Myocardial perfusion reserve quantified at 3 and 1.5 Tesla in comparison to fractional flow reserve as measured during coronary angiography

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Target audience: Clinicians and researchers working in the field of myocardial perfusion imaging

Purpose: Invasive measurement of fractional flow reserve (FFR) is considered the standard diagnostic tool to determine hemodynamic significance of coronary artery disease (CAD). Adenosine-perfusion cardiac magnetic resonance imaging (CMR) at 1.5 and 3 Tesla has been proven to be capable to noninvasively determine myocardial perfusion reserve, but has not been compared against each other and especially validated against FFR as standard reference.

Methods: 34 patients (62.0 ± 10.9 years) with suspected CAD were included into the study. All patients were scanned at both field strengths, 1.5 and 3 Tesla, including adenosine and rest perfusion imaging. Coronary x-ray angiography including FFR measurement in the left anterior descending (LAD), circumflex (CX) and right coronary artery (RCA) was then performed in all patients. Myocardial perfusion reserve was calculated in 544 myocardial segments for each field strength and compared to the FFR measurement of the supplying coronary artery. FFR ≤0.8 was regarded as relevantly reduced.

Results: In 38 coronary arteries (19 LAD, 8 CX, 11 RCA) a FFR ≤0.8 was found. Receiver operator curve analysis yielded higher area under the curve for 3T in comparison 1.5T CMR (0.963 vs. 0.645, $p<0.001$) resulting in higher sensitivity (0.91 vs. 0.62) and specificity (1.0 vs. 0.77).

Conclusion: We conclude that quantitative evaluation of myocardial perfusion reserve at 3 and 1.5 Tesla is capable to detect hemodynamic significance of coronary artery stenosis. The diagnostic accuracy at 3T seems to be superior to 1.5T.