Efficiency on Coronary Stenosis Evaluation Using Breath-hold Three-dimensional FIESTA Sequence

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INTRODUCTION

Recent developed pulse sequences for coronary MRA had shown great potentials in practice. Excellent reliability had been achieved for direct visualization of coronary arteries using breath-hold three-dimensional FIESTA sequence which localized the vessels on different planes. The purpose of the study was to investigate the efficiency of the sequence in the application of coronary stenosis evaluation.

MATERIALS AND METHODS

24 candidates for x-ray catheter angiograms were enrolled in the study on GE 1.5T TwinSpeed MRI scanner. Coronary MRA were performed within three weeks before or after their catheter angiography. The established protocol localized the main coronary vessels in 9 steps interactively using three-dimensional fat-saturated FIESTA sequence which acquired a 3×8mm slab in 256×192 matrix within a single breath-hold. The in-planar resolution was 1.0×1.2mm. Stenosis was graded as 0, 0~25%, 25%~50%, 50%~75%, 75%~100% both on catheter angiograms and MIP-reconstructed coronary MRA images by interventional cardiologist and radiologist separately. Double-blinded comparison between catheter angiograms and coronary MRA was performed segments by segments referred to the standard coronary segmentation.

RESULTS

Table right listed the stenosis graded by coronary MRA and catheter angiogram. Sample images were shown in Figure 1-4. Coronary MRA could predict the normal segments with high accuracy (98.2%, 56/57). It had a sensitivity of 94.0% (79/84) and a specificity of 95.7% (89/96) when taking stenosis graded 50% as statistical intercepted-point. But it was poor for detail grading to differentiate between 0-25% and 25-50%, 50-75% and 75-100%.

Comparison between coronary MRA and catheter angiogram

Coronary	Catheter angiogram				
MRA	0	0~25%	25~50%	50~75%	75~100%
0	56	0	1	0	0
0~25%	6	9	1	0	0
25~50%	4	5	7	4	0
50-75%	3	0	4	22	7
75-100%	0	0	0	20	30

DISSCUSION

Since coronary MRA revealed both intra- and extra- vessel wall tomographically, stenosis on coronary MRA was quite different when compared to catheter angiogram. Narrowed lumen, thickened wall, hemo-dynamic dilation and peri-focal tissue infiltration were considered to be the indications for stenosis but these only consistent with stenosis graded over 50%. The low spatial resolution limited its application in detail grading between 0-25% and 25-50%, 50-75% and 75-100% because the thickened wall and residue lumen was not clear enough for accurate measurement and calculation and the thickened vessel wall could only be identified on those severe stenosis graded over 50%. Stenosis was graded qualitatively rather than quantitatively on coronary MRA. Coronary MRA using breath-hold three-dimensional FIESTA sequence could differentiate hemo-dynamic significant stenosis from those hemo-dynamic insignificant and it was helpful for coronary artery disease screening.

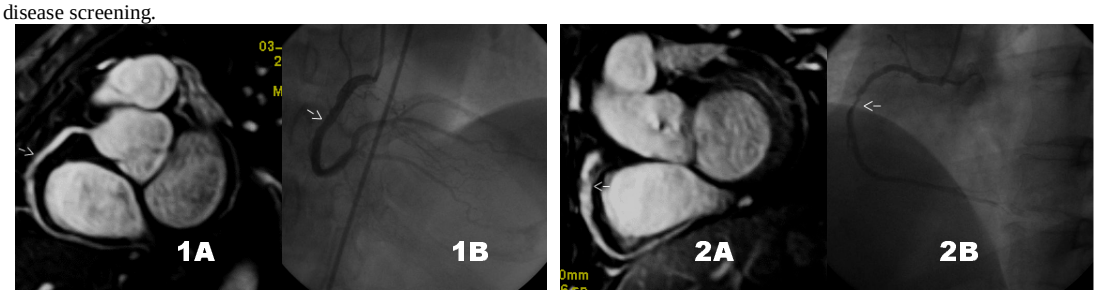

Figure-1: Mild stenosis (<25%) on middle RCA was detected by coronary MRA (1A) and verified by catheter angiogram (1B).

Figure-2: Severe stenosis (>75%) with narrowed lumen, thickened wall and peri-focal infiltration (2A) on middle RCA was revealed by coronary MRA and verified on catheter angiogram (2B).

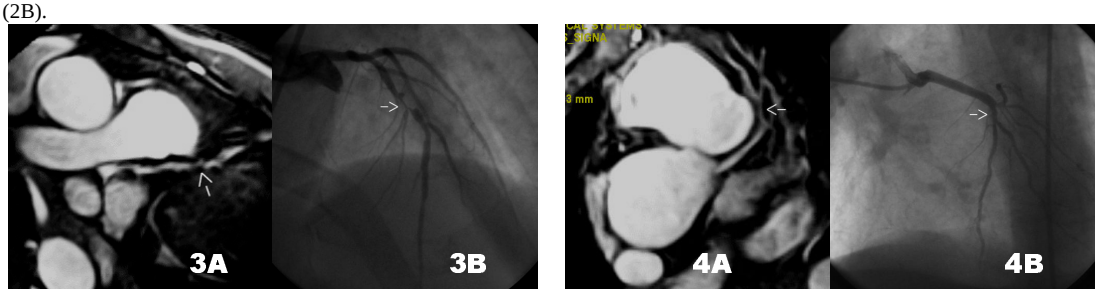

Figure-3: Multiple severe stenosis (>75%) with dilated and narrowed lumen (3A) on middle LAD on coronary MRA. It was consistent with catheter angiogram (3B).

Figure-4: Stenosis on proximal LAD was over-estimated (>75%) on coronary MRA compared to catheter angiogram (50-75%).

References:

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