Progress Report 2011

Single-unit dynamics in the epileptic foci in patients with temporal lobe epilepsy

EPIDYN

PN-II-ID-PCE-2011-3-0240

Contract 153/2011

Progress report regarding the implementation of the project during October-December 2011

- Between October and December 2011 we have performed the following activities regarding to the project PN-II-ID-PCE-2011-3-0240 „Single-unit dynamics in the epileptic foci in patients with temporal lobe epilepsy", study which suggest the depth understanding of neural mechanism which stand at the generation and propagation of the pathological activity associated to the epileptic seizures, by studying the activity of single-units and also the reactivity at electric microstimulation in the patients with temporal lobe epilepsy, immune at drug treatment.

1. Documentation in order to complete in detail the experimental protocol which is going to be applied to patients planned for investigations in 2011, by consulting the specialized literature, and, as well, by the participation of two of the research team's members at , Society for Neuroscience 2011 Annual Meeting, Washington DC, Nov 12-16 si American Epilepsy Society 2011 Annual Meeting, Baltimore MD, Dec 2-6. With these occasions, some direct discussions have been carried with other researchers, which make studies in this area, and the validity and originality of the proposed experimental approach.

2. The finalization of the protocol and its submission to the medical ethics committee's approval of the Bagdasar Arseni Clinical Emmergency Hospital, where it will be developed the surgeries.

3. The finalization of the agreement informed about the participation at the study, that will be presented to the patients which will opt to participate at this study.

4. The development of the Matlab code for reading the files that contain EEG registrations, in native format EMS Pegasus. This system will be used not only for the preliminary monitoring with electrodes in scalp, for the long term monitoring (LTM) using depth electrodes at University Emergency Hospital Bucharest, but also at Bagdasar Arseni Clinical Emergency Hospital for intraoperative execution of electrocorticographs registrations using grids and strips of electrodes. One of the identified problems during the recent testing with the system EMG Pegasus was that the resulted events following the manually marking of EGG spikes inter-ictale??, about their review in Matlab, weren't saved in the exported files in one of the EEG standard formats (for example EDF90 – „European Data Format"). As a result, the manually selection of the spikes that were going to be analyzed, using the markers adding functionality, existent in the Pegasus software packet.

