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Meeting abstract

408 Automatic ROI placing for selecting optimal data acquisition window for magnetic resonance coronary angiography

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Introduction

Magnetic resonance coronary angiography (MRCA) has great potential for the diagnosis of coronary artery disease. However, the quality and accuracy of coronary MR angiography varies from subject to subject. Reducing cardiac motion effects in coronary arteries requires quantitative information on the motion of the coronary arteries throughout the cardiac cycle. However, there is little quantitative information on rest period. In the previous study, a new automatic measurement of the cardiac rest period using an image based global cross-correlation of multi heart-phase cine-scans in comparison to visual assessment was developed. The method still requires substantial user interaction such as placing a region of interest (ROI). There exists several automated post-processing method without user interaction for the selection of the optimal data acquisition in MRCA, however, a user has to define a threshold value substantially.

Purpose

The purpose of this work is to develop an automated method without user interaction for the optimal placing of ROI in coronary MRA.

Methods

Fifteen health volunteers were scanned on a 1.5 Tesla scanner (Toshiba Medical Systems Corporation, Japan). For each subject, cine images were acquired in the 4 chamber orientation with the following protocols: 2D SSFP (retrospective gating, about 50–60 phases/cardiac cycle) with 2.2 × 1.4 × 8 mm spatial resolution during free-breathing. ROI (44 × 44 mm) was used to calculate the difference between adjacent cardiac phases. A ROI including on the outer edge of the cross section of the coronary artery was manually depicted from the first phase of each subject. Five ROI were randomly selected and averaged to make a ROI template. Furthermore extracted heart region was used to minimize signal contribution from regions outside the heart by rate of change per pixel throughout whole phases. The maximal and minimum intensities were identified and rate of change within a user-defined threshold value x were defined as heart region. The contrast of each phase is also normalized using the histogram of pixel intensities. To choose an appropriate ROI location automatically, the correlation coefficient (CC) between the ROI template and the first phase of all fifteen subjects were calculated. Based on there CC values, the optimal ROI placing was determined. The maximum CC was taken as center of the ROI location. Figure 1.

Results

Calculated appropriate ROI location was compared to the visually determined optimal ROI location. The comparison results of the observed and automatically calculated ROI location are as follows. In thirteen subjects (87%), the visual assessment was almost equal to the calculated area. Thus a high correlation between the automatically

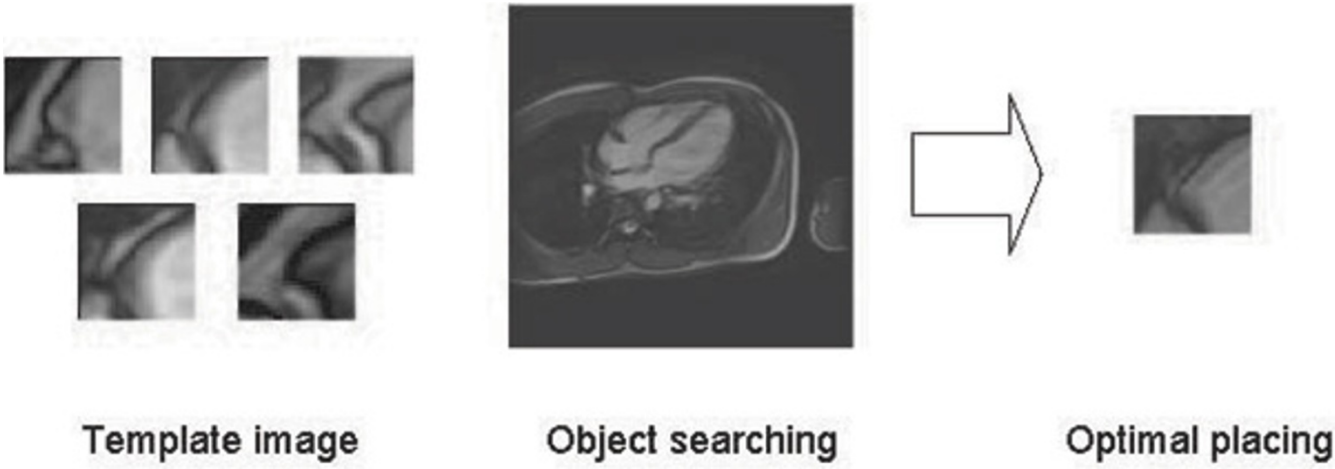

Figure 1
The purpose of this work is to develop an automated method without user interaction for the optimal placing of ROI for selecting optimal data aquisition window in coronary MRA.

and visually determined center points for ROI placing was found.

Conclusion

Automated placing of ROI yielded similar results compared to visual assessment. The study facilitates user independent assessment of the optimal ROI placing for MRCA. A ROI scale (44 × 44 mm) is appropriate for calculating CC between ROI template and the first phase. This technique can be used for further procedure such as determining data acquisition window in the quiescent period of the cardiac cycle and most helpful for MRCA when aiming at 3-dimensional coverage of the whole coronary arteries during a single scan.