

Study finds factors that may cause fluctuations in deep brain stimulation levels over time

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Deep brain stimulation therapy blocks or modulates electrical signals in the brain to improve symptoms in patients suffering from movement disorders such as Parkinson's disease, essential tremor and dystonia, but a new study suggests that several factors may cause electrical current to vary over time.

Led by Michele Tagliati, MD, director of Cedars-Sinai Medical Center's Movement Disorders Program, the study identified variables that affect impedance – resistance in circuits that affect intensity and wavelength of electrical current. Doctors who specialize in programming DBS devices fine-tune voltage, frequency and other parameters for each patient; deviations from these settings may have the potential to alter [patient outcomes](#).

"Deep brain stimulation devices are currently designed to deliver constant, steady voltage, and we believe consistency and reliability are critical in providing therapeutic stimulation. But we found that we cannot take impedance stability for granted over the long term," said Tagliati, the senior author of a journal article that reveals the study's findings.

"Doctors with experience in DBS management can easily make adjustments to compensate for these fluctuations, and future devices may do so automatically," he added. "Although our study was not

designed to link changes in impedance and voltage with [clinical outcomes](#), we believe it is important for patients to have regular, ongoing clinic visits to be sure they receive a steady level of stimulation to prevent the emergence of side effects or the re-emergence of symptoms."

Findings of the study – one of the largest of its kind and possibly the first to follow patients for up to five years – were published online ahead of print in *Brain Stimulation*. Researchers collected 2,851 impedance measurements in 94 patients over a period of six months to five years, evaluating fluctuations in individual patients and in individual electrodes. They looked at a variety of factors, including how long a patient had undergone treatment, the position of the implanted electrode, the side of the brain where the electrode was implanted, and even placement and function of contact positions along electrodes.

Medications usually are the first line of treatment for movement disorders, but if drugs fail to provide adequate relief or side effects are excessive, neurologists and neurosurgeons may supplement them with [deep brain stimulation](#). Electrical leads are implanted in the brain, and an electrical pulse generator is placed near the collarbone. The device is then programmed with a remote, hand-held controller.

More information: *Brain Stimulation*, "Longitudinal Impedance Variability in Patients with Chronically Implanted DBS Devices," April 15 (Epub ahead of print).

Provided by Cedars-Sinai Medical Center

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