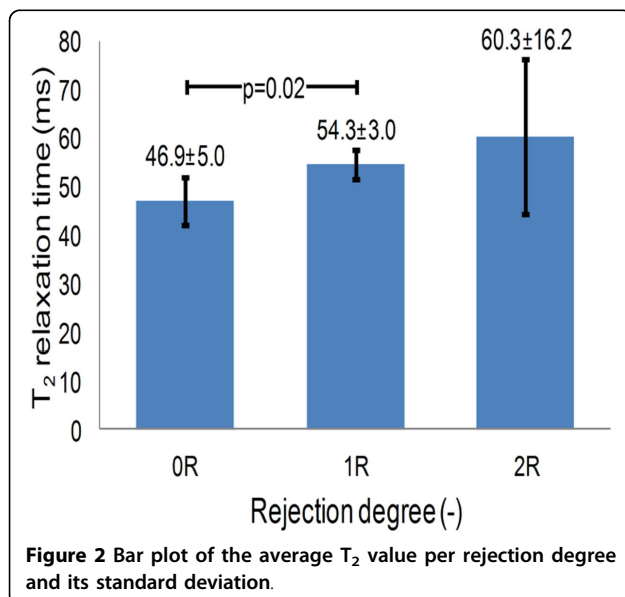
Authors' details

¹Department of Radiology, University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland. ²Center for Biomedical Imaging (CIBM), Lausanne and Geneva, Switzerland. ³Cardiology Service, Department of Internal Medicine, University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland. ⁴Center for Cardiac Magnetic Resonance (CRMC), University Hospital of Lausanne (CHUV), Lausanne, Switzerland. ⁵Institute of Pathology, University Hospital (CHUV) and University of Lausanne (UNIL), Lausanne, Switzerland.

Published: 16 January 2014

doi:10.1186/1532-429X-16-S1-M11

Cite this article as: van Heeswijk et al.: Free-breathing T_2 mapping at 3T for the monitoring of cardiac allograft rejection: initial results. *Journal of Cardiovascular Magnetic Resonance* 2014 **16**(Suppl 1):M11.



Submit your next manuscript to BioMed Central and take full advantage of:

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at
www.biomedcentral.com/submit

