Reproducibility of area at risk assessment in acute myocardial infarction by T1- and T2-mapping sequences in cardiac magnetic resonance imaging in comparison to Tc99m-sestamibi SPECT.

Area at risk (AAR) is an important parameter for the assessment of the salvage area after revascularization in acute myocardial infarction (AMI). By combining AAR assessment by T2-weighted imaging and scar quantification by late gadolinium enhancement imaging cardiovascular magnetic resonance (CMR) offers a promising alternative to the "classical" modality of Tc99m-sestamibi single photon emission tomography (SPECT). Current T2 weighted sequences for edema imaging in CMR are limited by low contrast to noise ratios and motion artifacts. During the last years novel CMR imaging techniques for quantification of acute myocardial injury, particularly the T1-mapping and T2-mapping, have attracted rising attention. But no direct comparison between the different sequences in the setting of AMI or a validation against SPECT has been reported so far. We analyzed 14 patients undergoing primary coronary revascularization in AMI in whom both a pre-intervention Tc99m-sestamibi-SPECT and CMR imaging at a median of 3.4 (interquartile range 3.3-3.6) days after the acute event were performed. Size of AAR was measured by three different non-contrast CMR techniques on corresponding short axis slices: T2-weighted, fat-suppressed turbospin echo sequence (TSE), T2-mapping...
from T2-prepared balanced steady state free precession sequences (T2-MAP) and T1-mapping from modified look locker inversion recovery (MOLLI) sequences. For each CMR sequence, the AAR was quantified by appropriate methods (absolute values for mapping sequences, comparison with remote myocardium for other sequences) and correlated with Tc99m-sestamibi-SPECT. All measurements were performed on a 1.5 Tesla scanner. The size of the AAR assessed by CMR was $28.7 \pm 20.9 \%$ of left ventricular myocardial volume (%LV) for TSE, $45.8 \pm 16.6 \%$LV for T2-MAP, and $40.1 \pm 14.4 \%$LV for MOLLI. AAR assessed by SPECT measured $41.6 \pm 20.7 \%$LV. Correlation analysis revealed best correlation with SPECT for T2-MAP at a T2-threshold of 60 ms (ms) ($\text{slope} = 0.99$, Pearson's $r = 0.94$), and for MOLLI at T1-threshold of 1,075 ms (slope 0.86, $r = 0.91$, Pearson's $r = 0.45$). For the assessment of AAR in AMI, the novel T2-mapping technique correlates best with SPECT size, T1-mapping with MOLLI and standard T2-weighted imaging showed similar good correlations.