Technical University of Denmark

Popular science summary of the PhD thesis

PhD student	Sirin Wilhelmsen Gangstad
Title of the PhD thesis	Ultra long-term subcutaneous EEG monitoring of brain functioning and disease
PhD school/Department	DTU Compute

Science summary

For patients with epilepsy, both seizures and the fear of having another seizure can have far-reaching consequences. In many cases, anti-epileptic drugs can provide a better seizure control and thereby a better control of one's everyday life. Poor sleep can lead to more seizures, but seizures and anti-epileptic drugs can negatively affect sleep quality. Seizures, drugs and sleep all impact the patient's quality of life. There is therefore a growing consensus that possible sleep disturbances should also be considered when choosing the right treatment.

The interaction between sleep and epilepsy could be illuminated by observing how seizure occurrence and sleep quality evolve over extended periods of time. Monitoring sleep and seizures using a wearable EEG device could reveal patterns unknown to the patient, as many patients are not aware of all of their seizures. Objective seizure and sleep measures could therefore provide crucial information to the treating epileptologist.

This thesis presents a pilot study testing a small and wearable EEG device on patients with epilepsy, where the electrodes are implanted under skin above the ear. The patients wore the device continuously for three months. We show that the device is capable of measuring seizures and sleep structure, is safe to use and is well-tolerated by the patients. The EEG did in many cases reveal a different seizure pattern than the one reported by the patient. We developed patient specific sleep scoring algorithms that matched the performance of human experts. An analysis of sleep length and seizure occurrence showed that severe sleep deprivation could trigger seizures. However, many seizures seemed to be influenced by other, unknown factors.

Although the results show that it is feasible to monitor patients for long periods, future research is needed to illuminate the clinical utility of this new treatment aid.

Please email the summary to the PhD secretary at the department