Poster presentation

Detection of coronary intraplaque hemorrhage using inversion-recovery-prepared SSFP sequence

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Introduction
IntraPlaque hemorrhage(IPH) is a feature of vulnerable atheromatous plaques. It has strong associations with cardiovascular ischemic events. Early detection of such a significant plaque characteristic is critical and potentially benefit for their aggressive management. Cardiovascular magnetic resonance (CMR) imaging have emerged as promising noninvasive imaging techniques for coronary plaque visualization.

Purpose
We made a detailed assessment of this technique for coronary artery and compared the findings of X-angiography(XCA), intravascular ultrasound(IVUS) and MDCT.

Methods
CMR imaging was performed on a 1.5 T MR system (Intera, Philips Medical Systems, Best, The Netherlands) with five element cardiac synergy coil. 95 subjects (83 male, 12 female, age 31-86 years, mean 66) who had undergone XCA and/or coronary 64-slice MDCT angiography were enrolled. We performed coronary artery wall imaging using a T1-weighted 3-dimensional inversion recovery balanced steady-state free precession (3D IR-SSFP). Inversion time was adjusted to null blood (typically inversion time 450 ms). The 3D IR-SSFP data were compared with the reference standards of presence of coronary stenosis detected by XCA and presence of coronary plaque detected by MSCT.

Results
Coronary artery walls were successfully visualized on 3D IR-SSFP(80%). Strong high signal intensity (SHS) on IR-SSFP were observed in 37 (14%) of total 253 segments and 9 segments (24%) with <50% coronary artery stenosis by XCA. The low echoic lesions were detected on IVUS images in the sites corresponding to sites that had SHS. SHS was noted in 4 (12%) of 33 coronary segments with no plaque by MSCT and in 3 (21%) of 14 segments with mixed plaque.

Conclusion
We demonstrates selective coronary plaque visualization by IR-SSFP that allows for differentiation between MDCT-characterized plaque entities. We demonstrate the potential utility of IR-SSFP for selective coronary vessel wall visualization and differentiation of plaque types. IR-SSFP can be used to non-invasively visualize the coronary vessel wall and to detect the presence of (sub) clinical coronary atherosclerosis. High signal intensity of IR-SSFP may be indicative of plaque hemorrhage and/or inflammation. Therefore, coronary plaque vulnerability could be predicted by cardiac MRI. Further studies are needed to define the importance of these findings in the detection and treatment of vulnerable plaques.