Cleveland Clinic Innovations

Acute Intracranial Micro-Magnetic Stimulation

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PRODUCT

Micro-magnetic stimulation for acute activation of the brain or spinal cord during neurosurgical procedures

INDICATION

Micro-magnetic stimulation, neurosurgical procedures, brain mapping, epilepsy, brain/spinal tumor

VALUE PROPOSITION

- Increases spatial resolution of brain images.
- Lower risk of complications compared to traditional methods.
- Decreases surgical mapping time.

DEVELOPMENT STAGE

Prototype Developed

PUBLICATION

Park, Hyun-Joo et al. “Activation of the central nervous system induced by micro-magnetic stimulation.” *Nature communications* vol. 4 (2013): 2463.

INTELLECTUAL PROPERTY

US Patent 10,213,615

CONTACT INFORMATION

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UNMET NEED

Neurosurgical procedures that require precise functional mapping of the brain include epilepsy resections, tumor resections, and chronic neuro-prosthetic implantations. Currently, functional mapping is done using intracranial electrical stimulation in combination with electrophysiological methods, but limitations exist that can reduce efficacy. Additionally, poor spatial resolution reduces the ability to precisely segregate functional domains of the brain. Transcranial magnetic stimulation systems are bulky and suffer from poor spatial resolution. Since typical mapping procedures require multiple brain or spinal cord sites to be tested, repeated penetrations into tissue may lead to surgical complications and can damage tissue that is otherwise normal. Limited changes have been made over the last couple decades, making this a much-needed area of improvement.

SOLUTION

This invention overcomes limitations of current electrical stimulation and transcranial magnetic stimulation by activating the brain via electromagnetic micro-coil. Inductors are placed on the surface of the tissue and magnetic fields are focused inside, allowing for the generation of an eddy field, which is more focused. No net charge is sent into the tissue, reducing the chance of complications caused by electrical imbalance. This invention increases spatial resolution without damaging tissue and decreases surgical mapping time through the use of a brain conforming contour unit. By mapping brain tissue more clearly and with less risk of complications, affected brain tissue can be found and treated more precisely. Patients with refractory epilepsy, and better definition of tumor margins in brain and spinal cord tumors would benefit from this device.