**1H-magnetic resonance spectroscopy in the rat model of temporal lobe epilepsy induced by perforant pathway stimulation**

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**Introduction:** 1H-magnetic resonance spectroscopy (1H-MRS) is a non-invasive neuroimaging modality able to quantify the variability of metabolic injury usually found in humans and animal models in temporal lobe epilepsy. Quantification of the different metabolic levels may help in the identification of the epilepticus focus, optimization of clinical diagnosis, drug treatment and to determine the patient clinical prognosis. This study aimed to evaluate 1H-MRS in a rat model of temporal lobe epilepsy, which does not show *status epilepticus,* induced by perforant pathway stimulation.

**Materials and Methods:** 6 male *Wistar* rats *in vivo* at 12 weeks old were studied and divided into 2 groups : Sham control group (4) and Electrical stimulation group (n=2). A 3-T Philips scanner was used with an 8 integrated channels volumetric coil (Rapid Biomedical GmbH, Wurzburg, Germany). Spectra from all animals were obtained in the hippocampus using a single voxel with point-resolved spectroscopy (PRESS) at TE/TR: 135/2000ms and size of the VOI (Voxel of Interest): 5 x 8.5 x 9 mm3. We performed a 1H-MRS acquisition before the electrical stimulation using the perforant pathway to have a baseline data from the animals. New spectra acquisitions were obtained after 48 hours, 15 days, and 30 days after the electrical stimulation. According to this electrical stimulation model, bilateral bipolar electrodes were implanted in all rats’ brains and one week after the surgery a recovery sequence of stimulation was performed with a Grass Astro-Med S88 stimulus generator (paired pulses, 0.1-ms pulse duration, interpulse interval of 40 ms, and pulse amplitude of 20 V).  In the first two days a 30 min. stimulation sequence was performed and followed by 8 hours stimulation on the thirtieth day. The same procedures were used for the Sham control group, however they were not stimulated. The automatic quantification of metabolic levels from 1H-MRS was performed using the LCModel software. Only good quality spectra with <15% of error using Cramér-Rao lower bounds were included. Metabolites were expressed in terms of their ratio to Creatine+Phosphocreatine.

**Results:** Our results are preliminary from a longitudinal research which is currently being developed. There are no studies published in literature regarding the description of 1H-MRS with this experimental model of temporal lobe epilepsy. This protocol has been shown to be efficient for metabolic quantification; however we will include more animals in our future analysis in an attempt to achieve a sample with significant statistical power.

**Discussion:** Changes in chemical compounds in epilepsy are common and may reflect glial and neuronal impairment. Abnormalities in N‐Acetyl aspartate (NAA) concentration may evidence neuronal loss or dysfunction in mitochondrial metabolism, and they are related to the epileptogenic zone in mesial temporal sclerosis.

**Conclusion:** 1H-MRS could help to identify biomarkers linked to mechanisms of the epileptogenesis and follow the efficiency of antiepileptic drug therapy and epilepsy progression.

**References:** [1] Norwood BA *et al*., J Comp Neurol 518(16):3381-407, 2010; [2] Gülin Öz *et al*., Radiology 270(3):658-679, 2014; [3] Pearce PS *et al*., Epilepsia 57(12):1978-1986, 2016.