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Poster presentation

Acceleration of whole heart and targeted coronary artery imaging at 3 T with a 32-channel coil

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Introduction

Although great technical advances have been made in coronary MRA, long scan times have played a part in the slow translation to routine clinical practice. The recent advent of array coil technology with high numbers of elements allows for higher SENSE factors, which lowers scanning time to a more acceptable level [1,2]. The trade-off of higher acceleration is lower SNR, which can be mediated by going to a higher field strength. Previous studies have investigated the use of a 32-channel coil at 1.5 T [1,2], however, only recently has this technology become available at 3 T.

Purpose

In this study we investigated whether the reduced scan time achieved with a new 32-channel vs. a 6-channel cardiac coil provided improved coronary artery image quality at 3 T for both whole heart and targeted imaging protocols.

Methods

Ten healthy volunteers were scanned in supine position on a 3 T MRI scanner equipped with a 6-channel and a 32-channel cardiac coil (Philips Healthcare, Best, NL). After localization scans, 3D fast segmented gradient echo sequences were performed. Parameters for the targeted sequences included TR/TE = 5.5/1.59 ms, fa = 20°, and a resolution of 1 × 1 × 3 mm^3. For the transverse whole-heart scan, the resolution was 1.5 × 1.5 × 1.5 mm^3 with a TR/TE = 4.1/1.16 ms and fa = 20°. The acceleration factor was increased with the 32-channel coil from 2 to 2.4 for the targeted scans and from 2 to 4 for the whole-heart sequence. Objective values of SNR, CNR and vessel sharpness for the right and left coronary artery systems were determined for all scans. A subjective quality score was assessed by a blinded, expert reviewer.

Results

The scan time (without navigation) for the whole-heart sequence was ~ 4 min and ~ 2 min for the 6- and 32-channel coils, and ~ 1:45 min and ~ 1:15 min for the targeted scans, respectively. The objective and subjective image qualities were overall similar for both the whole heart and targeted imaging approaches (Table 1). There was very little difference in vessel sharpness, CNR and image quality when comparing the whole-heart images from the 32- and 6-channel coils despite almost halving the scan time. The

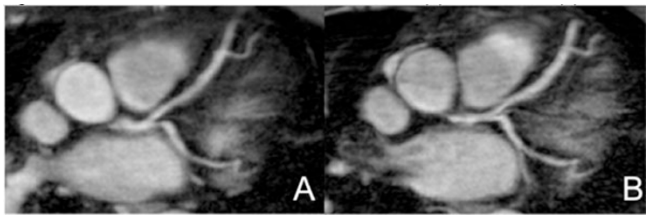

Figure 1
Left coronary scan with the 6-channel (A) and 32-channel (B) coils.

Table 1:

		32-channel		6-channel	
		Targeted	**Whole-heart**	**Targeted**	**Whole-heart**
Vessel length	RCA	90 ± 27	94 ± 28	95 ± 29	98 ± 30
	LM + LAD	62 ± 12	52 ± 15	56 ± 7	52 ± 15
Vessel diameter	RCA	3.1 ± 0.3	3.5 ± 0.3	3.0 ± 0.2	3.6 ± 0.4
	LM + LAD	2.7 ± 0.2	3.2 ± 0.5	2.7 ± 0.2	3.2 ± 0.4
Vessel sharpness	RCA	0.43 ± 0.04	0.55 ± 0.05	0.42 ± 0.06	0.51 ± 0.05
	LM + LAD	0.37 ± 0.04	0.52 ± 0.07	0.37 ± 0.06	0.48 ± 0.06
SNR muscle	RCA	16 ± 8	12 ± 5	17 ± 6	16 ± 6
	LM + LAD	14 ± 4	14 ± 5	14 ± 5	14 ± 6
SNR blood	RCA	32 ± 15	23 ± 11	33 ± 10	29 ± 8
	LM + LAD	31 ± 11	30 ± 9	31 ± 11	26 ± 11
CNR	RCA	16 ± 8	12 ± 7	16 ± 4	12 ± 3
	LM + LAD	17 ± 7	12 ± 4	17 ± 6	12 ± 5
Image quality	RCA	3.0 ± 0.0	2.6 ± 0.5	2.9 ± 0.8	2.9 ± 0.6
	LM + LAD	2.6 ± 0.7	2.8 ± 0.7	2.8 ± 0.7	2,6 ± 0.7

same general trend was seen with the targeted scans. Figure 1 shows representative images.

Conclusion

The combination of a 32-channel cardiac coil and 3 T allows the possibility of high quality coronary artery imaging in less than five minutes making it more attractive for widespread clinical use.

References

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