Utilizing different methods for visualizing susceptibility from a single multi-gradient echo dataset.

Abstract:

PURPOSE: Objects that cause a susceptibility gradient can generate regions of hypo-intensity in MRI. MR techniques developed for positive enhancement of such objects require sequence parameter optimization. Thus comparison of images acquired successively using different techniques is difficult since different parameter settings result in variations in signal and noise. A new method is presented that allows production of positive contrast images, a relaxation rate R*2-map and negative contrast images from a single dataset by post-processing. METHODS: Positive contrast techniques considered include the "white marker" technique, inversion-recovery on-resonance (IRON) and susceptibility gradient mapping (SGM). The new method was tested in phantoms of iron-oxide agent gel solutions and prostate marker seeds. Images produced by post-processing were compared with those obtained directly. The post-processing technique was applied in vivo for the visualization of iron-oxide contrast agent uptake in a balloon-injured swine carotid model. RESULTS: The images produced in the post-processing step allowed determination of optimal parameter settings for each technique. SGM was found to provide the greatest positive contrast, whilst the T*2-weighted images provide more sensitivity to regions that exhibited weaker susceptibility effects. CONCLUSIONS: Combined T*2-weighted imaging and
SGM using the same complex image data was found to provide complementary information and high sensitivity to detect distortion inducing agents.