

AbstractID: 3371 Title: Detectability of Vasodilatation During Breath Holding by Dynamic CBV-based MRI: Comparison with BOLD-based MRI

Purpose:

To investigate the sensitivity of a CBV-based MR technique, vascular space occupancy (VASO) imaging, in the detection of vasodilatation during different durations of breath holding (BH) and its clinical feasibility as compared with BOLD MRI.

Method and Materials:

Experiments were performed on a 1.5T Siemens MRI scanner. For VASO, a non-slice-selective IR-GE-EPI was used with TR/TE/TI = 2000/9.3/665 ms, SW = 6 mm and in-plane resolution = 3 mm. For BOLD, a GE-EPI was used with TR/TE = 2000/ 60 ms. Two normal volunteers each performed 4 experimental runs, including two-cycle 30-s and 15-s BH each for BOLD and VASO. CNRs of were determined from ROIs drawn within the thalamus. A similar protocol was also carried out in a patient with right frontal anaplastic astrocytoma to review clinical feasibility.

Results:

Positive BOLD signal changes were noted during 30-s and 15-s BH (4.9 and 2.2 %), and the CNRs were 4.0 and 2.5. VASO method was able to detect CBV related negative signal changes (-3.1 and -1.8%, for 30-s and 15-s BH), and the CNRs were 2.3 and 1.8. Initial analysis of the patient data set revealed negative intra-tumoral BOLD signal changes. While the global pattern of the VASO map agreed well with BOLD, the extent of intra-tumoral changes was smaller. The BOLD map was then re-thresholded to a lower p-value which demonstrated intra-tumoral changes similar to those with VASO.

Conclusions:

CNRs of VASO were lower than those from BOLD. However, they were closer to BOLD (58 and 72% for 30-s and 15-s BH) than previously published results from visual stimulation (~ 30%). Discrepancies between two techniques in the clinical case were likely resulted from the differences in sensitivity. However, given that CBV-based signal change is more directly related with the vasomotor response, it could potentially be more clinically relevant.