Appendix (Methods).

Conventional CMR Protocol. An overview of the thorax was firstly obtained followed by cine acquisitions using a steady state free precession protocol in stack of short axes encompassing the entire LV and 3 long axes (2 chamber view, 4 chamber view and 3 chamber view). A standard MOLLI 5s(3s)3s T1-native sequence in a mid-ventricular short axis view was used to acquire images for T1- Mapping. Similarly, a T2 map mGRASE sequence in mid-ventricular view was used to acquire images for T2-Mapping analysis.

Single-Beat fast-SENC acquisition. Specific for the fast-SENC acquisition, the modulation gradient is applied perpendicular to the slice-selection direction. Thus, circumferential strain from long axis images and longitudinal strain from short axis images. Three short axis (basal, mid and apical) and three long axis (3 chamber, 4 chamber and 2 chamber) acquisitions are performed. Typical imaging parameters are as follows: field-of-view=256×256 mm^2, slice thickness=10 mm, voxel size=4×4×10 mm^3, reconstructed resolution=1×1× 10 mm^3, single-shot spiral readout with flip angle=30°, effective echo time (TE)=0.7ms, repetition time (TR)=12ms, temporal resolution=36ms, typical number of acquired heart phases=22, spectrally selective fat suppression (SPIR), total acquisition time per slice <1s (1)(2).

Analysis of conventional CMR data. The conventional CMR acquisitions, including T1 and T2 Mapping images were imported in a dedicated software (Circle CVI). Interventricular septal wall thickness, LV posterior wall thickness, LV end-diastolic diameters were measured in an apical 3 chamber view ant end-diastole. LV end-systolic diameter was measured in an apical 3 chamber view at end systole. LV end-diastolic and end-systolic volume (LVEDV and LVESV) and LVEF and LV mass were measured using the stack of cine short axis images. MAPSE was measured as the maximum systolic excursion of the mitral annular plane at the level of the lateral wall in an apical 4 chamber view. TAPSE was measured as the maximum systolic excursion of the tricuspid annular plane at the level of the right ventricular free wall.

Image analysis single-Beat fast-SENC acquisition. For the analysis of the fast-SENC images, a dedicated software was used (MyoStrain software, Myocardial Solutions, Inc., Morrisville, North Carolina, USA). The fast-SNEC acquisitions were imported in the dedicated software and the epicardial and endocardial borders were traced at end-systolic. The software performs the tracking of the borders automatically thereafter thought-out the entire cardiac cycle, however the tracing was checked manually as well. Longitudinal strain was calculated using the three short axes fast-SENC images based on a 16-segment model, whereas circumferential strain was extracted from the three fast-SENC long axes acquistions using a 21-segment model. The global longitudinal (GLS) and circumferential (GCS) values for myocardial strain were calculated as an average of the 16 and 21 segments, respectively. Vey low intra- and interobserver variabilities for GLS, GCS and %normal myocardium have been previously demonstrated (2).

Reference list (Appendix)

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