Detection of experimental myocardium infarction in rats by MRI using heat shock protein 70 conjugated superparamagnetic iron oxide nanoparticle.

Abstract: Superparamagnetic iron-oxide based contrast agents can provide important diagnostic information regarding the assessment of cardiac inflammatory diseases. The aim of the study was to analyze whether nanoparticles conjugated to recombinant 70-kDa heat shock protein (Hsp70-SPION) can be applied for the detection of acute myocardium infarct by MRI. Cellular experiments demonstrated increased CD40-mediated uptake of Hsp70-SPIONs in comparison to non-conjugated SPIONs. Following induction of an acute infarct in rats by ligation of the left anterior descending artery SPIONs and Hsp70-SPION conjugates were injected intravenously on day 4. The animals underwent sequential MRI that showed the presence of the particles in the infarcted zone. Subsequent biodistribution analyses with the help of method on non-linear magnetic response indicated the preferential accumulation of the Hsp70-SPIONs in the heart tissue that was further confirmed with histological analyses. The study demonstrated that an acute infarct can be visualized by MRI using Hsp70-functionalized SPION conjugates. Superparamagnetic iron oxides nanoparticles (SPIONs) have been studied extensively as a contrast
agent for MRI. Their tissue specificity can be further enhanced by conjugation with various ligands. In this study, the authors conjugated superparamagnetic nanoparticles to 70-kDa heat shock protein (Hsp70-SPION) to investigate the feasibility for the detection of acute myocardium infarct. The positive findings would suggest that this approach might be used clinically in the future.