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Poster presentation

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Diagnostic performance of non-contrast whole-heart coronary magnetic resonance angiography combined with black-blood arterial wall imaging in patients with suspected coronary artery disease

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Introduction

Whole-heart-coronary-MRA (WH-CMRA) or black-blood-coronary-arterial-wall imaging have been used independently to detect coronary artery disease (CAD) in previous studies [1,2]. However, the diagnostic performance of a combined approach hasn't been reported yet.

Purpose

To evaluate the diagnostic performance of combined non-contrast WH-CMRA and black-blood-arterial-wall imaging in patients with suspected CAD.

Methods

Thirteen patients with suspected CAD were scanned at 1.5 T (MAGNETOM Sonata, Siemens, Germany) after written informed consent was obtained. WH-CMRA was acquired using a 3D ECG-triggered, navigator-gated, fat-suppressed, T2-prepared steady-state-free-precession sequence. Cross-sectional coronary wall imaging (thinkness = 5 mm) was performed using a 2D-black-blood, navigator and ECG-gated, Turbo-Spin-Echo sequence with asymmetric-adiabatic-spectral inversion-recovery fat suppression [3]. Continous slices without gap for wall imaging were positioned from pre to post of the suspected

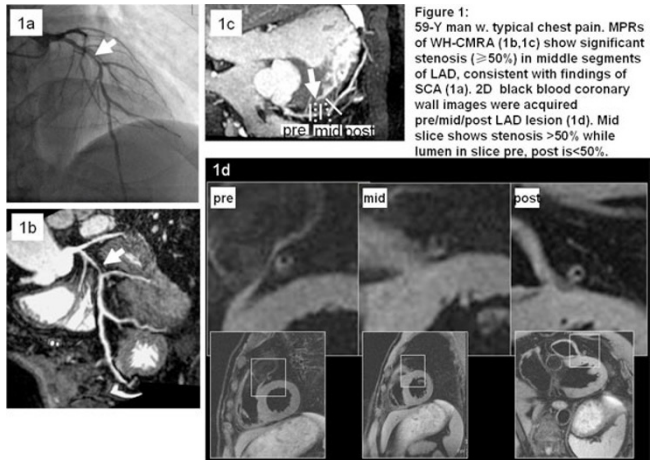

Figure 1:
59-Y man w. typical chest pain. MPRs of WH-CMRA (1b,1c) show significant stenosis (≥50%) in middle segments of LAD, consistent with findings of SCA (1a). 2D black blood coronary wall images were acquired pre/mid/post LAD lesion (1d). Mid slice shows stenosis >50% while lumen in slice pre, post is<50%.

Figure 1
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Table 1: Patient population and results of non-contrast WH-CMRA and black blood arterial wall compared with SCA.

Patient	BMI	HR	Location	WH-CMRA	IQ WH-CMRA	Vessel Wall	IQ Vessel Wall	Match CMRA-V. Wall	Combined MR diagnosis	Stenosis on SCA	Match MR-SCA	Follow Up
P01, M/32	28.38	69	LAD proximal	+	4	+	4	Y	+	80%	Y	stent
			LAD middle	+	4	+	4	Y	+	75%	Y	stent
P02, M/37	26.77	68	LM	-	4	-	4	Y	-	-	Y	-
P03, M/45	29.04	60	LAD middle	-	4	-	4	Y	-	-	Y	-
P04, M/49	24.49	75-80	LAD proximal	-	3	+	3	N	+	50-60%	Y	-
P05, M/63	22.04	71	RCA proximal	+	4	+	4	Y	+	80-90%	Y	stent
			RCA middle	+	4	+	4	Y	+	80-90%	Y	stent
P06, F/72	33.33	82-93	LM	-	3	?	1	N	-	-	Y	-
			LAD proximal	-	3	?	1	N	-	-	Y	-
P07, F/67	34.17	73	LAD proximal	-	2	-	2	Y	-	60%	N	-
P08, M/59	27.04	68	LAD middle	+	4	+	4	Y	+	60-70%	Y	-
P09, M/54	25.56	60	LAD proximal	-	3	-	4	Y	-	-	Y	-
			RCA proximal	-	3	-	4	Y	-	-	Y	-
P10, M/48	25.39	72-79	LAD proximal	-	3	-	3	Y	-	-	Y	-
P11, M/46	26.58	65-72	RCA proximal	-	3	-	3	Y	-	-	Y	-
			RCA middle	-	3	-	3	Y	-	-	Y	-
P12, M/57	26.45	65	LAD proximal	+	4	+	4	Y	+	80%	Y	stent
			LAD middle	+	4	+	4	Y	=	85%	Y	stent

Table 1: Patient population and results of non-contrast WH-CMRA and black blood arterial wall compared with SCA. *(Continued)*

P13, M/62	20/07	60	LAD middle	+	4	+	4	Y	+	70%	Y	CABG
			RCA proximal	-	4	-	4	Y	-	-	Y	-

"-" means stenosis <50%, "+" means stenosis ≥ 50%, "Y" = yes, "N" = no. Image quality (IQ) score: 1-poor, 2-good, 3-very good, 4-excellent.

lesion segment perpendicular to the multi-planar reformats (MPRs) of WH-CMRA. All patients received SCA within 1 week before or after the MR examination. Image quality of WH-CMRA and vessel wall images was evaluated on a segment basis by 4-point scale (1 - poor, 4 - excellent). Segments with a score of 1 in both techniques were excluded from analysis. A positive diagnosis of CAD was made based on the MR images when at least in one of both techniques a stenosis ≥ 50% was detected by visual analysis. Only left main (LM), proximal and middle segments of right coronary artery (RCA)/left anterior descending coronary artery (LAD) were included in our study. CAD was defined positive on SCA when showing a luminal diameter reduction ≥ 50%.

Results

20/65 segments were found stenosis by WH-CMRA. The mean total scan times for WH-CMRA and coronary wall imaging were 13 ± 1.2 min, 2 ± 0.3 min respectively.10 of 20 segments were diagnosed as CAD by SCA. On a segment-based analysis, average image quality of WH-CMRA and arterial wall were 3.5 and 3.45, respectively. Two of 20 segments of wall image score were 1 because of rapid heart rate. MR results did not agree with SCA in one of 20 caused by high BMI (34.17) and irregular breathing. The sensitivity of WH-CMRA only and WH-CMRA combined with arterial wall were (8/10) and (9/10), NPV (10/12) and (10/11), PPV(8/8) and (9/9) respectively. No difference of specificity (10/10) between the two groups Figure 1 and table 1.

Conclusion

The combination of WH-CMRA and black blood coronary wall imaging improves diagnostic accuracy to detect CAD over WH-CMRA alone. The study with larger sample size is under investigation.

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