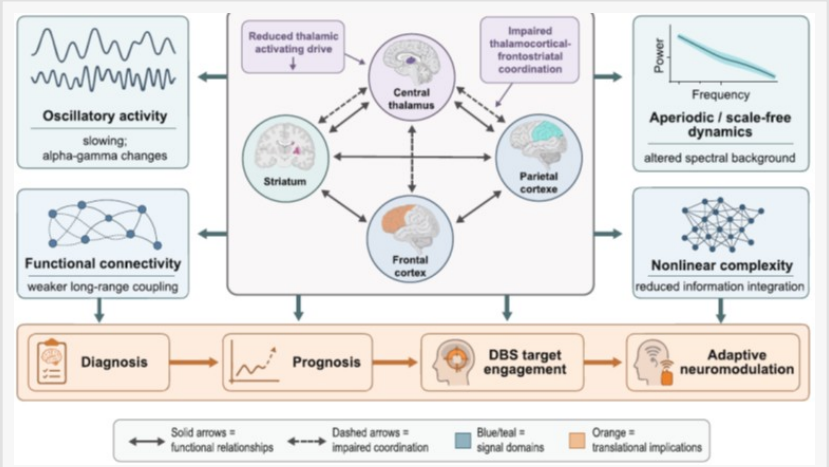
Hebei Medical University Researchers Review Prolonged Disorders of Consciousness Management

Identification of prolonged disorders of consciousness by measuring electrical signals from neuronal networks



Schematic demonstration of four different types of brain signaling measures | Credit: Conghui Li from The First Hospital of Hebei Medical University and Yi Yang from Beijing Tiantan Hospital, China | Image source link: https://doi.org/10.1186/s41016-026-0

BEIJING, FENGTAI, CHINA, August 14, 2026 /EINPresswire.com/ -- The accurate detection of pDOC is challenging in patients with severe brain injuries, and the incorrect detection limits treatment effectiveness. Current evidence indicates a 40% false diagnosis even with the use of advanced detection tools. This is mainly due to patient conditions—exhaustion, sedation, or unresponsive conditions. At present, doctors depend on various brain scanning techniques as the confirmatory procedure for identifying consciousness in patients.

The researchers from Hebei Medical University reviewed several scientific research databases to overview the current evidence on pDOC management methods. Their major focus was on the studies that directly measured the brain's electrical signaling in pDOC patients, termed “local field potential.” The study led by Dr. Conghui Li and Dr. Yi Yang was published in Volume 12, article number 22, on July 13, 2026, in the Chinese Neurosurgical Journal. Dr. Conghui Li said, "We aim to analyze how the brain electrical signal recordings support the pDOC diagnosis and study the possible outcomes and limitations of this technique.”

This review analysis proposes a brain communication network model to explain how brain injury leads to long-term unconsciousness. According to this model, the brain injury damages or destroys many nerve cells, disrupting the flow of electrical signals to the deep brain areas like the thalamus. As a result, the communication between important brain regions is weakened, thereby reducing the brain functioning. Supporting this theory, four major brain electrical signaling activity measures are identified that help the researchers to understand the level of

consciousness.

The healthy conscious brain maintains a constant, organized, and balanced flow of activating slow and calming fast signals of both the rhythmic and non-rhythmic signal types. Interestingly, different areas of the active brain keep communicating with each other in a controlled, nonchaotic manner. According to another scientific theory, an active brain does multitask—each part of the brain processes its own information as well as keeps its communication network functional.

The severe brain injury disrupts all these balanced signaling pathways and communication networks: the fast, active brain waves shift to weaker brain waves, while slower signals become more dominant. Furthermore, the coordinated functioning of multiple brain areas is impacted, and instead of a continuous flow, the brain sends short, simple, and less organized signals. The ability of the brain to process information is also declined during the state of unconsciousness. Collectively, these changes reduce the person's awareness and responsiveness.

Current studies comparing the healthy brain with the severely injured brain identify poorer communication between the thalamus and the outer layer of the brain in patients with pDOC. Measuring how complex this signaling activity is—particularly after brain stimulation—helps the doctors to estimate the person's level of consciousness.

