

Poster presentation

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Automated quantitative assessment of myocardial infarction in late enhancement MRI

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Introduction

Accurate quantitative assessment of the size and distribution of myocardial infarction (MI) from late enhancement (LE) MRI is of significant prognostic value for post-infarction patients. Manual processing of the data is labor-intensive and simple processing methods, like thresholding, tend to produce unreliable results.

Purpose

The purpose of this study was to design an automated, robust, and systematic method for labeling the MI in LE MR imaging for quantitative MI assessment.

Methods

Twenty patients with known chronic myocardial infarction (all male, mean age 64 ± 8 , range 45-82 years) referred for viability assessment were included. LE MR was performed in multiple short axis slices covering the entire LV (slice thickness 10 mm, 5 mm overlap). Endocardial and epicardial LV contours were derived semi-automatically taking into account corresponding cine MR data. Two independent observers manually outlined the MI regions from a total of 348 slices.

The automated method started with finding a reliable and robust threshold on the image intensity, to discriminate the hyperenhanced MI from the normal myocardial tissue. The identified regions were subsequently processed with respect to their size and geometry to preclude falsely identified MI regions caused by noise or contour tracing

error. Finally, the remaining MI regions were further refined by region-growing to achieve an explicit delineation of the entire MI region.

Results

Good agreement was observed between the automated method and manual tracing from both observers. The relative size of infarction as derived from manual tracing was

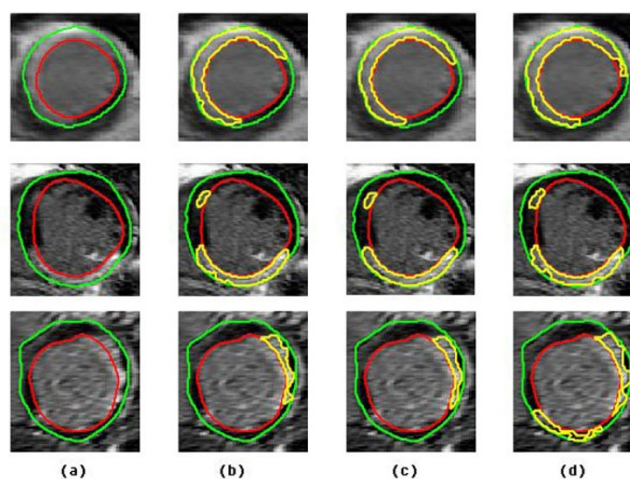


Figure 1
Comparison of MI labeling results. Column (a): the original LE MR images, (b): MI labeled by the automated method, (c): MI labeled by observer 1, and (d): MI labeled by observer 2.

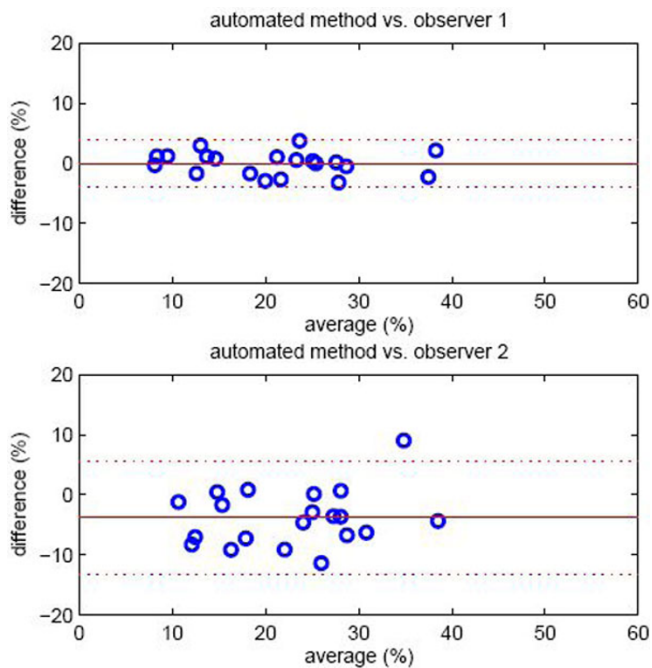


Figure 2
Bland-Altman analysis of the percentage infarction between the automated method and manual tracing of observer 1 and observer 2, respectively.

24.7% ± 7.7% (range 11.3%-40.7%). The difference was 0.0% ± 1.9% (P = NS) between the automated method and observer 1, and 3.8% ± 4.7% (P< 0.05) between the automated method and observer 2. No trend of increasing error was observed according to Bland-Altman analysis. The difference between the automated method and manual tracing was in the order of inter-observer variability (3.8% ± 4.4%) Figures 1 and 2.

Conclusion

An automated MI labeling method is proposed in this study. Validation results demonstrated that the method can provide accurate quantitative assessment of the MI for post-infarction patients. More extensive study like heterogeneity and transmural analysis can be done on this basis.

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