AbstractID: 4549 Title: Hemodynamic response without large vein signals: BOLD imaging using diffusion-weighted spin-echo EPI

Purpose: This study aimed to evaluate the temporal characteristic and variability of hemodynamic responses measured by the diffusion-weighted spin-echo (DWSE) BOLD-fMRI and compare with spin-echo (SE) and gradient-echo (GE) results.

Method and Materials: Six volunteers participated in this study and using 1.5T scanner. The paradigm consisted of 40 repeated trials for DWSE and 30 for GE and SE, with each trial consisting of 1-s visual stimulation followed by 13-s fixation. The GE images were acquired by a single-shot GE EPI, with TR/TE/FA =1000ms/60ms/75°. SE EPI were used to measure DWSE and SE BOLD signals with TR/TE=1000ms/80ms.Bipolar diffusion gradients were incorporated into SE EPI with b values of 50($DWSE_{50}$) and 200 s/mm^2($DWSE_{200}$). Activated voxels were detected by correlating with a gamma variate function. The time series of selected ROI within the visual cortex were extracted for each pixel and averaged randomly across repeated single trials.

Results: Statistically earlier onset times and remarkably smaller variance at the same CNR level (controlled by averaging different number of trials) were observed with the DWSE than the GE data, with SE performed in between. No significant difference was found between $DWSE_{50}$ and $DWSE_{200}$.

Conclusions: Since DWSE technique is able to null the intravascular signal and more sensitive extravascular signal around small vessels, we suggest DWSE could more accurately detect onset time. Further, the curve profiles in GE and SE showed a good correlation with exponential decay and in $DWSE_{50}$ and $DWSE_{200}$ correlated well with linear decay. In other words, at higher CNR the onset time variance may approach constant for GE and SE but continue decreasing for DWSE. The curves of $DWSE_{50}$ and $DWSE_{200}$ overlapped, which suggests b value of 50 s/mm^2 may be sufficient to eliminate the large vessels' contamination on the determination of the onset of BOLD fMRI responses.

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Conclusion: