

AbstractID: 10752 Title: Evaluation of a new more efficient and more objective MRS Tool for Brain Gliomas

Purpose:

To introduce a novel two-point initialization and semi-automated objective tool for MR brain spectroscopy. This method will improve the efficiency speed and reduce user-bias in evaluation in-vivo spectra assessed over artifacts (simulated) that arise from shimming, electronic noise, field inhomogeneity, coil sensitivities, relaxation which can cause variation in baseline drift or system noise.

Method and Materials:

Ten cases of C-6 induced rodent Glioma models/controls were analyzed from MRS data acquired on a Bruker Biospin 7T scanner. The new two point method only requires the user/technologist to specify 'start' - 'end' PPMs. First moment calculation is to used estimate the global standard deviation that initializes a Marquart-Levenberg nonlinear optimization method. Three equations were assessed: I) Gaussian-only fit, II) equal weighted Gaussian and Lorentzian Mixture, and III) free ratio between Gaussian and Lorentzian mixtures. We tested the algorithm in four metabolic regimes (Creatine, Choline, NAA, and Lipid/Lactate).

Results:

General Linearized Mixed Models were used to assess the method. There were significant differences ($F=1817$; $df = (3, 47e3)$, $p<.0001$) between the algorithm types (I-III) across disease model (c6 vs. control). When the pure Gaussian was applied the results tended to over estimate area ($t= 2.73$; $df=450.0$, $p<0.001$). The 50% mixture of Gaussian-Lorentzian ($t= -2.28$; $df 428.1$, $p<0.001$) was found to underestimate of the true area. No difference was found on the freely varying (model III) for two point fit.

Conclusion:

The 2-point method was shown to be equivalent or better than the 3 pt method for the initial spectra bracketing step. This provides advantages since the two point method requires less judgment (more objective) and is faster to perform. Additionally, we have demonstrated that the simple fitting of a Gaussian function may not be sufficient and Lorentzian terms may be required. Such standards are important for efficient glioma MRS evaluation.