
Recollection of vivid memories following intracerebral stimulations in epileptic patients

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Abstract

Electrical stimulation of the temporal cortex in patients with epilepsy sometimes elicits experiential phenomena such as recollection of vivid memories. The neurophysiological substrate of such phenomena is poorly understood. Furthermore, the relation between the site of stimulation and the type of memory elicited has only recently started to be investigated. We investigated these issues in several patients and take patient FGA as an example. FGA had intracerebral electrodes stereotaxically implanted in the right temporal lobe for investigation of drug-resistant epilepsy. We report the results of electrical stimulations of the perirhinal region. Two stimulations elicited experiential phenomena consisting of visual memories that belonged to FGA's past, but which were not related to any particular episode (autobiographical semantic memory). These visual memories consisted of objects or of details of objects. These two stimulations were contrasted with other stimulations in the same subhippocampal region. Cross-correlation analysis of the depth-EEG signals filtered in frequency sub-bands revealed that experiential phenomena occurred only when the various brain structures involved in the after-discharge were synchronized in the theta range. These structures included the perirhinal region, the hippocampus, other limbic structures as well as a primary visual area. Our results suggest that recollection of vivid memory after electric stimulation of the cortex may rely on wide networks of brain areas that transiently synchronize. However, the phenomenological experience could depend on the site of stimulation: context-free when subhippocampal structures are stimulated, context-rich when the amygdala/hippocampus are stimulated.

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