Dobutamine stress cardiovascular MR imaging in patients after coronary revascularisation with stent placement

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Introduction:

Dobutamine stress cardiovascular MR imaging for detection of ischemia-induced wall-motion abnormalities has become a mainstay for noninvasive diagnosis and risk stratification of patients with suspected coronary artery disease (CAD). Several studies have demonstrated that dobutamine stress MR provides high sensitivities and specificities for the detection of ischemia and is superior to dobutamine stress echocardiography. Furthermore, it has been shown that it can be used for risk stratification and it allows predicting patients' prognosis. However, most studies included patients with suspicion of coronary artery disease, whereas larger studies on CAD patients after stent placement have not been published yet.

Purpose:

In our study we investigated the value of high-dose dobutamine stress MR imaging in CAD patients after percutaneous coronary interventions (PCI) for the detection of restenoses using invasive coronary angiography as the standard of reference.

Methods:

50 Patients (mean age 62 ± 7 years) with known coronary artery disease who had undergone PCI with stent placement were examined with high-dose dobutamine stress MR imaging and invasive coronary angiography. MR imaging was performed on a 1.5 T MR scanner (Magnetom Sonata, Siemens, Erlangen, Germany). A dobutamine/atropine stress protocol (10, 20, 30 and 40 µg/kg per min dobutamine and up to 1 mg of atropine) was used until the age-predicted target heart rate was achieved. Imaging at each stress level was performed in at least 3 long and 3 short axis views using a segmented steady state free precession sequence (TrueFISP, TR 3ms, TE 1.5ms, FA 60°). All examinations were evaluated by an experienced radiologist and a cardiologist in consensus. Myocardial ischemia was defined by new or worsening stress-induced wall motion abnormalities in more than one myocardial segment.

Results:

In the 50 patients, coronary stents were placed in 74 coronary arteries. Seven in-stent stenoses were found by use of invasive coronary angiography; six of these cases were correctly diagnosed by MRI, one in-stent stenosis was missed by MRI which resulted in a sensitivity of 86%. Sixty-seven coronary arteries with implanted stents showed no significant stenoses in invasive coronary angiography, however, in seven of these vessels the MRI examination was false positive, which resulted in a specificity of 89%. The positive predictive value was 46%, the negative predictive value was 98%. Diagnostic accuracy was 89%.

Conclusion:

High-dose dobutamine stress MRI allows for a reliable detection of significant in-stent stenoses: Due to a high diagnostic accuracy the technique appears to be helpful in the selection of patients who need to undergo control invasive coronary angiography.