Characterization of non-calcific coronary plaques using high-resolution MR imaging at 3T: comparison with MDCT

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Purpose: To evaluate the feasibilityof detection and characterization of non-calcific coronary artery plaques in vivo using high-resolution MR imaging at 3T and to compare MR imaging findings with those of MDCT

Materials and Methods: This study included 10 patients with non-calcific components of coronary artery lesions detected at MDCT. Coronary artery MR angiography was performed and then 12 non-calcified stenotic segments were targeted for plaque imaging at 3T (Intera Achieva, Philips). T1-, T2-weighted double inversion recovery imaging (slice thickness, 1.5 or 2 mm; FOV, 22 cm or 30 cm; in-plane resolution, 0.98 mm x 1.08 mm or 1.17 mm x 1.18 mm) was performed in contiguous short-axial planes of proximal and mid-segments of coronary arteries. For white-blood images, a TFE sequence (2 mm thickness; resolution, 0.9 mm x 0.9 mm) was applied in the same planes. Postcontrast T1-weighted images were also obtained after injection of Gd-DTPA (0.1 mmol/kg). In 2 cases, intracoronary US was performed. Two radiologists analyzed MR and CT images in consensus. Plaques with low signal intensity area more than 50% plaque area on T2-weighted and T1-weighted postcontrast MR images and with mean attenuation value of less than 30 H.U. at CT were considered as vulnerable plaques.

Results: MR image quality was diagnostic without significant artifacts in all patients. Significantly heterogeneous signal intensity on MR images of various sequences was found in 9 of 12 soft plaques (75 %), while there were no areas of significantly different attenuation of plaque components in each plaque on CT. Six plaques were classified as vulnerable ones by CT findings and 4 plaques by MR findings. Two of 6 vulnerable plaques at CT showed no evidence of vulnerability on MR images. Mean plaque areas determined by MR and CT were 6.61 2.65 mm2 and 5.34 2.17 mm2 respectively with modest correlation (r = 0.53) and without significant difference (p = 0.14). Findings of intracoronary US correlated well with MR findings in visualization of plaque components.

Conclusion: Coronary artery plaque characterization is feasible using 3T MR imaging. 3-T MR imaging may provide more information than MDCT in coronary plaque imaging.

Clinical relevance: High-resolution MR imaging may be more sensitive in detection of fatty content of the plaques and more accurate in exclusion of vulnerable plaques as compared with MDCT.