

Cortical and sub-cortical excitability during spindles and K-complexes, putative attractors of epileptic activity



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Purpose: The ARMOR project (www.armor-project.eu) is developing a platform for home monitoring of epilepsy patients. During sleep stage II (SS2) the frequency of specific types of epileptic activity is high. It is believed that large graphoelements of SS2, spindles and K-complexes act as attractors of epileptic activity.

Method: We studied high quality whole night sleep MEG recordings of four normal subjects [1]. The brain activity during K-complexes and spindles was compared with activity shortly during targeted baseline periods that included periods before (1-2 seconds) the graphoelements, quiet core periods of sleep stages [1], including SS2 and the awake state, with separate comparisons performed in the time and frequency domains.

Results: We showed widely distributed cortical foci of activity with hot spots during spindles around the central sulcus, parietal and prefrontal cortex, and during K-complexes the strongest hot spots in the anterior and motor cingulate. The statistical comparisons between periods of large K-complex and spindle activity with targeted baseline periods confirmed these findings with very high statistical significance ($p < 0.0001$) for each subject. However, the same comparisons showed distinct sub-cortical areas for each baseline period, suggesting significant changes in sub-cortical excitation in different sleep stages, even in the quiet periods, consistent with our earlier study [1].

Conclusion: Our results highlight the need to monitor epileptic activity during sleep with simultaneous characterization of sleep stages. This need will be satisfied by the output of the ARMOR project that has home monitoring capability, allowing such a characterization to be followed over extended periods and thus probe the evolution of epilepsy with unprecedented detail.

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References:

[1] Ioannides AA et al. (2009) MEG identifies dorsal medial brain activations during sleep, *NeuroImage* 44: 455-68.

Assigned speakers:

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Assigned in sessions:

25.06.2013, 13:30-14:30, Poster Session, Poster session: Clinical neurophysiology A, Poster Area