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Neural Prosthesis Seminar

"A Continuum of Strategies Targeted at Neuroplasiticity for Recovery After Neurologic Injury"

October 21, 2011 • 8:30 AM

Biomedical Research Building • BRB 105

Case Western Reserve University

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Abstract:

Studies in animals and humans have shown that the functionally isolated human spinal cord maintains specific properties recognized to generate locomotion in other species. These concepts now have been translated into the clinic by the Christopher and Dana Reeve NeuroRecovery Network of seven rehabilitation centers that provide standardized Locomotor Training to individuals with chronic incomplete spinal cord injury. 206 individuals ranging from 0.9 to 26 years post injury were assessed during intensive Locomotor Training, including step training using body weight support and manual facilitation on a treadmill followed by overground assessment and community integration. While significant improvement from enrollment to final evaluation was observed in balance and walking measures for AIS C and AIS D patients, the magnitude of improvement differed significantly between AIS groups for all measures. These results indicate that rehabilitation that provides intensive activity-based therapy can result in functional improvements in individuals with chronic incomplete SCI even years after injury.

In another study we hypothesized the human spinal locomotor circuitry has sufficient automaticity potential to generate postural control and rhythmic, coordinated weight bearing stepping. We implanted a 23 year old individual, 3.4 years post injury. He was clinically assessed as an AIS B, i.e., some sensory but no motor function below the lesion (C7). While sitting and standing in a supportive system without stimulation, little or no observable EMG activity occurred in the leg muscles. With epidural stimulation the transition from sitting to standing was accompanied by an increase in the EMG amplitude by orders of magnitude. In addition, after several months of training he was able to voluntarily move his legs in the presence of epidural stimulation. The results also show that a physiological state can be achieved with epidural stimulation so that the sensory input can effectively control the locomotor circuitry to stand and to step.

For more information, please contact Cathy Naples at (216) 707-6490.

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