

Accuracy of magnetic resonance imaging to identify the coronary artery plaque: a comparative study with intravascular ultrasound

Y. He¹, Z. Zhang¹, Q. Dai¹, J. An², L. Jin³, R. Jerecic³, and D. Li⁴

¹Department of Radiology, Beijing Anzhen Hospital, Capital Medical University, Beijing, China, People's Republic of, ²Siemens Mindit Magnetic Resonance, Siemens Healthcare, MR Collaboration NE Asia, Shenzhen, China, People's Republic of, ³Siemens Limited China, Siemens Healthcare, MR Collaboration NE Asia, Shanghai, China, People's Republic of, ⁴Biomedical Imaging Research Institute, Cedars-Sinai Medical Center, United States

Purpose

To evaluate the ability of black blood coronary arterial wall MRI to identify the coronary artery plaque, using intravascular ultrasound (IVUS) as the golden standard.

Methods

19 consecutive patients (mean age 58 ± 9 years, 12 men) underwent coronary artery wall MRI and IVUS within 10 days. All studies were conducted on a 1.5T MR scanner (Sonata, Siemens). Cross-sectional images were acquired using a 2D double inversion recovery, ECG-triggered, navigator-gated, fat-suppressed, turbo spin echo sequence on the lesion of coronary artery from the ostium to the middle segment continuously without gap. The vessel cross-sectional area (CSA), luminal CSA, plaque burden, CNR and SNR were measured in each slice which were then compared with the IVUS images. IVUS were divided into 5 mm segments to compare side by side with MRI.

Results

16/19 patients completed coronary artery MRA and wall imaging, 41 of 67 slices were found plaques on both IVUS and MRI; the plaque burden, SNR, CNR in the coronary wall containing plaque were greater compared to the normal coronary wall (0.71 ± 0.13 vs 0.59 ± 0.12 , 1.86 ± 0.41 vs 1.47 ± 0.23 , 5.10 ± 2.21 vs 2.99 ± 1.17 , respectively, $P < 0.05$). In segments containing plaques, the vessel CSA (16.77 ± 10.67 vs 16.97 ± 8.36 , $r = 0.79$, $P < 0.01$), lumen CSA (5.18 ± 5.01 vs 7.13 ± 5.14 , $r = 0.88$, $P < 0.01$), plaque burden (0.71 ± 0.13 vs 0.59 ± 0.15 , $r = 0.67$, $P < 0.01$) measured by MRI and IVUS were well correlated, especially the lumen CSA were strongly correlated.

Conclusion

MRI coronary artery wall imaging can identify coronary plaque in the proximal segments. There is a good agreement between IVUS and MRI with regard to extent of wall thickening. However, MRI overestimated plaque burden and degree of luminal stenosis, which is the difference in spatial resolution between techniques.

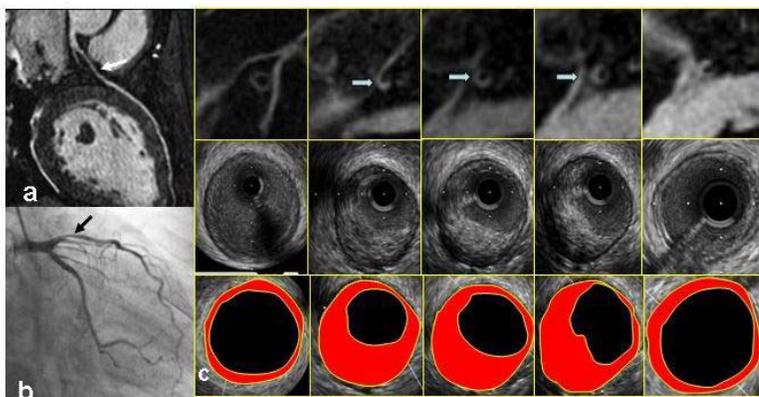


Figure A 46-Year-Old Male Participant with Eccentric Coronary Plaque **(a)** LAD MRA showing moderate stenosis in the proximal coronary artery (arrow). **(b)** Conventional coronary artery angiography also shows moderate lumen stenosis in the same site (arrow). **(c)** Cross-sectional MRI coronary wall images (top row), corresponding IVUS images (middle row), and IVUS images (bottom row) from LM (right) to proximal segment of LAD (left). Plaques were found in MRI (arrows), which were correlated well with IVUS.