



TARGETED EPIDURAL SPINAL STIMULATION

Problem – Challenge

Spinal cord injury (SCI) is a medically complex and life disrupting condition that each year affects 250 000 and 500 000 people worldwide. Most SCIs lead to chronic paralysis but the symptoms of spinal cord lesion will depend on the extent of the injury and the position of the damage along the spinal cord. The neurological damage caused by SCI essentially breaks down the communication between the brain and nervous system of the spinal cord that are responsible for driving essential neurological functions such as walking. Therapeutic approaches have been proposed to restore movement, typically by focusing on precisely reconstituting the circuit connectivity that was in place before the injury, but none have been found to be effective. The only interventions reported to promote recovery rely on activity-based rehabilitation therapies through training; a drawback being that patients who fail to produce active movements voluntarily, experience minimal benefits from these therapies.

Solution

Based on the assumption that spared spinal cord circuits could be re-activated and reconnected with the brain by enabling an activity based rehabilitation, EPFL developed a multisystem technology to mimic in real time how the brain naturally activates the spinal cord. The core of the system relies on technologies that can electrically stimulate the spinal cord in very precise manner based on a deep understanding of the underlying biology.

Last year, an exciting milestone was reached following the outcome of a clinical study led by EPFL and the CHUV that demonstrated the efficacy of the technology in three human patients with chronic paraplegia. All three patients were reported to be able to walk "hands-free" over more than one kilometer with the help of targeted electrical stimulation in combination with a smart bodyweight-support system. Most importantly, the patients recovered the voluntary control of previously paralyzed leg muscles after only a few months of training.

A significant portfolio of patents has been licensed to the company GTX Medical, a spin-out of EPFL that is developing the technologies such as optimized paddle lead to stimulate targeted regions of the spinal cord and novel electronics to adjust the precise timing of the electrical pulses. The body-weight support robot developed by EPFL is being commercialized by the company Motek Medical.



@ Caillet Jamani

