AbstractID: 8589 Title: Temporal variations of hemodynamic responses of BOLD fMRI at 3T: spin echo vs. gradient echo

Introduction

Because of its superior sensitivity, gradient-echo (GE)-BOLD signal is currently the most widely used contrast for fMRI. However, several works have suggested that the spin-echo (SE)-BOLD can improved spatial localization of neural activity due to its greater weighting to smaller vessels. We hypothesized that the temporal variations of measured hemodynamic responses (HR), a basic factor of temporal resolution of fMRI, directly related to spatial accuracy of the methods. Therefore this study compared GE- to SE-BOLD in time course and onset time variations of the HR.

Methods

Five normal volunteers participated in this study at a 3.0T MRI scanner. The paradigm consisted of 30 trials each with 1-s visual stimulation and 15-s fixation. Both the GE and SE experiments used echo-planar readouts with TR/TE/FA= 1000ms/35ms/64 and TR/TE=1000ms/72ms, respectively. Eight slices with 5-mm thickness were acquired to cover visual areas. For each activated voxel, the time series were extracted and averaged randomly across 30, 20 and 10 trials, from which the onset times and CNRs were determined with curve fitting to a gamma variate function.

Results

Variance of the onset time decreased with CNR increased. At the same CNR levels, we observed significantly smaller onset variances for SE compared to GE. Decreased sensitivities were noted for the SE when comparing the number of activated voxels with the GE results. The mean time courses showed earlier onset for the SE response as compared to the GE.

Discussion

We observed earlier onset times with smaller within-region variances in the SE- than in the GE-BOLD. Since the SE technique gives more weighting to the extravascular contributions around small vessels, we suggest that it could more accurately detect the onset time related to neuronal events. When comparing at the same CNR levels, the smaller latency variations of the SE measurement demonstrated its superior spatiotemporal natures.