Electrocortical studies of the hippocampal-parahippocampal (HP) structures in humans: Foramen ovale (FO) electrodes, as a research tool in human cognition and epilepsy

Results:

Using the opportunity to record parahippocampal activity with foramen ovale electrodes in epilepsy patients we examined high-frequency activity and its relation to NREM sleep-slow oscillations and sleep spindles. Parahippocampal high-frequency activity was organized into bursts which were consistently associated with interictal epileptic spikes.

Ripple density was higher during Non-REM than REM sleep ($p<0.001$). Ripple activity distinctly decreased time-locked to slow oscillation negative half-waves in the three patients without temporal structural alterations ($p<0.001$), whereas in the four patients with severe mesiotemporal structural alterations this coupling was obscure. Generally, in the patients ripple activity was increased before spindle peaks and distinctly decreased after the peak ($p<0.001$). Coordinated occurrence of hippocampal ripples, sleep spindles and slow oscillations have already been reported in animals yet the present results provide first evidence for such a temporal coupling in humans. Our findings are consistent with the notion of a hippocampo-to-neocortical information transfer during sleep that is linked to coordinate ripple and spindle activity, and that in the intact temporal lobe is synchronized to cortical slow oscillations.

Published Work:

Clemens Z, Mölle M, Eross L, Barsi P, Halász P, Born J. Temporal coupling of parahippocampal ripples, sleep spindles and slow oscillations in humans. Brain 2007;130:2868-78.

Clemens Z, Fabó D, Halász P. Twenty-four hours retention of visuospatial memory correlates with the number of parietal sleep spindles. Neurosci Lett. 2006;403:52-6.

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