

Poster presentation

Respiratory self-gated coronary MRI: A comparison between 2D spiral pencil beam and projection navigators

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Purpose

To investigate performance of a prospective respiratory self-gating with a single projection method compared to the 2D spiral pencil beam, so called diaphragmatic navigator, positioned on the right diaphragm, for coronary MRI.

Background

Respiratory self-gated navigator techniques have been introduced to directly measure the respiratory induced heart motion from a single projection data. The estimated motion is used to *retrospectively* eliminate the respiratory motion artifact of the acquired images [1,2]. In this study, we have implemented and evaluated a *prospectively* gate self-gating coronary MRI, and compared the acquired images with the ones reconstructed by the diaphragmatic navigator.

Materials and methods

A respiratory self-gating coronary MRI sequence is implemented on Philips 1.5 T to measure center line of k-space of the imaging volume, immediately prior to the data acquisition. The Fourier transform of the measured signal provides a projection-profile. By computing cross-correlation between the most recently acquired profile and the reference one, the first acquired profile, the respiratory induced heart motion is estimated. Computed heart displacement is, then, utilized for prospectively gating the respiratory motion of the heart. Acceptance window range of 5 mm is employed to accept/reject the data. The pro-

spective gating method is integrated into image reconstruction of our scanner. For comparison, images are also acquired using a product diaphragmatic navigator placed on the dome of right hemi-diaphragm. Human studies are conducted on five healthy subjects with written consent. A free-breathing ECG-triggered-SSFP ($TE/TR/\alpha = 2.1 \text{ ms}/4.3 \text{ ms}/90 \text{ deg}$, spatial-resolution = $1 \times 1 \times 3 \text{ mm}^3$) sequence is used for imaging right coronary artery-RCA. The acquired images are graded by two readers. Signal to noise ratio(SNR), and contrast to noise ratio(CNR) are also measured.

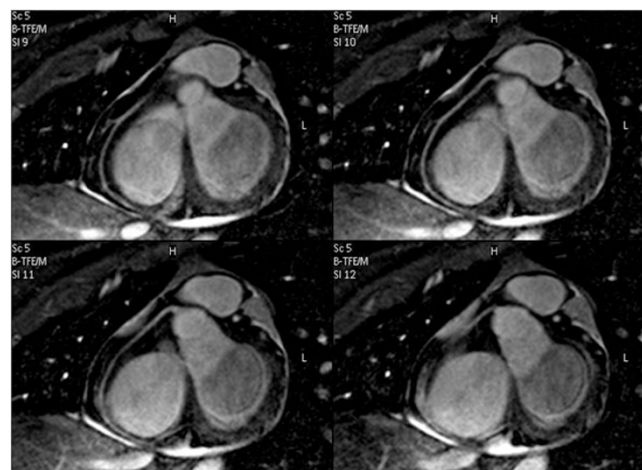


Figure 1
Example slices from a 3D data-set showing right coronary artery acquired using diaphragmatic navigator.

Table 1: Mean-SNR and CNR of images reconstructed by diaphragmatic and respiratory self-gating navigators. The difference is not significant ($p > 0.8$).

Reconstruction methods	SNR	CNR
Diaphragmatic navigator	36.38 ± 6.2	25.65 ± 6.02
Self-gating navigator	35.58 ± 5.6	24.88 ± 4.74

Results

Figures 1 and 2 show acquired coronary images of a volunteer by using diaphragmatic and respiratory self-gated navigators, respectively. Table 1 demonstrates the comparison of averaged SNR and CNR of acquired images using the two navigators over five volunteers. Finally, Table 2 summarizes the subjective scores by two readers.

Conclusion

We have successfully implemented and evaluated a respiratory-self gating coronary MRI sequence. Acquisition and reconstruction are performed on the commercial Philips scanner. Results verify that RCA images reconstructed by

Table 2: Mean-score of images acquired by diaphragmatic and respiratory self-gating navigators. Scored system used to evaluate the images is: 0-very poor, 1-poor, 2-acceptable, 3-good, and 4-excellent quality.

Reconstruction methods	Reviewer 1	Reviewer 2
Diaphragmatic navigator	3.5 ± 0.55	2.83 ± 0.75
Self-gating navigator	3.5 ± 0.84	3 ± 0.71

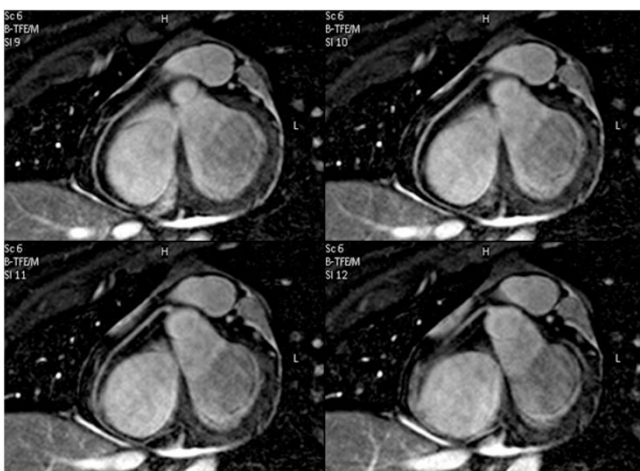


Figure 2
Example slices from a 3D data-set showing right coronary artery acquired using prospective respiratory self-gating navigator.

diaphragmatic and respiratory self-gating navigators are comparable.

References

1. Stehning : *MRM* 2005.
2. Lai : *MRM* 2008.

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