

Evaluation of whole-heart coronary MRA completed in 5 minutes using "paddle-wheel" balanced SSFP

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Introduction:

Respiratory navigator has been used for the acquisition of whole-heart coronary MRA, however, the positional information of the coronary arteries is limited, and image data set acquired in the period during the diaphragm is out of trigger window is not used for image reconstruction. For improving these points, self-navigated "paddle-wheel" balanced SSFP which uses image data itself for navigation was devised. We utilized this technique with fat saturation for clinical cases and evaluated the image quality.

Methods:

The pulse sequence was implemented on a 1.5T clinical scanner (GE Signa Excite TwinSpeed, ver11.0). The eight-channel cardiac coil was used for the receiver. Coronary MR images of 10 patients suspected coronary artery diseases were obtained with this sequence following routine cardiac MR studies including stress-rest perfusion and cine. The imaging parameters were: 224 readout points, 300 projections, 64 slices, TR/TE = 4.0/2.0 msec, FOV = 30-35 cm, acquisition matrices = 256x256. Readout length per trigger was 256 msec and imaging time was 300 heart-beats. A subject specific trigger delay time was determined based on the period during the motion of the right coronary artery was minimized on the cine images. The image dataset was transferred to a workstation and respiratory correction was performed. The subjective image quality for left main trunk (LMT) and 3 segments (proximal, middle, and distal) of RCA, LCA and LCX on 4-point-scale was determined on reconstructed transverse images after respiratory correction by two blinded observers. Total of 99 segments were assessed, since LCX and LAD branched early, resulting in a lack of LMT in one patient.

Results:

Image acquisition was completed in approximately 5 minutes. The average image quality (4=excellent ... 1=poor) was 3.36, 2.58 and 2.22 for RCA, LAD and LCX, respectively. The image quality scores of proximal LAD and LCX were 3.42 and 3.33, however, the distal LAD and LCX were assessed as 1.75 and 1.33, respectively.

Discussions and Conclusion:

Paddle-wheel balanced SSFP has an advantage in shortening exam time to 5 minutes, which is valuable in clinical usage. Both of radial sampling and the respiratory correction were advantageous to improve image quality of coronary arteries. T2 preparation was not incorporated in the current implementation. Adding T2 preparation would improve the image quality of distal LAD and LCX by enhancing the contrast between myocardium and coronary arteries.

Reference: Oshio K, Proc.ISMRM.13 (2005), 707.

RCA			LMT	LAD			LCX		
Proximal	Mid	Distal		Proximal	Mid	Distal	Proximal	Mid	Distal
3.58	3.25	3.25	3.64±0.67	3.42	2.58	1.75	3.33	2.00	1.33
3.36 ± 0.83				2.58 ± 1.05			2.22 ± 1.12		

Table: Results of image quality assessment (4=excellent, 3=good, 2=fair, 1=poor), (Ave ± SD)

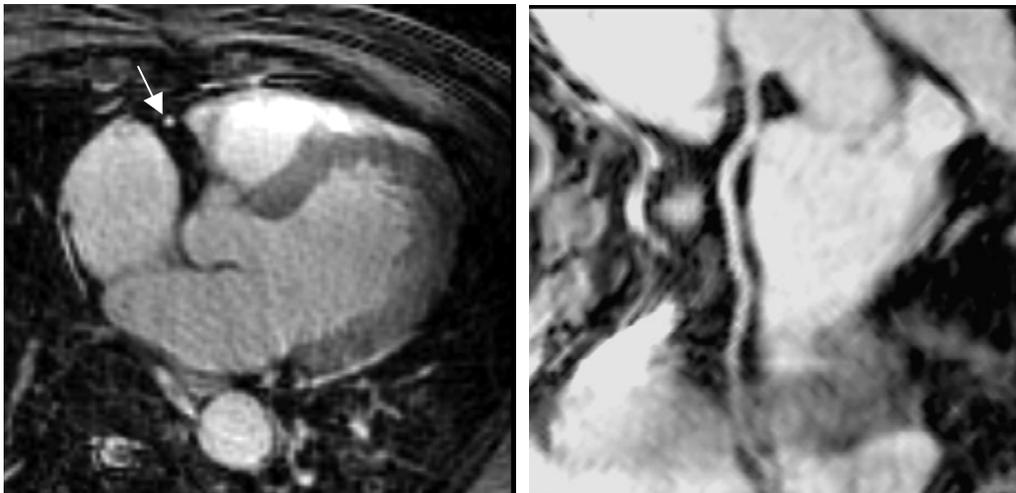


Figure: Transverse and reformatted images of the RCA obtained with "paddle-wheel" balanced SSFP