Diana G Rotaru et al., J Neurol Neurophysiol 2018, Volume 9
DOI: 10.4172/2155-9562-C10-088

WORLD NEURON CONGRESS

November 26-27, 2018 Helsinki, Finland

Towards direct and precise measurement of neurochemicals in psychiatry and neuroscience: Simultaneous spectral editing of GABA and glutathione with HERMES

Diana G Rotaru, David J Lythgoe
King's College, UK

As the non-invasive evaluation of brain metabolism is considered an important factor in the understanding of neurological and psychiatric disorders (Alzheimer's Disease, Parkinson's Disease, epilepsy, schizophrenia, autism, ADHD, psychosis, bipolar disorder, major depressive disorder, etc.) more interest has been given to Magnetic Resonance Spectroscopy (MRS). Based on recent work on spectral editing schemes, discrimination and quantification of otherwise unresolvable neuro-metabolites like GABA (Gamma-Amino butyric Acid, the main inhibitory neurotransmitter) and GSH (glutathione, an antioxidant found throughout the brain) becomes possible. The purpose of our study was to test if HERMES (Hadamard Encoding and Reconstruction of MEGA-Edited Spectroscopy) could be used to discriminate between GABA and GSH. A comparison with standard methods (MEGA-PRESS - MEshcher-GArwood Point REsolved Spectroscopy) and test-retest reproducibility were also considered. A special proton MRS (1H-MRS) acquisition protocol was implemented on our 3T MR750 General Electric scanner. The HERMES pulse sequence was then tested in phantom and *in vivo* experiments, for the latter, a voxel in the dorso-medial prefrontal cortex (DMPFC) being prescribed. For the measurement of the edited signal, two software packages were used: LC Model, along with FID-A pre- processing and Gannet, which currently can be used without any additional pre-processing steps. The acquisition results showed that spectral editing was successfully performed, with GABA and GSH being edited correctly considering the spectral appearance and the concentration values. Regarding the analysis methods, LC Model and Gannet were both suitable for HERMES data sets. The test-retest reliability was assessed based on the concentration values we obtained and suggests there was a strong consistency between test-retest results for the same method of analysis. The advantages of the HERMES pulse sequence over conventional MR protocols include time efficiency, high-quality results and cost- effectiveness. As such, with HERMES we were able to obtain GABA and GSH spectra simultaneously in one scanning session no longer than 12 minutes, while the time required when using MEGAPRESS for the both GABA&GSH is double, one session of 12 minutes being necessary for each metabolite. The long-term benefits of using HERMES include the development of a reliable tool for neuroimaging research along with improved healthcare solutions (patient stratification, early disease detection, accurate diagnosis, treatment tracking and drug therapy evaluation).

Biography

Diana G Rotaru is currently a PhD student in the Neuroimaging Department at Centre for Neuroimaging Sciences, Institute of Psychiatry, Psychology and Neuroscience, King's College London. She completed her BSc at the Faculty of Medical Engineering, University Politehnica of Bucharest with a thesis focused on EEG seizure detection using artificial intelligence. Later, her research interests turned to neuroimaging and she graduated with an MSc in Neuroimaging. She decided to continue her dissertation project and she is working now on Magnetic Resonance Spectroscopy method development aiming to provide the tools necessary for precise and direct measurement of low concentration neuro-metabolites on clinical and preclinical moderate-to-high-field MRI scanners.

diana.rotaru@kcl.ac.uk

Notes: