SUPPLEMENTARY DATA

Analysis of extracellular volume using T1 mapping

In T1 myocardial mapping, after a preparation pulse sequence, signal recovery from each voxel is sampled during multiple measurements. The associated T1 relaxation time is derived for each pixel, and a parametric image is reconstructed, which is named as the T1 map. Midcavity short-axis section orientations were used for T1 mapping using a modified Look-Locker inversion recovery (MOLLI) technique. The MOLLI single slice T1 determinations were performed before contrast as previously described(1). All source images have identical voxel sizes, image position, and phase of cardiac cycle except for different effective inversion times.

MOLLI data were processed offline using the MASS research software (MASS V2010-EXP; Leiden University Medical Center, Leiden, The Netherlands) with Levenberg–Marquardt fitting algorithm(2). Left ventricular endocardial and epicardial borders were traced semi-automatically on all phases in each sequence to extract the mean T1 values. Epicardial structures and blood pool were carefully excluded from the contours. Intra- and inter-observer agreement of myocardial T1 times was excellent, with intraclass correlation coefficient ranging from 0.98 to 0.99(3).

Hematocrit was measured in only 643 of the total 1,250 individuals. We calculated the synthetic ECV using the recently described methodology by Treibel et al(4), without measuring the hematocrit. This method was based on observations that hematocrit was correlated with pre-contrast T1 values of the blood pool. We performed an errors-in-variables linear regression between hematocrit as the dependent variable and pre-contrast T1 of the blood pool as the independent variable. A reliability of 0.79 was assumed based on a prior publication that reported the pre-contrast T1 variability using MOLLI. The synthetic hematocrit values were calculated as $HCTsyn = 726.19*(1/_{T1precontrast\ blood}) - 0.07$. These synthetic hematocrit values were then used for measurement of synthetic ECV. The ECVsyn and ECV were highly correlated (ICC = 0.89) and the difference between the two was not significant (mean difference = 0.017%, standard deviation = 1.435, p=0.75). On the basis of these results, synthetic ECV was calculated for all participants.

Analysis of diastolic function using myocardial tagging

Short-axis-tagged slices were analyzed by the harmonic phase method(5). Systolic and post-systolic circumferential strain peaks were assessed from the mid-wall mid-ventricular circumferential strain (Ecc) and strain rates through the cardiac cycle. These were then used to compute SRI and EDSR as previously described(6). Torsion curves were computed as previously described(7) The peak torsion recoil rate (deg/cm/ms) was calculated as the first minimum from the rate curve after peak torsion.

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