

**MODERATED POSTER PRESENTATION**

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

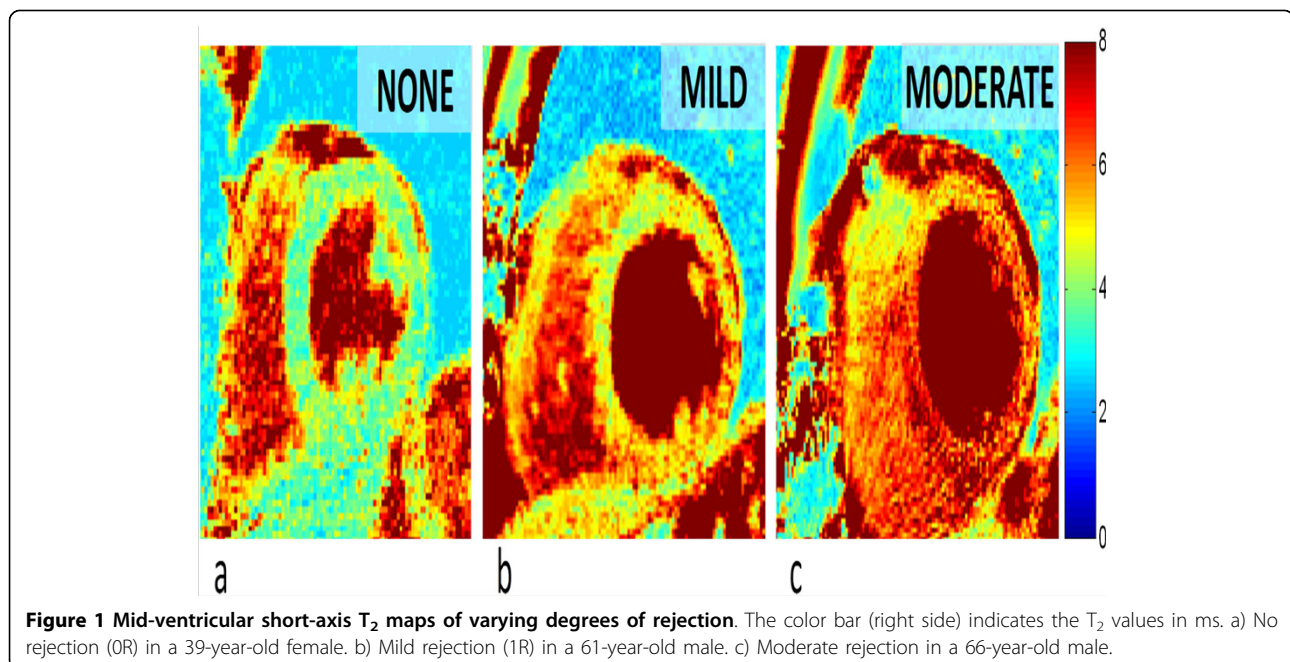
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## Background

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



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(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 mm<sup>2</sup>, 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 ( $46.9 \pm 5.0$  and  $54.3 \pm 3.0$  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.

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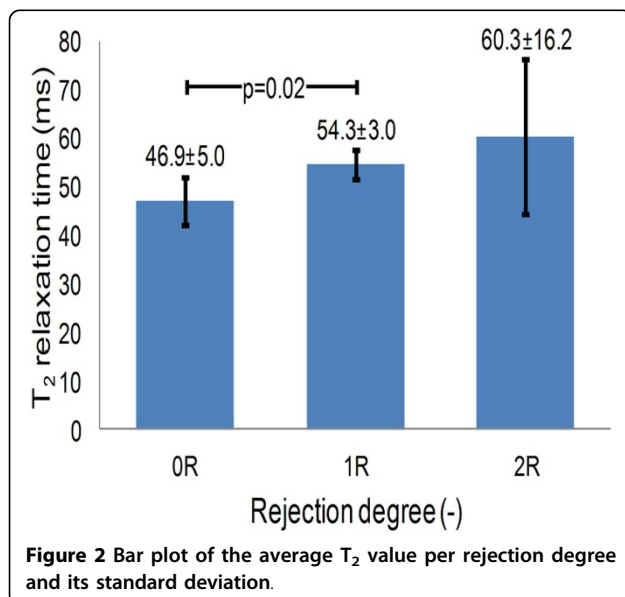
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