Wallace H. Coulter Foundation Lecture Series

Impaired Consciousness in Focal Seizures: Neuroimaging, Physiology and Treatment with Deep Brain Stimulation

Hal Blumenfeld
Professor of Neurology, Neuroscience, and Neurosurgery at Yale University

Lecture: Friday, November 2, 2018
9:00AM-10:00AM
Room EC 2300
10555 West Flagler Street
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Biography

Hal Blumenfeld is a Professor of Neurology, Neuroscience, and Neurosurgery at Yale University. He is an expert on brain mechanisms of consciousness and on altered consciousness in epilepsy. As director of the Yale Clinical Neuroscience Imaging Center (CNIC) and Loughridge-Williams Professor he leads multi-disciplinary research and is also well-known for his teaching contributions in neuroanatomy and clinical neuroscience. Dr. Blumenfeld studied philosophy and bioelectrical engineering as an undergraduate at Harvard, completed an MD/PhD at Columbia in the laboratories of Steven Siegelbaum and Eric Kandel, neurology residency at Massachusetts General Hospital, and fellowships in clinical epilepsy and neuroscience research with Susan Spencer and David McCormick before joining the Yale faculty. In addition to his research and teaching, he sees patients through the Yale Comprehensive Epilepsy Center. The main goal of Dr. Blumenfeld's career has been to understand the mechanisms of impaired consciousness in seizures and to improve the lives of people living with epilepsy. Combining neuroimaging, electrophysiology and behavioral testing in patients, with translational work in animal models, his work has greatly advanced current knowledge, with important therapeutic benefits.

Abstract

Normal consciousness and its impairment depends on widespread network function in the brain. It has therefore been a mystery why focal seizures so often cause loss of consciousness. Using a combination of human neuroimaging and intracranial EEG recordings along with fundamental studies in rodent models we found that focal hippocampal seizures produce a sleep-like state in the cerebral cortex. Thus focal hippocampal seizures cause widespread network dysfunction and loss of consciousness by inhibiting subcortical arousal systems in the brainstem, thalamus and basal forebrain, leading to cortical slow wave activity closely resembling deep sleep or coma. Most excitingly, recent work has shown that stimulation of subcortical arousal systems in rodent models can restore normal awake cortical physiology and normal exploratory behaviors despite ongoing seizure activity in the hippocampus. Although the goal of epilepsy treatment is to stop seizures, this new approach offers potential hope for people with medically and surgically refractory epilepsy who have seizures with loss of consciousness. It may be possible to restore consciousness during and after seizures with deep brain stimulation devices already available by targeting subcortical arousal systems, leading to significantly improved quality of life for these individuals.

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