



PRESENTATIONS OF PAIN IN INDIVIDUALS WITH SPINAL CORD INJURY

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Introduction

- Although loss of mobility is often considered the most serious consequence of spinal cord injury (SCI), people with SCI consistently rate pain as one of the most difficult problems associated with their injury (Widerström-Noga et al 1999)
- It not only is a cause of suffering but also has a direct bearing on the ability of spinally injured persons to participate in rehabilitation and regain their optimal level of activity (Anke et al 1995)
- In one survey, when given the option, one-third of people with SCI stated they would trade relief of pain for loss of bladder, bowel, or sexual function (Nepomuceno et al 1979)

Prevalence of Pain

- Although the prevalence is variable, depending on the methodology used, most studies indicate that around two-thirds of people with SCI experience pain and in one-third of them the pain is severe(Levi et al 1995 Störmer et al 1997 Rintala et al 1998 Ravenscroft et al 2000 Siddall et al 2003)
- A long-term follow-up study found that at 5 years following injury, musculoskeletal pain was the most common and was present in 58% of people, “at-level” neuropathic pain was present in 42%, and “below-level” neuropathic pain in 34% (Siddall et al 2003)
- Below-level neuropathic pain was the most likely to be described as severe or excruciating and was found to develop months and even years following injury. From this study, those who experience neuropathic pain in the first 3–6 months following injury are likely to continue to experience ongoing pain at 3–5 years (Siddall et al 2003)

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Association of pain, social support and socioeconomic indicators in patients with spinal cord injury in Iran

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ABSTRACT

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Factors Related to Pain

- An ability to predict the development of pain and provide guidance on prognosis would enable earlier treatment and better follow-up
- A significant relationship between the level of injury and the presence of pain has been suggested but is difficult to confirm. Several clinical observational studies have proposed that neuropathic pain is more common in people with incomplete lesions (Davidoff et al 1987b Beric et al 1988), a proposition that is supported by findings at autopsy (Kakulas et al 1990)
- The role of the spinothalamic tracts in the development of neuropathic pain following SCI remains an area of intense interest. Although a spinothalamic lesion (marked by loss of cutaneous temperature and evoked pain sensations in the area of pain) is considered necessary for the development of neuropathic pain below the level of injury, it has traditionally been thought to be insufficient to explain the presence of neuropathic pain (Finnerup et al 2003)
- It is difficult to make definitive conclusions on the relationship between pain and psychological factors and to attribute causality from these studies

Types of Pain after SCI

Proposed International Association for the Study of Pain Taxonomy of Pain following Spinal Cord Injury

BROAD TYPE (TIER 1)	BROAD SYSTEM (TIER 2)	SPECIFIC STRUCTURES/PATHOLOGY (TIER 3)
Nociceptive	Musculoskeletal	Bone, joint, muscle trauma or inflammation Mechanical instability Muscle spasm Secondary overuse syndromes
	Visceral	Renal calculus, bowel, sphincter dysfunction, etc. Dysreflexic headache
Neuropathic	Above level	Compressive mononeuropathies Complex regional pain syndromes
	At level	Nerve root compression (including cauda equina) Syringomyelia Spinal cord trauma/ischemia (transitional zone, etc.) Dual-level cord and root trauma (double-lesion syndrome)
	Below level	Spinal cord trauma/ischemia

Musculoskeletal Pain

- Musculoskeletal pain typically occurs in normally innervated regions rostral to the level of the SCI.
- Most people who sustain an injury to the spinal cord also sustain trauma to the vertebral column and its supporting structures, including ligaments, muscles, intervertebral discs, and facet joints, pain is related to activity and position.
- Overuse pain or pain of “abnormal” use of the extremities (e.g., with manual wheelchair use and transfers) which is very common in people with paraplegia (Dalyan et al 1999). Musculoskeletal pain can also occur when there is limited functional use of the extremities, such as persons with tetraplegia, in whom shoulder pain may be due to muscle atrophy and recurrent dislocation (Irwin et al 2007). Muscle spasm pain is also common following SCI and may contribute to musculoskeletal pain, particularly in those with incomplete injuries.
- Heterotopic ossification, infection, fracture, venous thrombosis, and pressure ulceration

Visceral Pain

- Pathology or altered function in visceral structures located in the chest, abdomen, and pelvis, such as urinary tract infection, renal calculi, and constipation, is a common source of pain in people with SCI (Finnerup et al 2008)
- The level of the injury will affect the quality of the pain. Paraplegics may experience visceral pain that is identical to the pain in those without SCI, whereas tetraplegics may experience more vague generalized symptoms of unpleasantness that are difficult to interpret.
- If investigations fail to find evidence of visceral pathology and treatments directed at visceral pathology do not relieve the pain, it is reasonable to consider whether the pain is neuropathic rather than visceral.

