Meeting abstract

1001 Greater degree of left ventricular scar is associated with increased mortality in patients with severe ischemic cardiomyopathy

Deborah H Kwonf*, Carmel H Halley, Thomas P Carrigan, Randolph Setser, Victoria Zysek, Zoran B Popovic Paul Schoenhagen, Randall C Starling, Scott Flamm and Milind Y Desai

Address: Cleveland Clinic Foundation, Cleveland, OH, USA

* Corresponding author

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Background
Patients with ischemic cardiomyopathy (ICM) have reduced survival. Delayed hyperenhancement magnetic resonance imaging (DHE-MRI) accurately measures myocardial scar. We sought to determine if extent of left ventricular (LV) scar is associated with survival in severe ICM patients.

Methods
349 patients with severe ICM >/= 70% coronary artery disease in >/= 1 epicardial vessel on angiography, mean LV ejection fraction (EF) of 24%] that underwent DHE-MRI (Siemens 1.5 T scanner, Erlangen, Germany) from 2003–6 were studied. (Siemens, Erlangen, Germany) from 2005–6. DHE-MR images were obtained in standard long and short axis orientations (covering the entire LV), after injection of Gadolinium dimenglumine using an inversion recovery spoiled gradient echo sequence: TE 4 msec, TR 8 msec, flip angle 300, bandwidth 140 Hz/pixel, 23 k-space lines acquired every other RR-interval, field of view (varied from 228–330 in the x-direction and 260–330 in the y-direction) and matrix size (varied from 140–180 in the x-direction and 256 in the y-direction). For DHE-MRI analysis, a custom analysis package (VPT software, Siemens, Erlangen, Germany) was used to manually delineate endocardial and epicardial myocardial edges. Scar was defined (as % of myocardium in a 17-segment model on custom software, Siemens Research) on DHE-MR images, as intensity > 2 standard deviation above viable myocardium. Transmurality score was recorded in all segments as follows: 0 = no scar, 1 = 1–25% scar, 2 = 26–50%, 3 = 51–75% and 4 = > 75%. Total scar score was calculated as transmurality score for all segments/17. LV volumes, EF, demographics, risk factors, need for cardiac transplantation (CTx) and all-cause mortality were recorded. Figure 1.

Results
There were 56 combined events (51 deaths and 5 CTx) over a follow up of 2.6 ± 1.2 years. Characteristics of patients with and without events is shown in the table in Figure 2. On receiver operating characteristic curve analysis, mean scar % predicted events (area under curve 0.62, p median of 2.3 (RR 1.96 [1.13–3.41]) and female gender (RR 1.83 [1.06–3.16]) predicted events (both p < 0.05).

