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MRI morphological and functional method for clear distinction of patients with left ventricular non-compaction, inflammatory dilated cardiomyopathy and physiological myocardial trabeculation

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Background

Left ventricular non-compaction (LVNC) cardiomyopathy is characterized by a thin, compacted epimyocardial and a thick non-compacted, trabeculated endomyocardial layer. High-resolution cardiac magnetic resonance imaging (CMR) has been clinically successfully used to establish a Non-compact-to-compact- (NCTC) ratio of 2.3 in a 4-chamber view which is regarded pathological. Clinically, in patients with dilated cardiomyopathy (DCMP) and noticeably even in volunteers with physiological myocardial trabecularisation, up to 28% of verifiably healthy participants demonstrated the NCTC-ratio ≥ 2.3 so that there is a clinical need for a better distinction between patients with LVNC, DCMP and healthy subjects.

We hypothesized that MRI is able to clearly distinguish LVNC from DCMP and healthy volunteers by a novel combined MRI and statistical approach of morphological and functional parameters.

Methods

31 LVNC patients, defined by an MRI NCTC-ratio >2.3 (in a 4-chamber view plus one additional parameter (fulfilment of echo-criteria, histology, genetic proof, invasive X-ray), 13 patients with histologically proven inflammatory DCMP as well as 117 male/female healthy volunteers were studied employing a vector-ECG gated multislice 2-, 3-, 4-chamber and short axis (SA) standard cine SSFP-sequence covering the entire left ventricle. Functional parameters like end-diastolic, end-systolic volumes and ejection fraction were generated via SA SSFP slices as usual. Compacted and non-compacted

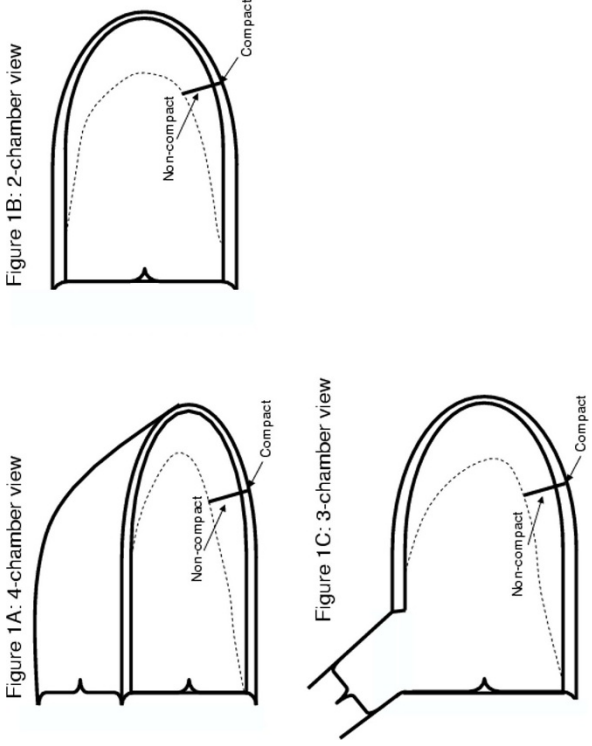

Figure 1

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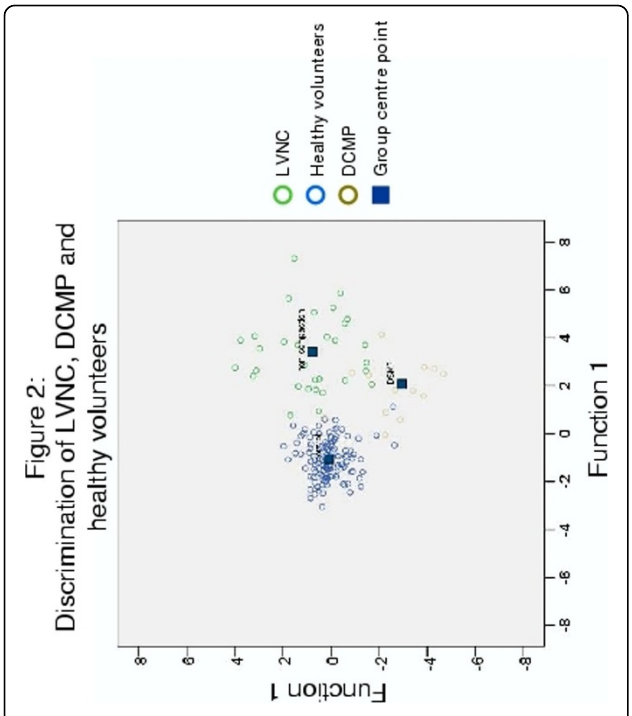

Figure 2

thicknesses were defined in 2-,3-,4-chamber views as illustrated in Figure 1A-C, as previously published. With a stepwise discriminant analysis, statistically significant morphological and functional predictors for clear distinction of LVNC, DCMP and physiological trabeculation were found and were successfully cross-validated with a jackknife procedure.

Results

Six predictors were determined to improve correct prediction: ejection fraction, compact thicknesses in 2- and 4-chamber views, NCTC-ratios in 2-and 4-chamber views and the non-compacted thickness in 3-chamber views. The combination of these six predictors led to a correct categorisation in 93% of cases which can be seen from Figure 2.

Conclusions

The correct identification of patients with cardiomyopathies and their clear distinction from healthy volunteers is clinically and therapeutically as well as socio-economically of paramount importance. By simple combination of values for ejection fraction, compact thicknesses in 2- and 4-chamber views, NCTC-ratios in 2-and 4-chamber views and the non-compacted thickness in 3-chamber views, we present a method that sufficiently distincts LVNC and DCMP patients from healthy volunteers. Prospective clinical trials have to be conducted to validate this approach in the future.

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