Design And Fabrication Of Multi-Electrode Array For Spinal Cord Epidural Stimulation

Tech ID: 28941 / UC Case 2015-028-0

SUMMARY

UCLA researchers in the Department of Bioengineering have developed a novel multichannel electrode array to restore locomotion in paralyzed or physically impaired patients.

BACKGROUND

Recovery of locomotion from permanent paralysis caused by spinal cord injuries (SCI) is a central focus in spinal cord prosthesis. Currently, there is no cure for spinal cord injury: aggressive physical therapy and rehabilitation can result in some improvement in locomotion, but is not guaranteed for all patients. Prior studies have demonstrated in animal models that it is possible to regain motor ability through spinal cord stimulation. However, current spinal cord electrodes are thick and bulky and are designed only for use in pain management. A device that will allow SCI patients to regain and control their movement would revolutionize the field and drastically improve patient quality of life.

INNOVATION

Researchers at UCLA have developed a flexible multi-site polymer electrode array for epidural spinal cord stimulation. The electrodes are flexible and durable enough to withstand typical motion. Programmable multi-site electrodes allow customization of stimulation parameters for individual patients. The device was tested in vivo in a rat SCI model, which showed that electrical stimulation using the electrode array restored walking ability in paralyzed mice.

APPLICATIONS

Spinal cord stimulation:

- Physical therapy and rehabilitation
- Prosthesis for patients with SCI
- Pain management

ADVANTAGES

- Can restore locomotor activity
- Customizable to each patient
- Small and portable
- Durable

RELATED MATERIALS

- “Bio-Impedance Characterization Technique with Implantable Neural Stimulator Using Biphasic Current Stimulus,” Yi-Kai Lo, Chih-Wei Chang, Wentai Liu, accepted by EMBC 2014.
- “Design and Fabrication of a Multi-electrode Array for Spinal Cord Epidural Stimulation,” Chih-Wei Chang, Yi-Kai Lo, Parag Gad, V Reggie Edgerton, Wentai Liu, accepted by EMBC 2014.
- Lo, Yi-Kai, Yen-Cheng Kuan, Stanislav Culaclii, Brian Kim, Po-Min Wang, Chih-Wei Chang, Jonathan A. Massachi et al. "A Fully Integrated Wireless SoC for Motor Function Recovery After Spinal Cord Injury." IEEE Transactions on Biomedical Circuits and Systems 11, no. 3 (2017): 497-509.

PATENT STATUS

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Electrode; spinal cord injury; epidural simulation; paralysis; locomotion; rehabilitation; physical therapy; prosthesis; spinal cord prosthesis; spinal cord

CATEGORIZED AS

- **Engineering**
  - Engineering
  - Robotics and Automation
- **Medical**
  - Devices
  - Disease: Central Nervous System
  - Rehabilitation
- **Sensors & Instrumentation**
  - Medical
- **Transportation**
  - Personal

RELATED CASES

2015-028-0

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,773,074	09/15/2020	2015-028

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Regulation Of Autonomic Control Of Bladder Voiding After A Complete Spinal Cord Injury

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