Conclusion
In ICM patients with severely reduced LVEF, greater extent of myocardial scar on DHE-MRI is associated with worse outcomes, including mortality or need for cardiac transplantation.
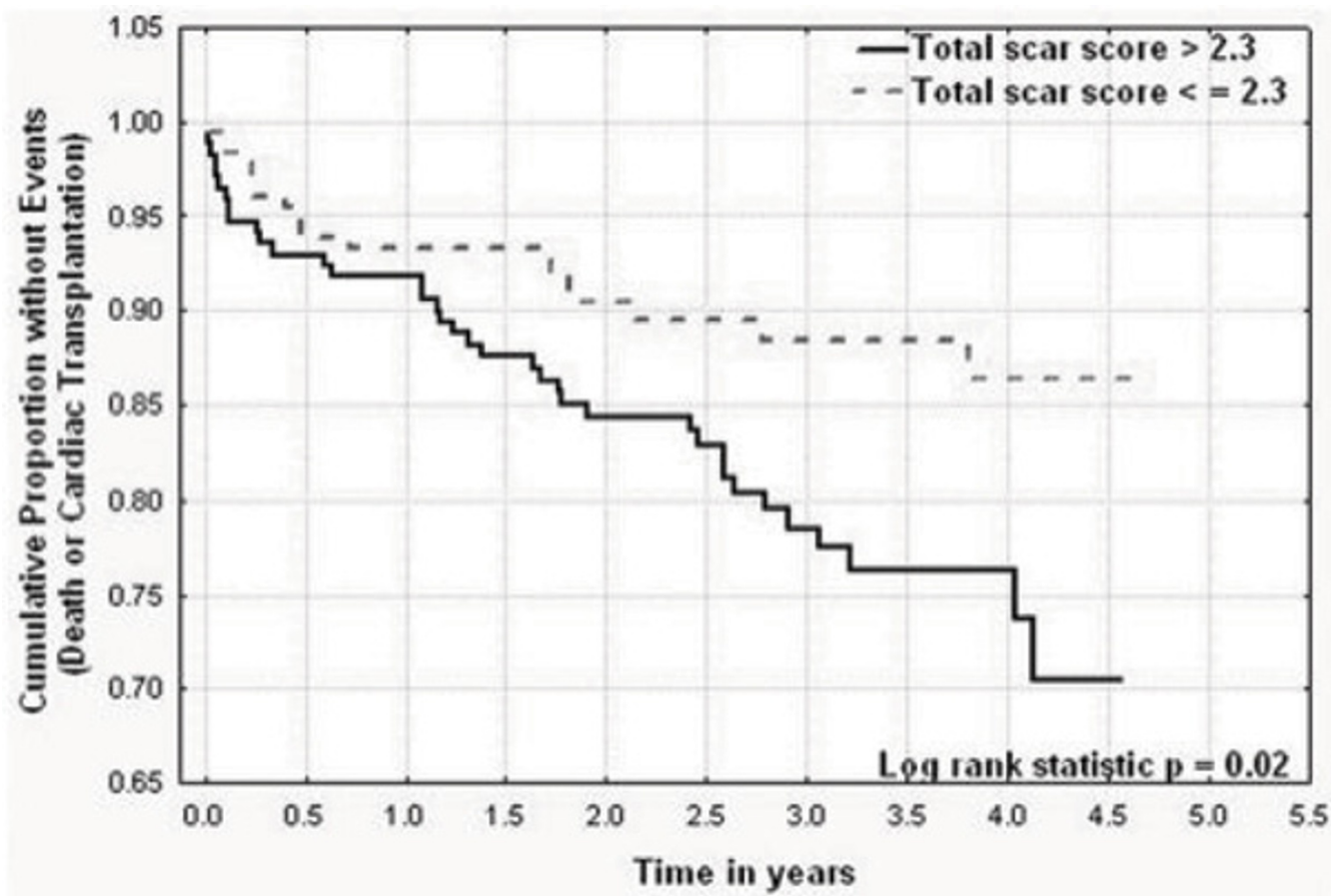
Figure 1

Total n = 349	No events (n=293)	Events (death or cardiac transplantation) (n=56)	P value
Age	65 ± 11	67 ± 11	0.17
Male*	229 (78%)	33 (64%)	< 0.05
Hypertension	110 (38%)	17 (30%)	0.30
Diabetes Mellitus	84 (28%)	15 (27%)	0.77
Documented myocardial infarction	23 (8%)	6 (11%)	0.49
History of prior coronary artery bypass grafting	27 (9%)	2 (4 %)	0.12
Statins	165 (56%)	24 (43%)	0.06
Beta-Blockers*	176 (60%)	25 (45%)	0.03
ACE inhibitors	141 (48%)	22 (39%)	0.22
Left ventricular ejection fraction (%)	24 ± 8	23 ± 7	0.39
Left ventricular end diastolic volume (ml)	227 ± 100	235 ± 127	0.67
Left ventricular end systolic volume (ml)	130 ± 83	141 ± 109	0.48
Post CMR coronary revascularization	75 (26%)	14 (25%)	0.93
Post CMR ICD or CRT	82 (28%)	13 (23 %)	0.47
Mean scar % on DHE-MRI*	30 ± 20	39 ± 22	0.002
Transmurality score on DHE-MRI*	7.8 ± 5	9.7 ± 5	0.004
Total scar score on DHE-MRI*	2.0 ± 1.1	2.5 ± 1.1	0.004

ACE: angiotensin converting enzyme, CMR: cardiac magnetic resonance, DHE-MRI: delayed hyper-enhancement magnetic resonance imaging, ICD: implantable cardioverter defibrillator, CRT: cardiac resynchronization therapy using biventricular pacemaker

Figure 2
Characteristics of patients with and without events.