# Evaluating Coronary Atherosclerotic Plaque Enhancement by Contrast-enhanced Navigator-gated 3D-SSFP sequence

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*INTRODUCTION*

Previous studies have demonstrated contrast-enhanced MRA can improve contrast-to-noise (CNR) ratio between the vessel lumen and the wall. The purpose of this study is to evaluate coronary atherosclerotic plaque enhancement using contrast-enhanced navigator-gated 3D-SSFP sequence.

*MATERIALS AND METHODS*

11 patients (mean age 57.5 years old, 9 males) with non-calcified or mixed plaques with main non-calcified component on the proximal or middle segments detected on coronary MDCTA were recruited for MRA study on GE 1.5T HD MRI scanner within 1 week. 7 of them had unstable angina pectoris. The coronary MRA was performed using a navigator-gated 3D-SSFP sequence with FOV 28cmx28cm, matrix 256x256 (post-contrast, 320x256) before and after administration of Gd-DTPA. 30ml Gd-DTPA was injected with biphase:10ml at a flow rate of 1.5ml/s and 20ml at 0.05ml/s. Coronary MRA was acquired 2~3 times after Gd-DTPA administration on the segments with plaques. The locations of plaques on MRA were corresponding to sites on CTA, at the same distance to an origin or bifurcation. The cross-sectional images perpendicular to the long axis of coronary artery were reformatted on MRA to evaluate the plaques. Plaque enhancement after contrast delivery was assessed using CNR (signal of plaque minus signal of adjacent sub-epicardium fat tissue divided by SD of noise). An 75% increasing of CNR was defined as enhancement.

*RESULTS*

18 plaques were identified on both pre- and post-contrast MRA at the corresponding site of CTA. 7 plaques showed enhancement, CNR increased from $9.35\pm3.92$ to $19.83\pm7.22$, (t=3.12, p<0.05), with increase of $123.69\pm49.56\%$. Of 7 patients with enhanced plaques, 5 patients had unstable angina pectoris. In 11

no-enhanced plaques, the CNR increased from $9.68\pm2.70$ to $10.88\pm3.25$, (t=0.94，p=0.36), with increase of $14.75\pm27.09\%$.

*DISCUSSION*

Enhancement of coronary atherosclerotic plaques can be demonstrated using contrast-enhanced navigator-gated 3D-SSFP sequence. Enhancement of plaques may be associated with inflammation, fibrosis and neovascularization pathologically. Inflammation and neovascularization play an important role in the progress and rupture of atherosclerotic plaques. Therefore, plaque enhancement may predict the vulnerability. This assumption should be confirmed through further study.

*REFERENCE*

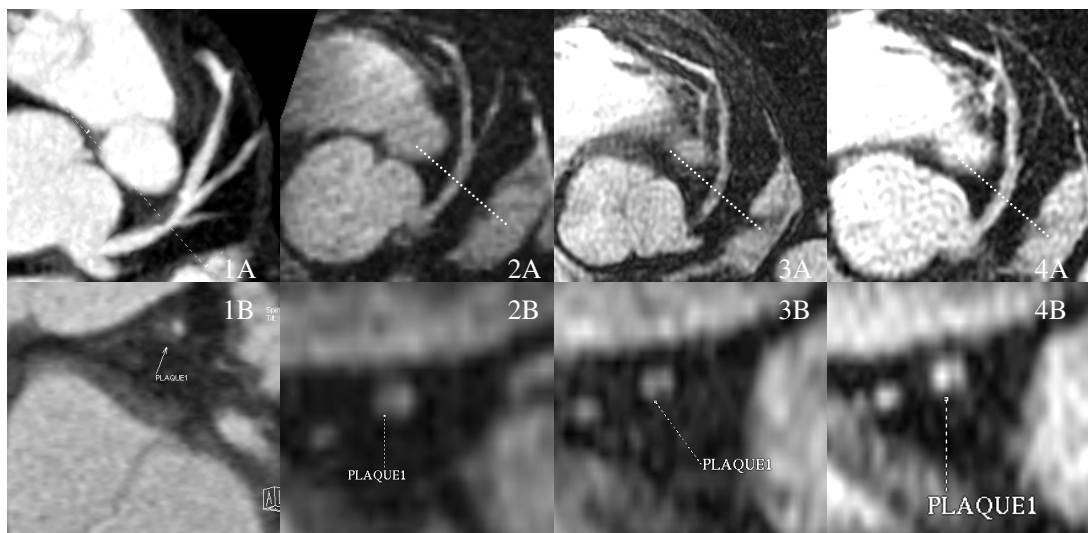Maintz D, et al, European Heart Journal 2006, 27: 1732-1736



Figure-1A/B: CT scan, a non-calcified plaque was delineated in the bifurcation of left main trunk and proximal to the left anterior descending branch. Figure-2A/B: pre-contrast MRA, the plaque shows relative low signal. Figure-3A/B: 5 minutes after contrast injection, the plaque shows moderate enhancement. Figure-4A/B: 15 minutes later, the plaque shows marked enhancement.