Monitoring Consciousness for Improved Anesthesia Delivery

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WARF: P09238US02

Inventors: Giulio Tononi

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method and apparatus for measuring consciousness in patients under anesthesia.

Overview

Anesthetics are a critical part of modern surgical practice. Unfortunately, once in every 1000 to 2000 operations a patient may temporarily regain consciousness or even remain conscious during surgery. One cause of such awareness during surgery is the difficulty in objectively evaluating levels of consciousness in patients. Determining consciousness is challenging because anesthetics work in many ways, any of which could impair responsiveness, even during consciousness. For example, some anesthetic agents prevent unwanted movement, which can affect the patient's ability to respond. Some anesthetics also promote forgetfulness, which can cause a patient to forget what they want to say or do, preventing a response. Finally, some anesthetics cause amnesia, raising the possibility that patients forget they were conscious, causing a misinterpretation of loss of consciousness.

Anesthetics are thought to work by regulating activity in key portions of the brain and spinal cord, affecting electroencephalographic (EEG) signals collected at the scalp. Brain function monitors have been developed to monitor EEG signals to determine levels of consciousness. These devices may help guide anesthetic delivery, but currently cannot definitively indicate the presence or absence of consciousness. A method to clearly monitor the transition from consciousness to unconsciousness to facilitate anesthetic delivery is needed.

The Invention

A UW-Madison researcher have developed a method and apparatus for assessing loss of consciousness with the potential for use during anesthesia. The device monitors brain waves in response to stimulation to determine the level of consciousness. It uses EEG sensors to collect electrical signals from firing neurons within a patient's brain and a neural stimulator to provide localized excitation of neurons within the brain at a certain location and time. A computer receives the electrical signals from the EEG sensor and executes a program to measure neural activity after the excitation of neurons and calculate an indication of consciousness based on the measured activity. The computer determines unconsciousness by noting when the neurons in the brain begin firing in a highly coordinated manner similar to the production of slow waves during deep sleep.

Applications

- Measuring level of consciousness in patients undergoing anesthesia using brain wave monitors
- Assessing consciousness of patients in a vegetative or minimally conscious state
- Determining consciousness in any other medically applicable circumstance

Key Benefits

- Ensures unconsciousness throughout surgery

- Allows fine-tuning of anesthesia dose to ensure loss of consciousness with minimum dosage, reducing complications related to overuse of anesthetics

Additional Information

For More Information About the Inventors
- Giulio Tononi

Related Technologies
- For information about an invention that promotes deep sleep using EEG signal monitoring and slow brain wave stimulation, see WARF reference number P06419US.

Publications
- Alkire M.T., Hudetz A.G. and Tononi G. 2008. Consciousness and Anesthesia. Science 322, 876-880.

Tech Fields
- Medical Devices : Neurological devices

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846