MR viability imaging at 3.0 Tesla compared to 1.5 Tesla: Initial results in patients with myocardial infarction

M. Hackenbroch[1], C. Meyer[1], J. Gieseke[1], A. Schmiedel[1], H. Schild[1], T. Sommer[1]
[1]Department of Radiology, University of Bonn, Bonn, Germany

Purpose:

Delayed contrast enhanced MR imaging has been shown to allow assessment of myocardial viability in patients with ischemic heart disease. The current standard approach is a 3D inversion recovery sequence at 1.5 Tesla. The purpose of this study was 1. to evaluate the technical feasibility and clinical utility of MR viability imaging at 3.0 Tesla in patients with myocardial infarction and 2. to compare these results to MR viability imaging performed at 1.5 Tesla.

Materials and Methods:

17 patients with acute and chronic myocardial infarction underwent contrast enhanced MR viability imaging at 3.0 Tesla and 1.5 Tesla. For viability assessment a 3D inversion recovery k-space segmented gradient echo sequence, with coverage of the whole left ventricle in a short axis and long axis view, was used at both field strengths (3.0 Tesla: TE/TR: 1.27/4.2, Flip angle 8°, spatial resolution: 1.52 x 2.18 x 4 mm; 1.5 Tesla: TE/TR: 1.25/4.1, Flip angle: 15°, spatial resolution: 1.52 x 2.18 x 4 mm). Images were obtained 10 and 15 min after the i.v. injection of 0.2 mmol/kg Gd DTPA. Optimal inversion time (TI) to suppress the signal of viable myocardium, contrast between infarcted tissue and viable myocardium (Signal of infarcted myocardium – Signal of viable myocardium/Signal of infarcted myocardium + Signal of viable myocardium), size of myocardial infarction (mass of infracted tissue in gram) and scores of image quality (5 point grading scale: 1 point for non diagnostic image quality to 5 points for excellent image quality) were assessed at 3.0 Tesla and 1.5 Tesla.

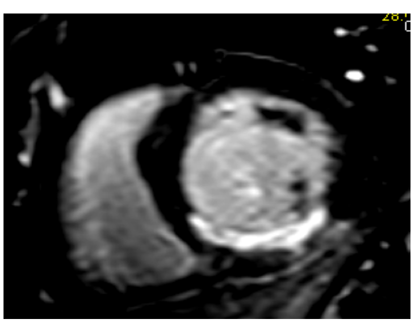
Results:

The average inversion time to suppress the signal of viable myocardium at 3.0 Tesla with respect to MR viability imaging at 1.5 Tesla was 274 $\pm$ 15 vs. 207 $\pm$ 8 (average increase 32.4%) at 10 min and 293 $\pm$ 18 and 234 $\pm$ 11 (average increase 25.2%) at 15 min after administration of contrast agent ($p<0.001$). The contrast between infarction and viable myocardium was equal at both field strengths (0.86 $\pm$ 0.06 at 3.0 Tesla vs. 0.85 $\pm$ 0.06 at 1.5 Tesla, p=0.28). The measured infarction size (42.6 g $\pm$ 24.5 g at 3.0 Tesla vs. 42.3 g $\pm$ 23.7 g at 1.5 Tesla, p=0.75) and the score of image quality were equal at 3.0 Tesla and 1.5 Tesla (4.26 $\pm$ 0.97 and 4.23 $\pm$ 0.75, $p>0.05$).

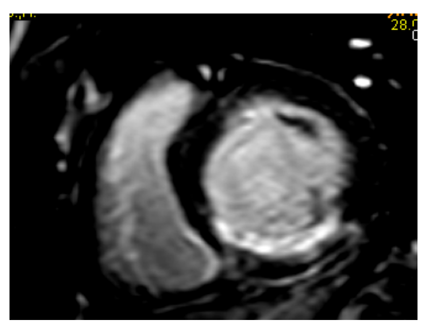
Conclusion:

Even at this early stage MR viability imaging at 3.0 Tesla provides high quality images in patients with acute and chronic myocardial infarction. The inversion time is significantly prolonged at 3.0 Tesla. Contrast between infarction and viable myocardium, infarction size and image quality at 3.0 Tesla are equal to 1.5 Tesla.

at 3.0 Tesla



at 1.5 Tesla



Acute inferior non-transmural myocardial infarction