3.0T Whole Heart Coronary MR Angiography Performed as a Part of Comprehensive Contrast Enhanced CMR Study.

M. Nagata[1], H. Sakuma[1], N. Ishida[1], S. Kato[1], H. Nakajima[2], M. Ishida[1], K. Onishi[2], M. Ito[2], and K. Takeda[1]

[1]Radiology, Mie University hospital, Tsu, Mie, Japan, [2]Cardiology, Mie University hospital, Tsu, Mie, Japan

Background: 3.0 T whole heart coronary MR angiography (MRA) permits acquisition of coronary arterial images with improved signal to noise ratio and high spatial resolution. The combined use of 3.0 T MR imager and patient-specific, narrow acquisition window in the cardiac cycle may allow for improved delineation of distal coronary arteries and branch vessels. The purposes of this study were to perform whole coronary MRA as a part of comprehensive contrast enhanced MR study, and to determine the image quality and diagnostic accuracy of 3.0T whole-heart coronary MRA.

Methods: Whole heart coronary MRA was acquired in 52 patients (38 men and 14 women, mean age of 64.5 years ± 12.9) with suspected CAD by using a 3.0T MR imager (Achieva) and 6 channel cardiac coils. After acquiring perfusion MRI and late gadolinium enhanced MRI with cumulative gadolinium dose of 0.15mmol/kg, navigator-echo gated, 3-dementional TFE images were obtained with T2 preparation, fat saturation, TR/TE/FA of 4.2ms/2.1ms/20 degree and SENSE factor of 2. Motion of the coronary artery was evaluated on cine MRI in each patient, and MRA data were acquired by using a patient-specific narrow acquisition window (57.9ms ±26.8) in the cardiac cycle during diastole (n=38) or systole (n=14). Image quality was classified on a 4-point scale (1=poor, 2=moderate, 3=good, 4=excellent). X-ray coronary angiograms were obtained in 15 patients within 2 weeks from MR study. MRA images were interpreted by 2 independent observers by using a sliding thin SLAB MIP method.

Results: Acquisition of MRA was successfully completed in all 52 patients, with averaged imaging time of 11.4 ± 4.5 minutes. Sufficient arterial blood contrast was demonstrated in all patients. Excellent image quality (score ≥ 3.8) was observed in the proximal and mid portion of the arteries (RCA #1-2, LMT#5, LAD #6-7, LCX #11) (Figure 1). In addition, high image quality (score ≥ 3.0) were found in the distal segments and branch vessels as well (RCA #3-4, LAD #8-9, LCX #13). The sensitivity, specificity, PPV and NPV of MRA for the detection of significant CAD were 88% (95% CI; 51-99%), 97% (84-99%), 89% (51-99%), 97% (84-99%) by vessel based analysis. These values by patient-based analysis were 86% (42-99%), 88% (47-99%), 86% (42-99%), 88% (47-99%)

Conclusions: 3.0T whole heart coronary MRA can be successfully performed as a part of comprehensive cardiac MR study, with improved visualization of distal segments and branch vessels compared with 1.5T whole heart coronary MRA. High negative predictive value of 3T whole heart MRA indicates the value of this method for screening significant coronary artery disease.

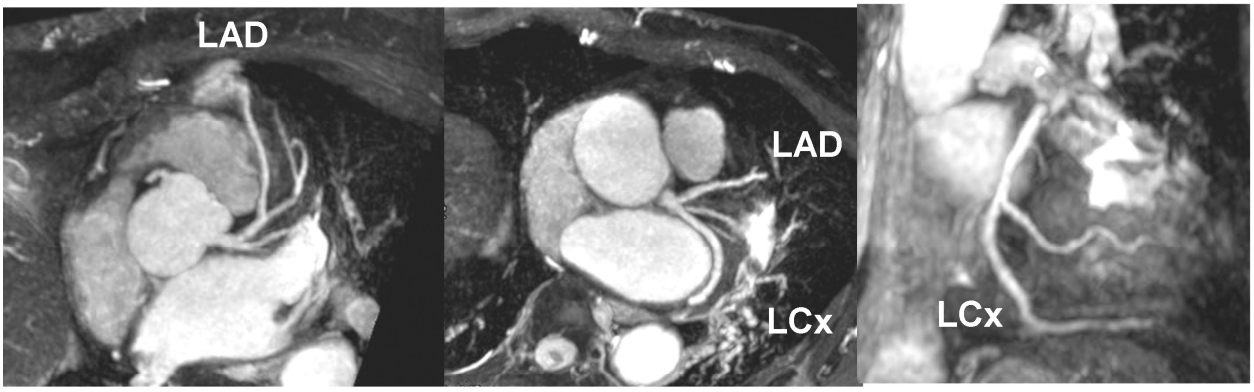

Figure 1. Sliding partial MIP images of 3T whole heart coronary MRA acquired with a patient-specific narrow acquisition window (50ms) in the cardiac cycle.