The research based on animal studies, anesthesia-used studies, and brain injury patient studies has identified five more important brain signaling activities that may help to improve the understanding, diagnosis, and treatment of pDOC. In patients with severe brain injury, there is a lack of coordination between different brain areas and an interrupted flow of electrical signals as short bursts are observed. A lack of coordinated firing of individual brain cells in response to the rhythmic signals, along with disrupted balance in brain signaling activity, is also observed in pDOC patients. Mild stimulation to the brain, particularly the thalamus, restores its normal activity, so measuring how the brain responds to stimulation is a reliable way to detect hidden awareness.

Dr. Li commented, "There are also important ethical challenges identified regarding the studies, such as obtaining consent from family members, equality in obtaining treatment, and clearly explaining uncertain test results to the family."

However, more detailed research should be conducted in the future. The reviewed studies included only a small number of patients with different types of brain injuries, and the recordings were made under different conditions. Hence, the findings cannot be applied confidently to individual patients.

In conclusion, measuring brain electrical signals directly from inner brain areas helps to provide more accurate diagnoses and more personalized treatments. According to Dr. Li, "Further studies on large patient populations, collaboration between hospitals, and strong ethical

guidelines are necessary to make this diagnostic test more reliable."

Reference

Title of original paper: Advances in local field potential research in prolonged disorders of consciousness: a narrative review
Journal: Chinese Neurosurgical Journal
DOI: https://doi.org/10.1186/s41016-026-00441-x

About the University

Hebei Medical University (abbreviated as HMU), formerly known as the Beiyang Medical School, is one of the high-ranking universities in Hebei Province. Founded by Governor Li Hongzhang in Tianjin in 1894, Hebei Medical University was the very first western medical school established by the government. HMU has four post-doctoral programs—Basic Medical Sciences, Clinical Medicine, Integration of TCM and Western Medicine, and Biology—37 doctoral programs, and 52 master's programs. HMU has five directly affiliated hospitals and 5 indirectly affiliated hospitals, five teaching hospitals, and 28 sites for clinical practice. HMU is not only the center for medical education and healthcare services but also the center for medical research in Hebei Province.
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About Dr. Conghui Li from The First Hospital of Hebei Medical University

Dr. Conghui Li is a neurosurgery researcher and clinician affiliated with the Department of Neurosurgery at The First Hospital of Hebei Medical University, China. His research focuses on disorders of consciousness (pDOC), deep brain stimulation (DBS), thalamic electrophysiology, moyamoya disease, and cerebral revascularization surgery. He has contributed to multiple peer-reviewed publications in neurosurgery and neuroscience, including studies on intracranial electrophysiology, prolonged disorders of consciousness, and advanced neurosurgical treatments. His work aims to improve the understanding of brain function after severe injury and to develop better diagnostic and therapeutic approaches for neurological disorders.

About Dr. Yi Yang from Beijing Tiantan Hospital, Capital Medical University

Professor Yi Yang, MD, is a neurosurgeon, researcher, and associate professor at Beijing Tiantan Hospital, Capital Medical University, where she also serves as a doctoral supervisor. Her research focuses on disorders of consciousness, deep brain stimulation, neuromodulation, brain–computer interfaces, and clinical neurophysiology. She has authored more than 60 peer-reviewed publications and has led over 15 national and provincial research projects. As an Oxford University Visiting Scholar, Dr. Yang has received recognition as a Beijing Science and Technology Rising Star and Beijing Brain Science Young Scholar. Her work combines advanced neuroscience with innovative clinical technologies to improve the diagnosis, treatment, and rehabilitation of patients with severe neurological disorders.

Funding information

This study was funded by International (Hong Kong, Macao, and Taiwan) Science and Technology

Cooperation Project (Z221100002722014), Science and Technology Innovation 2030 (2022ZD0205300), Chinese Institute for Brain Research Youth Scholar Program (2022-NKX-XM-02), National Natural Science Foundation of China (82371197), and Natural Science Foundation of Beijing Municipality (7232049).

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