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Determination of the area at risk using quantitative T2 mapping in re-perfused myocardial infarction: a comparison with late gadolinium enhancement and CINE imaging

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PURPOSE: To evaluate myocardial edema, representing area at risk (AAR) in re-perfused myocardial infarction (MI) by quantitative T2 mapping and compare the size of AAR with infarcted zone and dysfunctional myocardium.

MATERIALS AND METHODS: Between February 2012, June. 2012, 15 patients with acute MI underwent cardiac MRI after percutaneous primary coronary intervention (PPCI). Acute MI was diagnosed, based on EKG, coronary angiography and cardiac biomarker. In short axis view, every analyzed myocardium was subdivided into 30 sectors evenly using commercially available software (Argus; Siemens Medical Solutions, Erlangen, Germany). On CINE images, sector based myocardial contractility were calculated semi-automatically as a percentage of the systolic LV wall thickening (%, ((LV wall thickness$_{ES}$ LV wall thickness$_{ED}$)/LV wall thickness$_{ED}$) $\times$ 100, ES; end-systole, ED; end-diastole). T2 value of myocardium was measured in each sector. Infarcted zone was defined as hyper-enhanced area on LGE. On T2 mapping, AAR was defined as sectors that had T2 value (ms) > 2SD from remote myocardium. On CINE imaging, dysfunctional myocardium was defined as sectors that had LV wall thickening less than 40% or wall thickening < 80% of remote myocardium. The size (% of involving sector) of infarcted zone, AAR, and dysfunctional myocardium were calculated and then compared.

RESULTS: In all patients, AAR was delineated on T2 map with increased T2 values. The size of infarcted zone was smallest (24.6 $\pm$ 11%) and dysfunctional myocardium was largest (54.6 $\pm$ 10.2%). The size of AAR on T2 map was between infarcted zone and dysfunctional myocardium (42.3 $\pm$ 8%). The size differences (infarcted zone vs. AAR vs. dysfunctional myocardium) were statistically significant one another ($p < 0.05$).

CONCLUSION: T2 map can delineate constantly myocardial edema, representing AAR in acute MI. The size of AAR quantified by T2 mapping was between infarcted zone and dysfunctional myocardium in re-perfused AMI.