

## Biopsychosocial perspective on a mechanisms-based approach to assessment and treatment of pain following spinal cord injury

Eva G. Widerström-Noga, DDS, PhD, et al.

This article presents a broad overview of the types of pains experienced after a spinal cord injury (SCI) and important factors for future treatments designed to target specific underlying pain mechanisms. The challenges related to defining the underlying causes of pain in each patient and the role of psychosocial factors in the experience of pain are discussed. This review aims to familiarize healthcare professionals with mechanisms-based approaches to the treatment of SCI-related pain and future directions for the assessment and classification of pain after SCI.

## Prevalence of chronic pain after traumatic spinal cord injury: A systematic review

Marcel Dijkers, PhD, FACRM, et al.

Knowledge of the number of people with spinal cord injury (SCI) who have chronic pain is important for the planning of services and the development of new pain treatments. This research aimed to determine the prevalence of “chronic” pain after SCI based on a review of all relevant published studies. We found estimates ranging from 26% to 96% and conclude that so much unexplained variability is present in the published rates that calculating an average is not appropriate. The data suggest that pain rates do not differ much for males versus females, people with tetraplegia versus paraplegia, and people with complete versus incomplete injuries.

## Psychosocial factors and adjustment to chronic pain in spinal cord injury: Replication and cross-validation

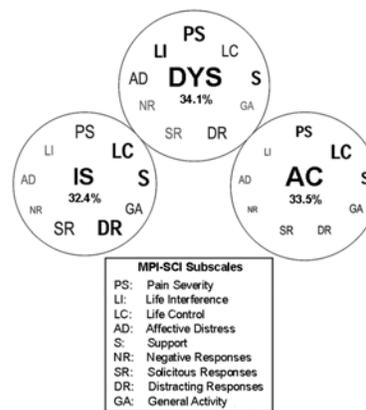
Ivan R. Molton, PhD, et al.

This study was designed to determine whether psychological factors were related to pain problems in people with spinal cord injury (SCI). This study may be of interest to any veteran who has chronic pain as a result of SCI. We found that certain styles of coping and certain ways of thinking about pain were associated with more

impairment, even after we considered the various levels of pain that persons with SCI have. Problematic psychological styles included passive coping and “catastrophizing” (always expecting the worst outcome in a situation). Further work is needed.

## Relationship between pain characteristics and pain adaptation type in persons with SCI

Eva G. Widerström-Noga, DDS, PhD, et al.



This article aims to increase the knowledge regarding how pain affects an individual with spinal cord injury (SCI). In particular, it focuses on how specific pain symptoms that an individual experiences may influence how well he or she adapts to persistent pain problems.

We hope that this knowledge will be useful for both patients and healthcare professionals involved in the care of individuals with SCI by promoting a therapeutic approach that combines treatments that target the underlying mechanisms of pain and improve the psychological and psychosocial status of those with SCI pain.

## Psychological characteristics of people with spinal cord injury-related persisting pain referred to a tertiary pain management center

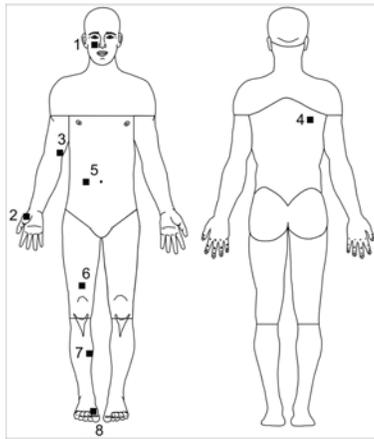
Kathryn Nicholson Perry, PhD, MSc, BSc (Hons), et al.

Pain is a common result of spinal cord injury (SCI) and is related to increased distress and disability. Previous studies have found that the available treatments were not entirely effective. This study found that people presenting to a hospital for treatment of their pain experienced high levels of pain and that many had received the recommended treatments but continued to experience problems. Receiving usual care from the hospital did not reduce pain, increase confidence to deal with it, or relieve

concerns about the meaning of the pain. These findings suggest that other types of treatment are required to assist with these problems.

