

**WALKING POSTER PRESENTATION**

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# Fast, whole-heart, free-breathing 3D T<sub>2</sub> mapping at 3T with application to myocardial edema imaging

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## Background

Cardiac MRI (CMR) T<sub>2</sub> mapping is a proven method for myocardial edema detection. However, the current approach requires multiple breath-holds and can take nearly 10-15 minutes to complete. Faster acquisitions could potentially improve patient comfort and cost-effectiveness of CMR exams. The objective of this study is to develop and test a free-breathing, three-dimensional, cardiac MR approach which can yield fast, accurate, T<sub>2</sub> maps of the whole left ventricle at 3T.

## Methods

We developed an ECG-triggered, free-breathing, T<sub>2</sub>-prepared, three-dimensional gradient-echo acquisitions with different echo times (0, 24, 55 ms) with near perfect navigator efficiency on a clinical 3T system. The proposed approach was tested and validated in ex-vivo porcine hearts, healthy volunteers and canines with reperfused acute myocardial infarction (rAMI). On the basis of the navigator signals, images were corrected for respiratory motion and were fit to a mono-exponential function to derive T<sub>2</sub> maps of the whole left-ventricular myocardium.

## Results

Ex-vivo myocardial T<sub>2</sub> values of the proposed approach (3D FB MoCo) were not different from standard 2D approaches (all  $p < 0.05$ ):  $48.7 \pm 0.9$  ms (3D FB MoCo) vs.  $48.2 \pm 0.6$  ms (2D spin echo) and  $47.5 \pm 0.8$  ms (2D T<sub>2</sub>-prepared bSSFP (T<sub>2</sub>-prep bSSFP)). In healthy volunteers, compared to 3D FB MoCo and 2D BH, myocardial T<sub>2</sub>

maps, 3D FB Non-MoCo T<sub>2</sub> myocardial maps showed longer T<sub>2</sub> values ( $p < 0.05$ ), larger coefficient-of-variations (COV) in T<sub>2</sub> ( $p < 0.05$ ), and lower image quality ( $p < 0.05$ ). Conversely, the mean and COV in myocardial T<sub>2</sub> and image quality of 2D BH and 3D FB MoCo T<sub>2</sub> were not different ( $p = 0.99$ ,  $p = 0.74$ ,  $p = 0.14$ , respectively). In canines with rAMI, edema volumes measured from 2D BH and 3D FB MoCo T<sub>2</sub> maps were closely correlated (both  $R^2 = 0.97$  and  $p < 0.05$ ). In Bland-Altman analysis, mean T<sub>2</sub> of edematous and remote zones and edema volumes were within the limits of agreement (bias in T<sub>2</sub> = 0.4 ms and edema volume = 0.9%).

## Conclusions

The proposed free-breathing, three-dimensional T<sub>2</sub> mapping approach at 3T enabled whole-heart acquisitions within 5 minutes with an accuracy in T<sub>2</sub> not different from that of the state-of-the-art breath-held T<sub>2</sub> mapping approach.

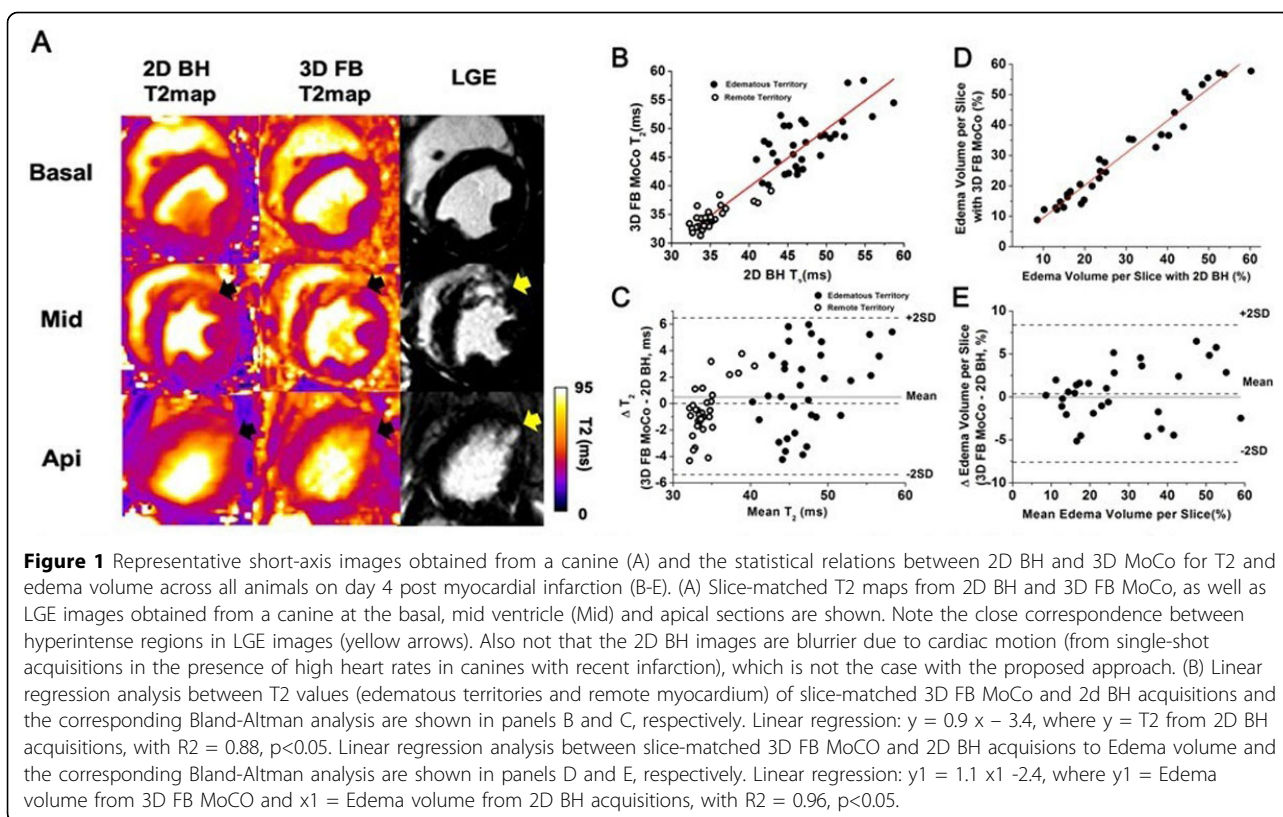
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