AbstractID: 12962 Title: Voxel Location Dependence of Brain Metabolites as Determined by Magnetic Resonance Spectroscopy

Purpose: To quantify the spatial variation of absolute metabolite concentration in the human brain as determined by magnetic resonance spectroscopy (MRS).

Method and Materials: Multivoxel (PRESS) magnetic resonance spectroscopy data has been analyzed in an attempt to map out brain anatomy. Phantom data, along with spectra from a healthy volunteer and protocol patients were compared in order to detect trends that can be correlated with anatomy and/or disease. A 7x7 voxel grid was utilized, with a 2x2cm voxel size along with a 1cm slice thickness for all MRS scans. Phantom metabolites concentrations were similar to a healthy human brain: 3.0, 10.0 and 12.5mM for Cho, Cr and NAA respectively. Gaussian fits were used to estimate peak area.

Results: The phantom absolute voxel metabolite concentration variation is fit by a second degree polynomial, $ax^2 + bx + c$. Average R^2 (Pearson product) for the six different fits (three metabolites × two directions) varied from 0.93±0.08 (st. dev.) for the left-right fit for NAA to 0.98±0.02 for the anterior – posterior fit for Cr . Absolute metabolite concentration from the healthy volunteer show a consistent trend when plotted in the left right direction with the most medial voxel having a low value of metabolite concentration, followed by a relative maximum in the mid – lateral cerebrum, with a relative minima on the most lateral voxels. This minimum is likely the result of low metabolite concentrations near the mid-hemisphere/ventricle region of the cerebrum. NAA concentrations from a protocol patient show roughly consistent functional spatial dependence for three anterior rows, with a posterior row distinct. Lactate/lipid contamination is likely the cause of this differentiation.

Conclusion: Determining the functional spatial dependence of metabolite concentrations can aid in the deciding the value of diagnostic clinical MRS scans.

Acknowledgment: This work was funded by the Arizona Biomedical Research Commission.