

A new direction of spinal cord stimulation thanks to closed Loop system: a case report

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Abstract

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Abstract

Background: Spinal cord stimulation (SCS) utilizes the delivery of mild electrical pulses via epidural electrodes placed on the dorsal side of the spinal cord to treat chronic pain. Contemporary SCS therapies leverage novel therapeutic pathways to limit paresthesia and deliver superior clinical outcomes. To account for stimulation fluctuations due to postural changes, closed loop (CL) SCS systems have been developed to automatically adjust stimulation parameters to compensate for this variability. Knowledge about SCS mechanisms of action have now extended far beyond the traditional gate control theory. Spinal ECAPs are measured with every stimulation pulse and subsequently processed by a sophisticated algorithm in the implanted stimulator. For the CL case, the growing ECAP is sensed by the stimulator and interpreted as a control signal to decrease the stimulation amplitude, controlling the amplitude of VTA and ECAP. The patient will feel an even stimulation with optimized dose delivery.

Case description: 44 years old woman with neurological bladder (already performed implantation of sacral neurostimulator, removed for non-efficacy); subjected to multiple interventions of endometriosis with intestinal resection and cystoscopy with excision of intestinal metaplasia. Treated for post-thoracoscopy pelvic and thoracic pain after postoperative diaphragmatic laceration. In October 2020 we implanted SCS for the pain of the right half thorax. After about a year he reported allodynia, hyperalgesia, paresthesia to the entire right hemisphere, major lying down. The electrocatheter was repositioned cranially, after ruling out possible cardiac causes. For the persistence of discomfort in March 2024 we placed the implantable generator Medtronic (closed Loop). Currently, three months after installation, there is marked improvement from the use of the device.

Discussion: Accelerometer based CL feedback is a robust tool for automatically adjusting stimulation to compensate for changes in the spacing between SCS leads and the spinal cord based on body positions. In some cases, stimulation may be insensitive to electrocatheter movements; for example related to coughing/sneezing or in response to subtle movements such as heartbeat or breathing. A more nuanced option may be needed to address these needs.

Conclusions: User acceptability grew and SCS established a position well within the mainstream options for chronic pain management. Science turns to rapid growth, considering the patient's feelings at the heart of this evolution. Less and less limitations and disadvantages in the use of spinal cord stimulation, while increasing the benefits in favor of a better control of the pain and the discomfort given by the treatment itself.

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