Journal of Cardiovascular Magnetic Resonance

BioMed Central

Poster presentation

Open Access

Measurement of myocardial triglyceride content by magnetic resonance spectroscopy in transplant native heart autopsies

Chia-Ying Liu*[1], Alban Redheuil[1], Charles Steenbergen[2], Joao Lima[1] and David Bluemke[3]

Address: [1]The Johns Hopkins Hospital, Department of Medicine, Division of Cardiology and Radiology, Baltimore, MD, USA, [2]The Johns Hopkins Hospital, Department of Pathology, Baltimore, MD, USA and [3]Radiology and Imaging Sciences, National Institutes of Health, Bethesda, MD, USA

* Corresponding author

from 13th Annual SCMR Scientific Sessions
Phoenix, AZ, USA. 21-24 January 2010

Published: 21 January 2010

Journal of Cardiovascular Magnetic Resonance 2010, **12**(Suppl 1):P125 doi:10.1186/1532-429X-12-S1-P125

This abstract is available from: http://jcmr-online.com/content/12/S1/P125

Introduction

Cardiac dysfunction has been associated with excessive myocardial lipolysis in animal models. Measurements of myocardial triglycerides in humans have been performed using proton MR spectroscopy (1H-MRS) [1,2]. The measured volume is usually selected within the ventricular septum to avoid the contamination from epicardial fat and to eliminate the artifacts from cardiac motion. It is difficult to assess the spatial distribution of the fat deposition in human myocardium by 1H-MRS. Hence, whether the fat content within the septum can be generalized to represent the whole cardiac tissue remains unknown.

Purpose

We performed 1H-MRS on transplant native heart autopsies to study the distribution of myocardial triglycerides by placing the voxel in different myocardial regions in the samples. The T1 maps were also acquired to examine the cross-sectional relation between myocardial triglyceride content and T1 values.

Methods

MRI/MRS studies were performed using a 3.0 T scanner (TrioTim, Siemens) on three fixed explanted hearts prior to transplantation: one with myocardial infarction (MI), and two with dilated cardiomyopathy (Myo1, 2). 1H-MRS was obtained with 6-8 ml voxels positioned in the samples as illustrated in Fig.1. MRS was performed with water suppressed and unsuppressed PRESS, TR/TE = 550/30 ms, 64 averages. Fat content was quantified with Amares/jMRUI and related to water in the unsuppressed spectra. T1 mapping was acquired using a modified Look-Locker inversion recovery sequence (MOLLI, SSFP, 35°, 240 × 180, 20 cm FOV) [3].

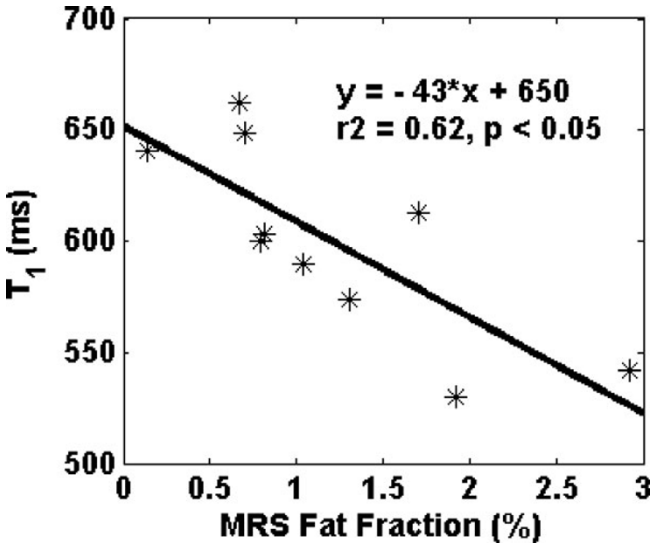

Figure 1

Table 1: Fat/Water fractions measured in different regions in the samples.

F/W(%)	MI	Myo1	Myo2
Lateral (1)	0.14	0.6	1.05
Posterior (2)	0.67	0.7	3.01
Septum (3)	9.23	0.82	1.33
Anterior (4)	1.74	0.79	1.96
RV (5)	6.14		172
Epicardial (6)	227		

Results

Fat/Water fractions from different regions of the slices are summarized in Table 1. Note the 9.23% fat deposition in the septum of MI, which indicated partial fatty replacement within the chronicle scar. The fat distributions were heterogeneous in MI and Myo2, while relatively uniform in Myo1. The RV fat content was high in MI and reached 172% in Myo2. The RV fat fraction in Myo1 was not measured due to a thin RV wall. The T1 values were significantly inversely correlated to the Fat/Water ratios as shown in Fig.2.

Conclusion

This study shows the distribution of myocardial triglycerides is heterogeneous in diseased hearts. The conventional procedure of voxel positioning in the septum for MRS is thus likely to only show moderate correlation with overall cardiac steatosis. These results suggest T1 mapping might provide a qualitative index for estimation of relative fat content in combination with the single voxel MRS measurement in the septum.

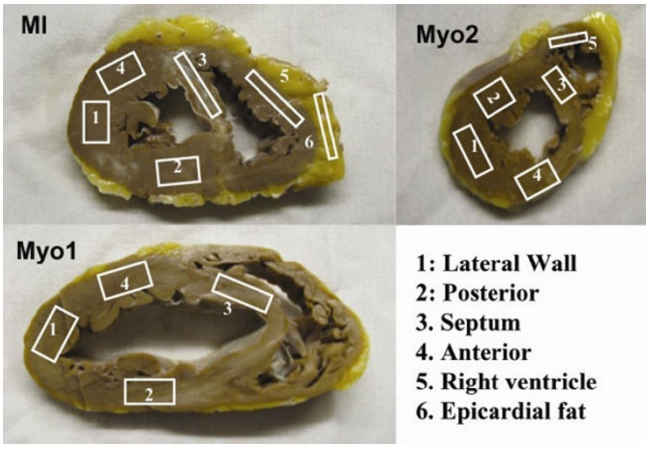

Figure 2

References

1. Szczepaniak LS, *et al.*: *Circ Res* 2007, **101:**759-767.
2. Meer RW van der, *et al.*: *Diabetes* 2007, **56:**2849-2853.
3. Messroghli DR, *et al.*: *MRM* 2004, **52:**141-146.