

ORAL PRESENTATION

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The association between ECV and microcirculation perfusion abnormalities in non-ischemic dilated cardiomyopathy

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Background

Myocardial fibrosis and abnormalities of the microcirculation are features of non-ischemic dilated cardiomyopathy (DCM) and may contribute to adverse remodeling. However, relationship between perfusion abnormalities and diffuse fibrosis has not been fully characterised. CMR allows quantification of the extracellular volume fraction (ECV), a marker of fibrosis, and absolute myocardial blood flow, in a single study. We hypothesised that increased ECV was associated with impaired myocardial perfusion reserve (MPR) in DCM patients.

Methods

Consecutive DCM patients referred for a clinical CMR study and age/gender-matched controls were prospectively enrolled. All subjects underwent CMR (1.5T Siemens Avanto) according to a standardized protocol which included T1-mapping and first-pass perfusion imaging. Mid-ventricular short-axis T1-parameter maps were acquired using a Modified Look-Locker Inversion recovery sequence prior to contrast and 20 minutes after gadolinium administration (Gadobutrol 0.1 mmol/kg). The pre- and post-contrast T1-maps were co-registered and using the haematocrit, an ECV map generated (Figure 1). CMR first-pass perfusion imaging was performed using a hybrid echo-planar-imaging sequence at the corresponding T1-map slice position during adenosine-induced hyperemia (140 µg/kg/min) and 30 minutes later at rest. Myocardial perfusion reserve (MPR) was calculated from absolute

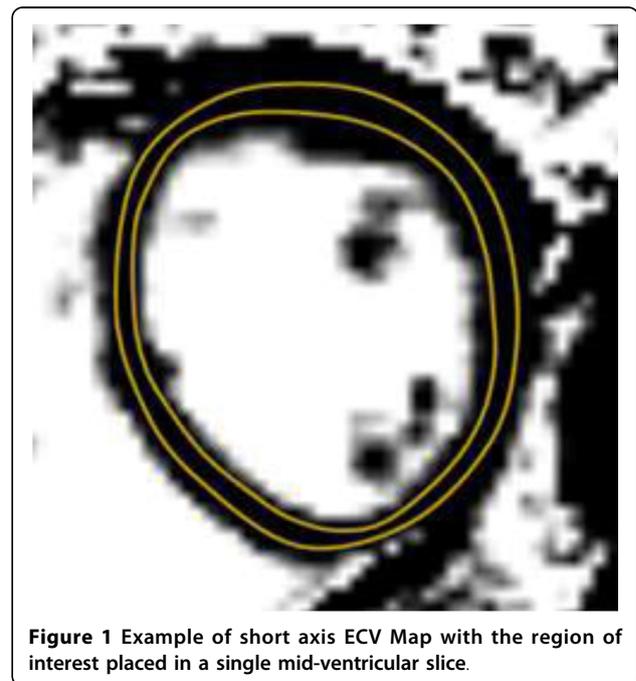


Figure 1 Example of short axis ECV Map with the region of interest placed in a single mid-ventricular slice.

stress and rest global myocardial blood flow quantified by a Fermi-constrained deconvolution algorithm.

Results

Thirty two DCM patients (25 male, mean age 49 ± 15 yrs, mean left ventricular ejection fraction [LVEF] $38 \pm 11\%$) and 28 controls (17 male, mean age 47 ± 13 yrs, mean LVEF $68 \pm 5\%$) were studied. Baseline clinical and CMR data are summarized in Table 1. Patients with DCM had a

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Table 1 Baseline Clinical and CMR Characteristics

Characteristic	DCM (n = 32)	Control (n = 28)	p-value
Age (years)	49	47	0.552
Male (n)	25	17	0.167
Heart rate (bpm)	74	62	0.001
Systolic BP (mmHg)	122	120	0.701
Diastolic BP (mmHg)	74	76	0.626
LV-EDVi (mL/m ²)	149	82	< 0.001
LV-ESVi (mL/m ²)	96	26	< 0.001
LVEF (%)	38	68	< 0.001
LVMI (g/m ²)	91	28	< 0.001

Beats per minute (bpm); blood pressure (BP); dilated cardiomyopathy (DCM); indexed left ventricular end-diastolic volume (LV-EDVi); indexed left ventricular end-systolic volume (LV-ESVi); left ventricular ejection fraction (LVEF); indexed left ventricular mass index (LVMI)

significantly higher ECV (mean \pm SD $28.7 \pm 3.6\%$ vs $25.7 \pm 3.4\%$, $p < 0.001$). 6 (18%) DCM patients had an ECV more than 2 SD above the control group. DCM patients had a lower MPR compared to controls (1.73 ± 0.63 vs 2.53 ± 0.81 , $p < 0.001$). Linear regression analysis demonstrated a significant but weak association between ECV and MPR ($B = -1.2$, 95% CI -2.36 to -0.04 , $R^2 = 0.07$, $p < 0.001$).

Conclusions

ECV is raised and MPR is impaired in DCM. There is a significant but weak association between these two parameters. Further work is required to assess if a temporal relationship exists between MPR and ECV, as well whether they individually correlate with markers of disease severity.

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