### Reliability and validity of quantitative sensory testing in persons with spinal cord injury and neuropathic pain

Elizabeth R. Felix, PhD; Eva G. Widerström-Noga, DDS, PhD

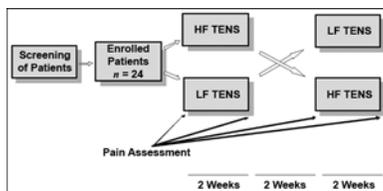


Chronic neuropathic pain in persons with spinal cord injury (SCI) can have a devastating impact on quality of life, but the specific causes of this type of pain in SCI are largely unknown. We measured thresholds for various types of stimuli, including light touch, temperature sensation, and pain, in a number of individuals with SCI

and neuropathic pain and found a significant relationship between the severity of their neuropathic pain and the degree of dysfunction within sensory pathways specifically responsible for detecting painful stimuli. This finding suggests that quantitative measurements of sensory function may help uncover the causes and/or consequences of neuropathic pain in SCI.

### Transcutaneous electrical nerve stimulation for treatment of spinal cord injury neuropathic pain

Cecilia Norrbrink, RPT, PhD



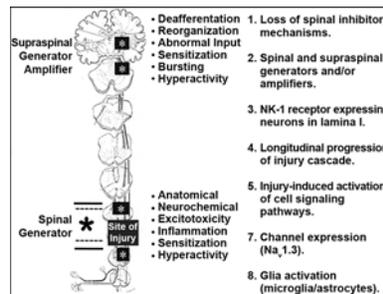
Neuropathic pain, i.e., pain due to nerve injury, following a spinal cord injury (SCI) is often difficult to relieve. Neuropathic pain is mainly

treated with drugs such as antidepressants or anticonvulsants, but for some people these drugs render unwanted side effects. In this study, treatment with transcutaneous electrical nerve stimulation (TENS) for SCI neuropathic pain was assessed. Out of 24 patients, 6 chose to continue

treatment with TENS after the study was completed and few side effects were reported. In conclusion, TENS can be beneficial for some persons with SCI and neuropathic pain and is worth trying as a complementary treatment.

### Spinal cord injury pain: Spinal and supraspinal mechanisms

Robert P. Yezierski, PhD

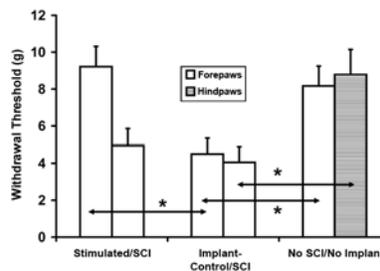


This article reviews the mechanisms responsible for the condition of altered sensations, including pain, following spinal cord injury (SCI). Sensory and motor function losses at and below the injury

level are obvious consequences of spinal injury. Secondary consequences, which include spasticity, bladder and bowel dysfunction, infertility, and pain, rank among the most difficult conditions an individual has to deal with following SCI. Mechanisms responsible for the condition of pain involve pathological, physiological, neurochemical, and molecular events associated with the injured spinal cord. Injury models used to study these events combined with clinical studies that have provided insights into the spinal and supraspinal mechanisms of at- and below-level pain are discussed.

### Restorative effects of stimulating medullary raphe after spinal cord injury

Ian D. Hentall, PhD; Scott B. Burns



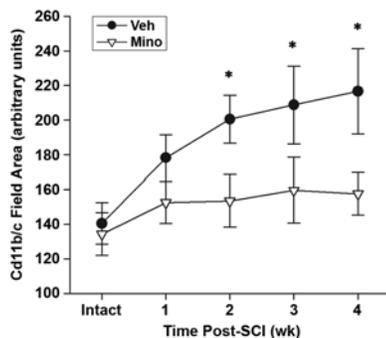
Pain often occurs after incomplete spinal cord injury. We tested whether stimulating a small region in the hindbrain called the raphe magnus can reverse this pain. Rats had wireless stimulators attached to their

heads, and electrical pulses were sent to the raphe magnus through fine wires. When stimulation was given for a few days right after injury, pain-related reflexes in the front paws, but not the hindpaws, returned to normal. The tissue

that remained near the injury also improved. The raphe magnus is known for controlling acute pain and body movements. We now find it has a restorative function, too.

