

Denoising Effect on T2* Values in Magnetic Resonance Imaging with Application in Iron Load of Patients with Thalassemia Major

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Abstract

Objectives: To investigate the effect of noise and denoising on the measurement of magnetic resonance (MR) imaging T2* values at interventricular septum of the heart in thalassemia major patients. A second objective is to estimate the T2* value based on the improvement of signal to noise ratio (SNR).

Methods: Different levels of Rician and Gaussian noises were added to the cardiac T2* MR images of 20 thalassemia major patients. The state-of-art denoising methods were applied to the obtained noisy images. T2* values of the interventricular septum and SNR were measured in both series of images by Segment and Matlab software, respectively.

Results: With respect to the Gaussian noisy and denoised images in different noise levels, although SNR improved, there were no significant differences between T2* values in original, noisy and denoised images. On the other hand, after denoising images with Rician noise a relation between improvement of SNR and T2* value is noticed. A predictor model is constructed based on the level of Rician noise for each method.

Conclusions: In the case of existence Gaussian noise, the results confirm that denoising is not effective on the measurement of T2* value. In the case of image distortion by Rician noise, a predictor model is proposed to estimate the original T2* value. The predictor model is used to estimate the T2* value of new patients. The predicted T2* values were in good agreement with the corresponding original T2* values.

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