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Anca Arbune is a medical resident in Neurology at the University Emergency Hospital (EEG and Sleep Laboratory) and a PhD student (since 2015) in Neurology at the 'Carol Davila' Medicine and Pharmacy University, Bucharest, where she writes a thesis on the *Electrophysiological Study of Neural Networks during Sleep*. She published numerous specialised papers and benefitted from a medical student research exchange programme, through the IFMSA, at the Department of Psychiatry of the National Cheng Kung University, Tainan, Taiwan. She was also an Erasmus student at the Faculty of Medicine of the University of Leipzig.

Sleep and Its Influence on Neural Networks

I am presenting here my work within a project on 'The influence of sleep on cortico-cortical evoked responses through single pulse electrical stimulation', in which I collaborate with Dr. Ioana Mindruta and Dr. Andrei Barborica.

Epilepsy surgery involves a very careful presurgical analysis. In more difficult cases, invasive intracerebral electrode implantation is required, especially when conflicting information on the seizure onset zone (SOZ) exists. During monitoring, patients sometimes fail to have sufficient spontaneous seizures. In these cases, single pulse electrical stimulation (SPES) proved to be a useful tool to delineate the epileptogenic network. As epileptogenic discharges on scalp EEG are documented to occur more frequently during sleep, SPES during nighttime might reveal useful information.

We conducted intracerebral depth electrodes implantation as presurgical evaluation protocol, using individually tailored implantation plans, and monitored the SEEG activity between 14 and 21 days. We also conducted 1 Hz, 50Hz and SPES (during wakefulness and sleep) stimulations for cortical mapping and epileptogenic network identification. For each SPES stimulation we analyzed early (ER) and delayed responses (DR).

We identified the epileptogenic network using electro-anatomo-clinical correlation in 6 patients, with different seizure onset zones (temporal, frontal, parietal, opercular), of which 4 were operated on and are currently seizure-free. The SPES evoked DR differed during wakefulness and sleep, demonstrating the variability of the epileptogenic network connections. Comparing SPES ERs between wakefulness and sleep, the responses during sleep had significantly lower thresholds. The connectivity was significantly altered, the tendency being to loosen the connections with the surface cortex and strengthen the mesial networks. The connections within the seizure onset zone seemed to alter even more, favouring local connections. More study is needed to confirm these results, but these present a very novel find on the influence of sleep on the epileptogenic netwrok and also on the patients states of consciousness.