Relationship between cardiac magnetic resonance derived extracellular volume fraction and myocardial strain in patients with non-ischemic dilated cardiomyopathy

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Background: The feature tracking (FT) technique has been proposed as a robust method to evaluate the myocardial strain using conventional cine magnetic resonance imaging (MRI) of the left ventricle. Data is limited regarding the relationship between FT-derived myocardial strain and diffuse myocardial fibrosis evaluated by T1 mapping in patients with non-ischemic dilated cardiomyopathy (NIDCM).

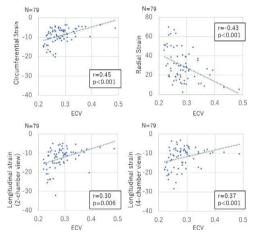
Purpose: The aim of this study was to evaluate the correlation between extracellular volume (ECV) by T1 mapping and myocardial strain by FT in patients with NIDCM.

Methods: A total of sixty-four patients with NIDCM (62±12 years) and 15 controls (62±11 years) were studied. Using a 1.5T MR scanner, pre- and post- T1 mapping images of LV wall at mid-ventricular level was acquired to calculate ECV by modified Look-Locker inversion recovery (MOLLI) sequence. Radial strain (RS), circumferential strain (CS) and longitudinal strain (LS) was assessed by FT technique. ECV and myocardial strain were compared using a 6-segment model at mid-ventricular level.

Results: Compared to the controls, the NIDCM patients had a significantly

higher ECV (0.30 \pm 0.02 vs. 0.24 \pm 0.01, p<0.001) and impaired myocardial strain (RS, 24.2 \pm 3.0 vs. 52.2 \pm 6.2, p<0.001; CS, -7.5 \pm 2.1 vs. -15.3 \pm 2.2, p<0.001; LS -10.4 \pm 3.5 vs. -20.2 \pm 4.7, p<0.001, respectively). Similar results were obtained when comparing all 6 myocardial segments (segment 7–12) (all p values <0.001). In a segment-based analysis, a significant positive correlation was found between the ECV and CS (r=0.26 to 0.41; all p values <0.05), a negative correlation was found between the ECV and RS (r=-0.31 to -0.41; all p values <0.05). In a patient-based analysis, there were significant positive correlations between the ECV and CS (r=0.45, p<0.001), ECV and LS from 2-chamber view (r=0.30, p=0.006), ECV and LS from 4-chamber view (r=0.37, p<0.001). There was a significant negative correlation between the ECV and RS (r=-0.43, p<0.001) (FIGURE)

Conclusions: In NIDCM patients, severity of myocardial fibrosis evaluated by T1 mapping is associated with impaired myocardial strain by FT technique.



Correlation between the ECV and strain