Scientists discover noninvasive technique to monitor migraines

August 31 2016

Credit: Sasha Wolff/Wikipedia

New UBC research has found that amplified electroencephalograms (EEGs) can produce diagnostic results of a brainwave associated with

migraines and epilepsy that are comparable to the current, more invasive, standard—a discovery that could lead to better treatment and diagnosis of these conditions.

The low-frequency brainwave linked to migraines and epilepsy is known as cortical spreading depression (CSD) and is currently best studied by placing electrodes directly on the surface of the brain. But researchers from UBC, Germany and Iran have found that EEGs—produced by placing electrodes only on the scalp—can produce equally reliable data if a specially designed amplifier is used in tandem.

"Using this method, we found that the electrical signals acquired from the skin of the scalp were very similar to those acquired from the surface of the brain," said lead researcher Zoya Bastany, a master's student in the faculty of applied science at UBC.

Bastany designed an AC/DC amplifier to acquire electrical signals from scalp electrodes used on anesthetized rats. The amplifier detects signals in a much broader frequency range than the standard clinical EEG system. CSD was then induced in the rats, and the recordings from scalp electrodes were compared with recordings from electrodes placed on the rats' brains.

Cortical spreading depression has never before been accurately measured using EEGs, according to UBC electrical and computer engineering professor Guy Dumont, Bastany's supervisor and study co-author.

"The new method opens up uses for EEGs in studying cortical spreading depression in a non-invasive manner and without a significant increase in diagnostic costs compared to standard EEG," said Dumont.

Ali Gorji, a professor of neuroscience at the University of Münster in

Germany and a study co-author, said the new analysis technique could contribute to the development of migraine drugs that target CSD, and to better understanding of other neurological disorders.

"Research is still continuing to fully understand the clinical relevance of CSD. But ultimately, having this noninvasive way of studying this brainwave could lead to better understanding, diagnosis and treatment of migraine, epilepsy and other neurological conditions such as stroke and traumatic brain injury," said Gorji.

The study is a joint research program between UBC, University of Münster, and Shefa Neuroscience Research Center and Mashhad University of Medical Sciences in Iran.

A paper describing the results was published July 2016 in the journal *Neuroscience*.

More information: *Neuroscience*, DOI: 10.1016/j.neuroscience.2016.06.056

Provided by University of British Columbia

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