5. This Matlab script for importing the native dates will allow quick processing, intraoperative of inter-ictal spikes's registrations using the cordial?? electrodes grids, the review using Matlab's toolboxes (EEGLab – Delorme and Makeig 2004, BioSig – Schlogl and Brunner 2008, Vidaurre et al 2011), and also the export of peri-event sections for the review of sources location surselor in LORETA (Pascal-Marqui et al 1994, Lantz et al 1997).
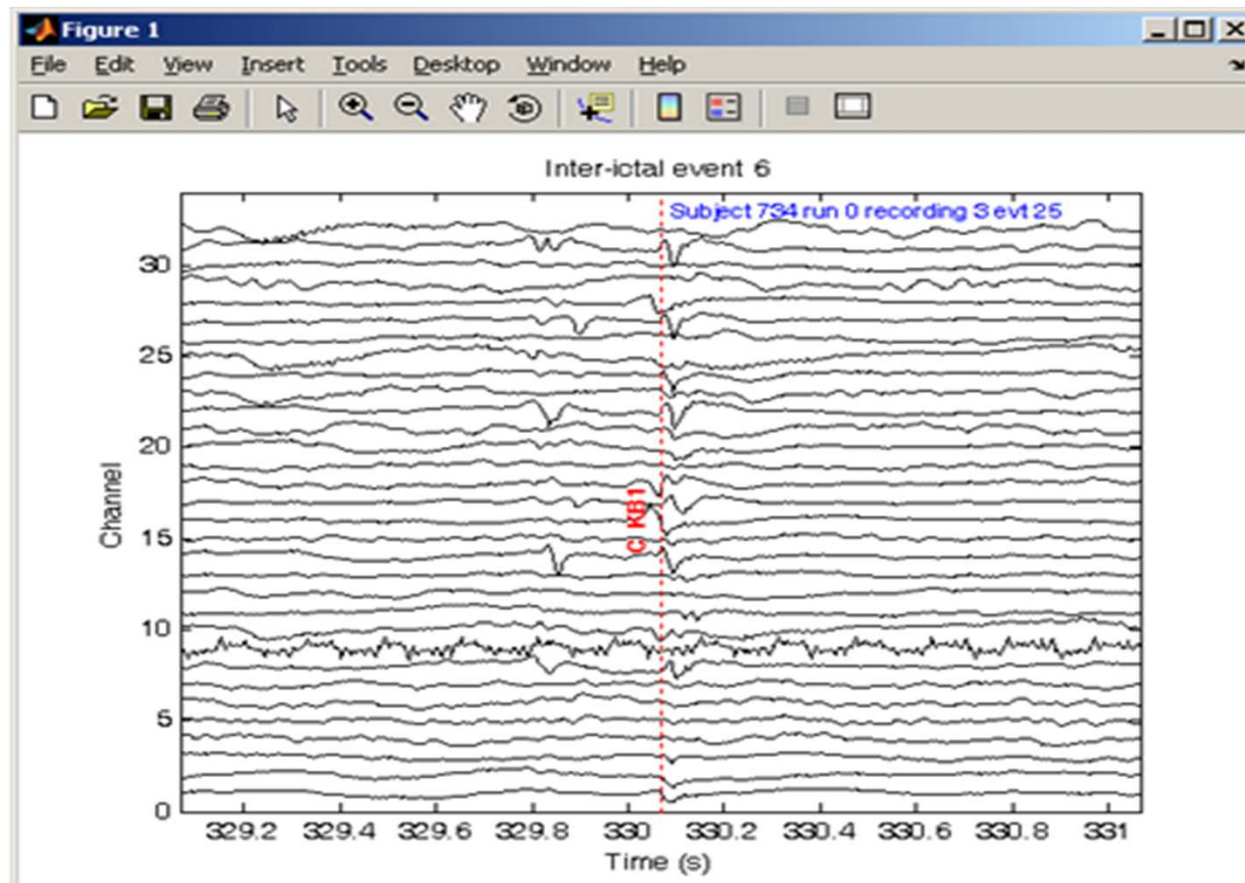
This Matlab script for importing the native dates will allow quick processing, intraoperative of inter-ictal spikes's registrations using the cortical grid electrodes, their review using Matlab's toolboxes (EEGLab – Delorme and Makeig 2004, BioSig – Schlogl and Brunner 2008, Vidaurre et al 2011), and also the export of peri-event sections for the review of sources location surselor in LORETA (Pascal-Marqui et al 1994, Lantz et al 1997).
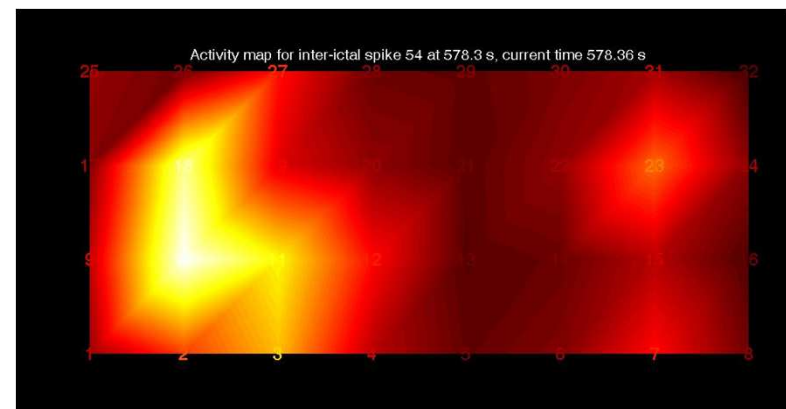
Topographic mapping of the inter-ictal spikes
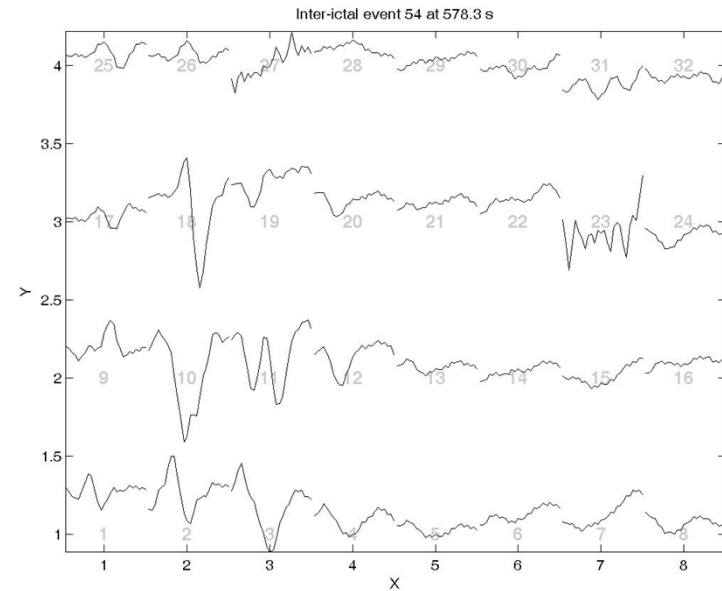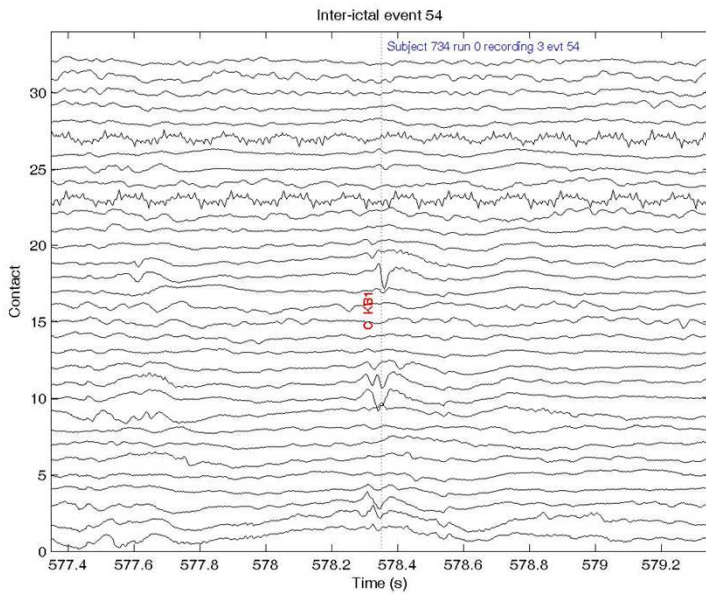
- We have designed a Matlab script that creates a topographic representation of the inter-ictal events and movies of the signal amplitude illustrating generation and propagation of spikes

