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Electrical nerve stimulation can reverse spinal cord injury nerve damage in patients

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Approximately 12,000 spinal cord injuries (SCI) happen every year in the U.S., the majority caused by car accidents, falls, sporting accidents and gunshot wounds. Better emergency care and therapy have made SCI manageable, but researchers continue to investigate approaches to make it repairable. A new study in *Journal of Neurophysiology* reports that peripheral nerve stimulation therapy can reverse SCI-associated nerve deterioration, potentially improving the benefits of current and emerging rehabilitation treatments.

Muscles contract when the nerves controlling them are activated by electrical impulses from the brain. The brain loses control of the muscles after SCI because injured nerves do not excite easily or at all. In addition to the nerves in the spine, the peripheral nerves—nerves going to the limbs—downstream of the injury site are also compromised after SCI, worsening muscle atrophy and other health complications that follow the injury. This secondary nerve deterioration also limits the benefits of rehabilitation therapy and the possibility of spontaneous recovery. According to the researchers, maintaining peripheral nerve function soon after SCI may lessen health complications and "lead to better functional and rehabilitation outcome later on." In this new study, the research team from The University of Sydney in Australia examined if an intensive, short-term nerve stimulation treatment could improve peripheral nerve function after SCI.

Patients with SCI underwent 30 minutes of electrical nerve stimulation therapy five days a week for six weeks on one limb. The other limb

remained untreated. All subjects started the therapy within six months of injury.

Patients with SCI had less excitable nerves with altered responses to electrical stimulation, indicating nerve dysfunction. After six weeks of therapy, the nerves in the treated limb responded to electrical stimulation more like nerves in healthy subjects. Nerve function in the untreated limb did not change over the six-week period. "The present study has clearly demonstrated that an intensive six-week peripheral nerve stimulation program was beneficial in improving nerve excitability parameters toward the normal range," the researchers wrote. Moreover, the improvements stayed if the patient continued with the stimulation therapy, the researchers said.

According to the researchers, short-term peripheral nerve stimulation may be a new approach to preventing long-term changes in nerve and muscle function and improving rehabilitation outcomes. "Therapies that help to maintain peripheral nerve function, such as the peripheral nerve stimulation paradigm used in the current study, need to be incorporated into the mainstream neuro-rehabilitation program in the early phases of SCI," the researchers wrote.

More information: "Short-term peripheral nerve stimulation ameliorates axonal dysfunction after spinal cord injury." *Journal of Neurophysiology* Published 1 May 2015 Vol. 113 no. 9, 3209-3218 DOI: 10.1152/jn.00839.2014

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