

Segment-based comparison of coronary MR Angiography (MRA) and multi-detector coronary CT Angiography (CTA)

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Introduction: Both MR and CT are discussed as possible non-invasive alternatives to coronary catheter angiography for the detection of coronary artery disease (CAD). Both of these methods have their own advantages and disadvantages and the accuracy for the detection of significant coronary artery stenoses has been evaluated for both methods independently in recent studies (1,2). However, there is no intraindividual comparison of CT and MR so far. Therefore, our purpose was to compare a steady-state-free-precession MRA sequence and CT angiography regarding image quality and diagnostic accuracy for the detection of relevant stenoses with special focus on the degree of plaque calcifications.

Material and Method: 23 patients with known CAD were examined with a navigator gated and corrected steady-state-free-precession coronary MRA sequence (in-plane resolution 1.5x0.99x0.99, scan-time approx. 7 min with 50% navigator-efficiency and heart rate of 60 bpm) and 16-slice CTA (Siemens Sensation 16, collimation 16x0.75mm, slice thickness 1mm). MRA was performed on a 1.5 T MR scanner (Philips Intera) either in transverse orientation for the left coronary system (5 segments: left main, left anterior descending and left circumflex) or in a double-oblique plane for the right coronary artery (3 segments). Segment-based sensitivity, specificity and accuracy for the detection of relevant stenosis (diameter <50%) as well as the subjective image quality on a 4-point-scale were determined in direct comparison by two blinded readers per modality. Additionally, the calcium-mass was measured and divided into three groups (A: >25 mg CaHA, B: 10.00-24.99 mg CaHA, C: 0.00-9.99 mg CaHA) and correlated to the accuracy with each modality.

Results: The average image quality was 1.6 for both modalities (1=excellent). Of 96 segments, 6 had to be excluded due to poor image quality in MRA and 3 in CTA. Another 14 segments in CTA could not be analyzed because of severe calcifications. Of these 4 belonged to group B and the remaining to group A. The results for the detection of relevant coronary stenosis in evaluable segments were: sensitivity 89% vs. 98%; specificity 81% vs. 95%; accuracy 87% vs. 96% for MRA vs. CTA respectively. Of those 14 severe calcified segments, which were excluded from CT-evaluation, 3 had poor image quality in MRA, 8 were correctly analyzed and 3 wrong (accuracy: 57%). The accuracy for low to moderately calcified segments (Groups C and B) was 77% for MRA and 81% for CTA.

Conclusion: In our intraindividual comparison, CTA was superior to MRA for the detection of significant coronary stenoses. The SSFP sequence provided reliable good image quality and additional information especially in severely calcified segments.

References:

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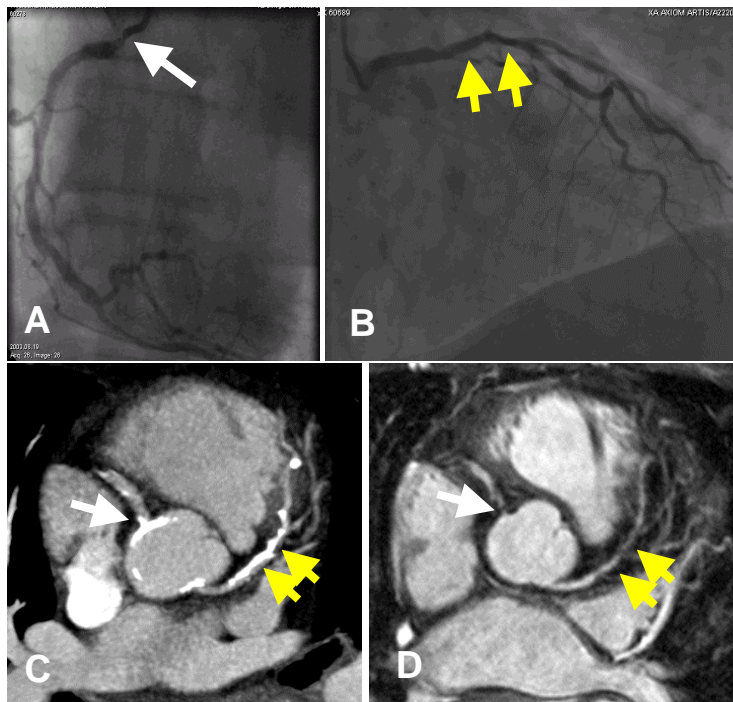


Figure: Catheter angiography (A) shows high grade ostial stenosis of the right coronary artery and luminal irregularities of the left coronary artery (B) without significant stenosis. Severe calcifications in both the right and left coronary artery prevent stenosis assessment in CT (C). MR angiography (D) shows high grade right coronary artery stenosis and left coronary artery luminal irregularities in good correlation to catheter angiography.