Medical Xpress

Recovery from spinal cord injuries can be predicted

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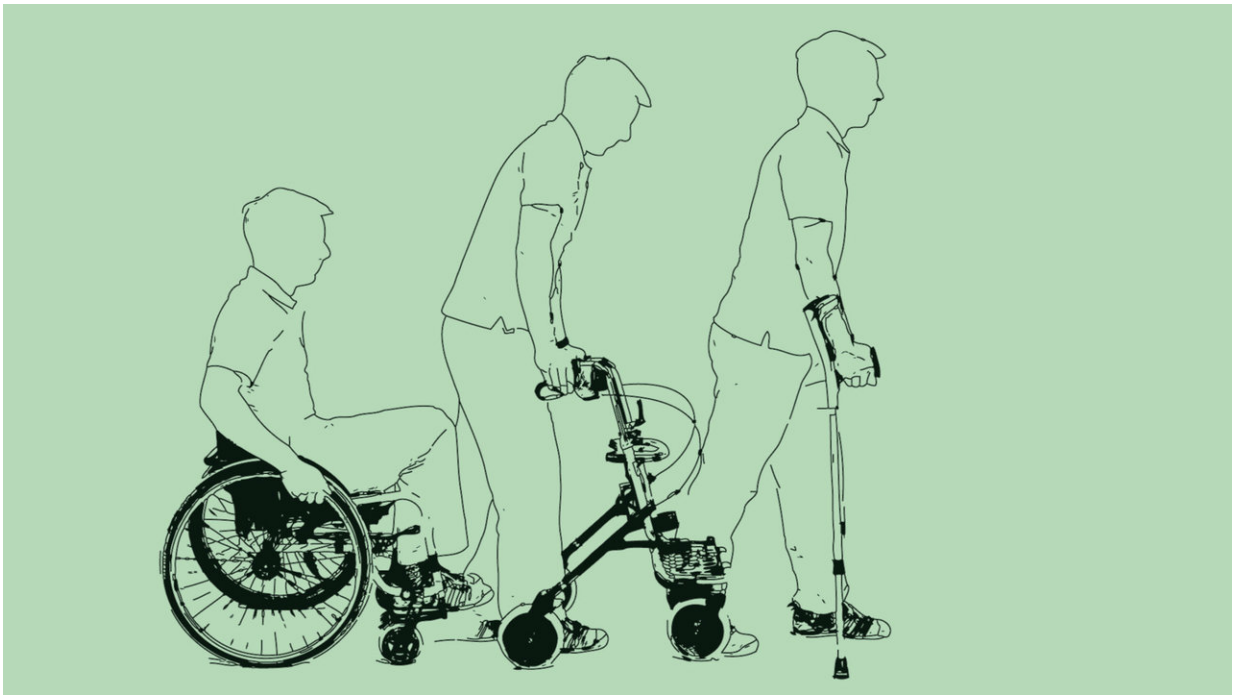

How well patients recover from a spinal cord injury can be reliably predicted. Credit: Marc Bolliger

Injuries to the spinal cord result in tissue loss in the spinal cord and brain. These neurodegenerative changes can be analyzed in detail using neuroimaging methods. University of Zurich researchers have now, for the first time, predicted the extent of functional recovery in patients suffering from a spinal cord injury two years after a trauma based on the

extent and progression of neurodegenerative changes within the first six months after injury.

A trauma to the spinal cord quickly leads to a progressive loss of nerve tissue. Over time, an injury at one site affects other parts of the spinal cord and even the brain. These neurodegenerative changes can be explored in detail using magnetic resonance imaging. An international team of researchers headed up by Patrick Freund from the Spinal Cord Injury Center of the University of Zurich and the Balgrist University Hospital has investigated the extent and progression of microstructural changes over the first two years after a spinal cord injury.

In their study, the scientists examined 15 patients who had suffered acute traumatic injuries to the spinal cord, as well as 18 healthy study participants after two, six, 12 and 24 months. They determined the anatomical extent of neurodegeneration In the brain and spinal cord, the loss of myelin, and the accumulation of iron in the nerve tissue as a result of degeneration and inflammation. The researchers found a direct link between the recovery levels of patients after two years and the extent of neurodegenerative change within the first six months after injury. "The smaller the overall loss of nerve tissue across the neuroaxis at the beginning, the better the patients' long-term clinical recovery," says Patrick Freund.

Surprisingly, the recovery was steepest within the first six months, but neurodegenerative changes were greatest within the same time period with no signs of deceleration over two years in the spinal cord and brain. This indicates a fierce competition between compensatory and neurodegenerative changes early after injury. The battle seems to be lost in favor of neurodegeneration over time. Nevertheless, the magnitude of early microstructural changes is predictive of the long-term recovery of patients suffering from a spinal cord injury. Crucially, noninvasive, high-resolution neuroimaging provides a mean to predict recovery trajectories

and distinguish between neurodegeneration caused by the spinal cord injury itself and beneficial changes resulting from therapy. "We now have a tool to reliably predict recovery and determine the effects of treatments and rehabilitation measures as opposed to spontaneous neurodegeneration in humans," says neuroimaging specialist Freund. "Clinical studies can thus be carried out more efficiently and cost-effectively in the future."

The patients who took part in the study will be examined again after five years using the same method. The scientists want to determine whether the neurodegenerative changes will have ceased by then or whether they will still be ongoing. Patrick Freund and his team are also planning training studies that aim to show whether the high-intensity exercising of arm and leg functions helps to slow down or stop the loss of nerve tissue.

More information: Gabriel Ziegler, Patrick Grabher, Alan Thompson, Daniel Altmann, Markus Hupp, John Ashburner, Karl Friston, Nikolaus Weiskopf, Armin Curt, and Patrick Freund. Progressive neurodegeneration following spinal cord injury: implications for clinical trials. *Neurology*. March 7, 2018. DOI: 10.1212/WNL.0000000000005258

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