5. On the detailed protocol, the needed equipments, materials and supplies list for the first investigations from the project has been defined and the contracting and buying of these have been ensured.

6. The list of investigations of tomographic imaging and of the electrophysiological registration ones which are going to be done, has been defined.

a. Imaging

i. Imaging of nuclear magnetic resonance (RMN):

    1. Initial RMN investigation with contrast substance (Gd), for highlighting the antomic features of each patient and the possible anatomo-pathological changes that can produce the epileptic manifestations. The contrast substance has the role to highlight the vasculature which can be an risk factor at the depth electrodes insertion for monitoring on long term and intraoperative of microelectrodes.

    2. Postoperative RMN imaging for monitoring the evolution on the cerebral area where the surgical resection has been done.

ii. X Ray tomography (CT)

    1. CT for the planning of the stereotactic insertion of depth electrodes used at preoperative monitoring on long term. This CT will be done in Leksell „G-frame" installed on the patient's head, and it will be co-registered with the preoperative RMN in the planning and neuronavigation program(FrameLink, Medtronic), program which will do the planning trajectories of the electrodes for reaching the proposed goals on being monitored.

    2. CT to check the accuracy of the positioning of depth electrodes implanted and monitoring the possible effects of implanting (edema, bleeding, etc.)

    3. Pre-operative CT performed in the day of the epileptogenic tissue resecting surgery with the Leksell frame type "G" attached, for planning the microelectrode's trajectory.

b. Electrophysiological recordings:

  i.Initial monitoring using EEG scalp electrodes

  ii. EEG registrations using depth electrodes

  iii. Operative registration in individual neurons ("single units") using microelectrodes

For the imaging investigations which cannot be done at the hospital, but it will be done by third-party providers, it will be allocated resources from the research project, so the patient does not cover major costs, and the future budget will be resized properly.

7. The activity of staff recruitment was initiated, including young researchers on vacant positions. Those were posted on Euraxess, receiving applications both from our country and abroad. A selection of the applications received was made up to current date, the process continuing until the deadlines, by respecting the legal terms of occupying the positions through competition.

References

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- Pascual-Marqui RD, Michel CM, Lehmann D. (1994) Low resolution electromagnetic tomography: a new method for localizing electrical activity in the brain. Int J Psychophysiol. 1994 Oct;18(1):49-65.

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