

**168/04 - "Electrocortical studies of the hippocampal-parahippocampal (HP) structures in humans: Foramen ovale (FO) electrodes, as a research tool in human cognition and epilepsy"**

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**Abstract:** Ripples are high-frequency oscillation bursts in the mammalian hippocampus mainly present during Non-REM sleep. In rodents they occur in association with sharp waves and are grouped by the cortical slow oscillation such that, in parallel with sleep spindles, ripple activity is suppressed during the hyperpolarized down-state and enhanced during the depolarized up-state. The temporal coupling between these oscillations has been suggested to serve a hippocampo-neocortical dialogue underlying memory consolidation during sleep. Here we examined whether a similar coupling exists between these oscillatory phenomena in humans. We based our investigations on epilepsy patients undergoing presurgical evaluation implanted with foramen ovale electrodes. Recording with foramen ovale electrodes is a unique technique allowing parahippocampal electrocorticography in a semi-invasive way. In sleep recordings from seven epileptic patients, scalp-recorded slow oscillations and spindles as well as parahippocampal ripples recorded from foramen ovale electrodes were identified by automatic algorithms. Additionally, ripple and spindle root mean square activity was determined for relevant frequency bands. Ripple activity distinctly decreased time-locked to slow oscillation negative half-waves in the three patients without temporal structural alterations, 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. Ripples were consistently associated with interictal spikes suggesting that spike/ripple complexes represent an epileptic transformation of sharp wave/ripple complexes in the epileptic hippocampus. 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.

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