### Early microglial inhibition preemptively mitigates chronic pain development after experimental spinal cord injury

Andrew M. Tan, PhD, et al.

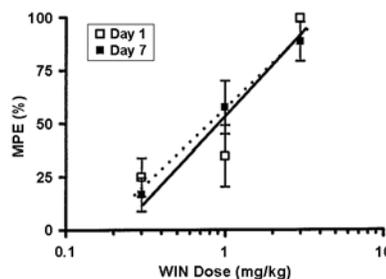


Spinal cord injury (SCI) can result in chronic pain syndromes that can persist indefinitely and reduce quality of life. Treatment of chronic pain after SCI remains extremely challenging; thus, an important research goal is to determine whether early

treatments can attenuate the subsequent development of pain conditions. This study examines the effects of SCI on chronic pain by using a drug that inhibits the activation of a cell type called microglia. We found that microglial inhibition soon after injury diminished development of pain at later time points and that modulation of microglial signaling may provide a new therapeutic strategy for patients suffering from post-SCI pain.

### Sustained antinociceptive effect of cannabinoid receptor agonist WIN 55,212-2 over time in rat model of neuropathic spinal cord injury pain

Aldric Hama, PhD; Jacqueline Sagen, PhD



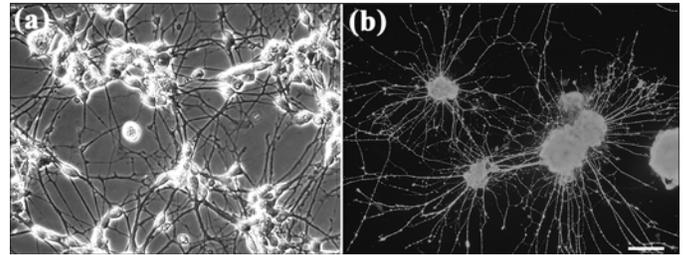
Chronic pain after spinal cord injury (SCI) is a complication that significantly diminishes the patient's quality of life. Few drugs effectively alleviate this type of pain, and those that do may lose effective-

ness with repeated use. Cannabinoid drugs have been shown to be useful in treating experimental pain in animal models and also appear to maintain their effectiveness with repeated treatment in SCI pain. As part of a comprehensive rehabili-

tation program, cannabinoids may help ease pain and increase quality of life for persons with SCI.

### Clinical feasibility for cell therapy using human neuronal cell line to treat neuropathic behavioral hypersensitivity following spinal cord injury in rats

Mary J. Eaton, PhD; Stacey Q. Wolfe, MD



We created a human neuronal cell line of hNT2.17 cells that secrete antipain substances when transplanted near the spinal cord of rats that received a spinal cord injury (SCI) from injection of quisqualic acid (QUIS), a toxic chemical. This SCI created painlike behaviors, such as hypersensitivity to light touch and heat and severe tingling in the hindlimbs, that caused the rats to constantly chew their skin. When 1 million hNT2.17 cells were placed near the low back of the spinal cord 2 weeks after the SCI, all these painlike behaviors completely and permanently disappeared. As part of the cell grafting procedures, the rats were immunosuppressed by 2 weeks of daily injections with cyclosporine A; this immunosuppression allowed the human cells to survive in the rats. If the rats were not immunosuppressed with the transplant or if the cell graft was placed later than 2 weeks after QUIS injection, the painlike behaviors only partially reversed. These hNT2.17 cells could also be safely transplanted far from the SCI location and still permanently reverse the pain behaviors. The cells did not make tumors either before or after transplant into the rats. This human cell line is a candidate for further development as a clinical pain treatment.