Neuropathic pain (IASP)

“Pain caused by a lesion or disease of the somatosensory nervous system”

- Neuropathic pain is a clinical description (and not a diagnosis) which requires a demonstrable lesion or a disease that satisfies established neurological diagnostic criteria
 - The term lesion is commonly used when diagnostic investigations (e.g. imaging, neurophysiology, biopsies, lab tests) reveal an abnormality or when there was obvious trauma
 - The term disease is commonly used when the underlying cause of the lesion is known (e.g. stroke, vasculitis, diabetes mellitus, genetic abnormality)
 - Somatosensory refers to information about the body per se including visceral organs, rather than information about the external world (e.g., vision, hearing, or olfaction)
 - Central neuropathic pain: Pain caused by a lesion or disease of the central somatosensory nervous system
 - Peripheral neuropathic pain: Pain caused by a lesion or disease of the peripheral somatosensory nervous system

Neuropathic pain (IASP)

Allodynia

Pain due to a stimulus that does not normally provoke pain

Dysesthesia

An unpleasant abnormal sensation, whether spontaneous or evoked

Hyperalgesia

Increased pain from a stimulus that normally provokes pain

Paresthesia

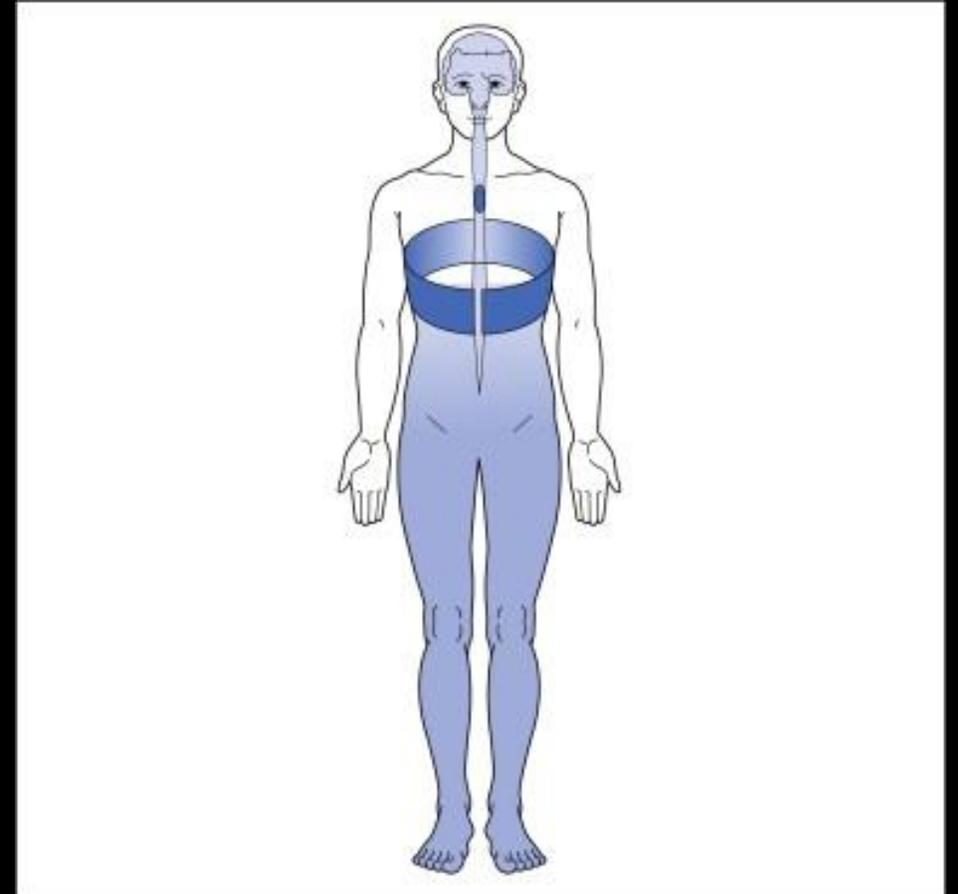
An abnormal sensation, whether spontaneous or evoked

Sensitization

Increased responsiveness of nociceptive neurons to their normal input, and/or recruitment of a response to normally subthreshold inputs

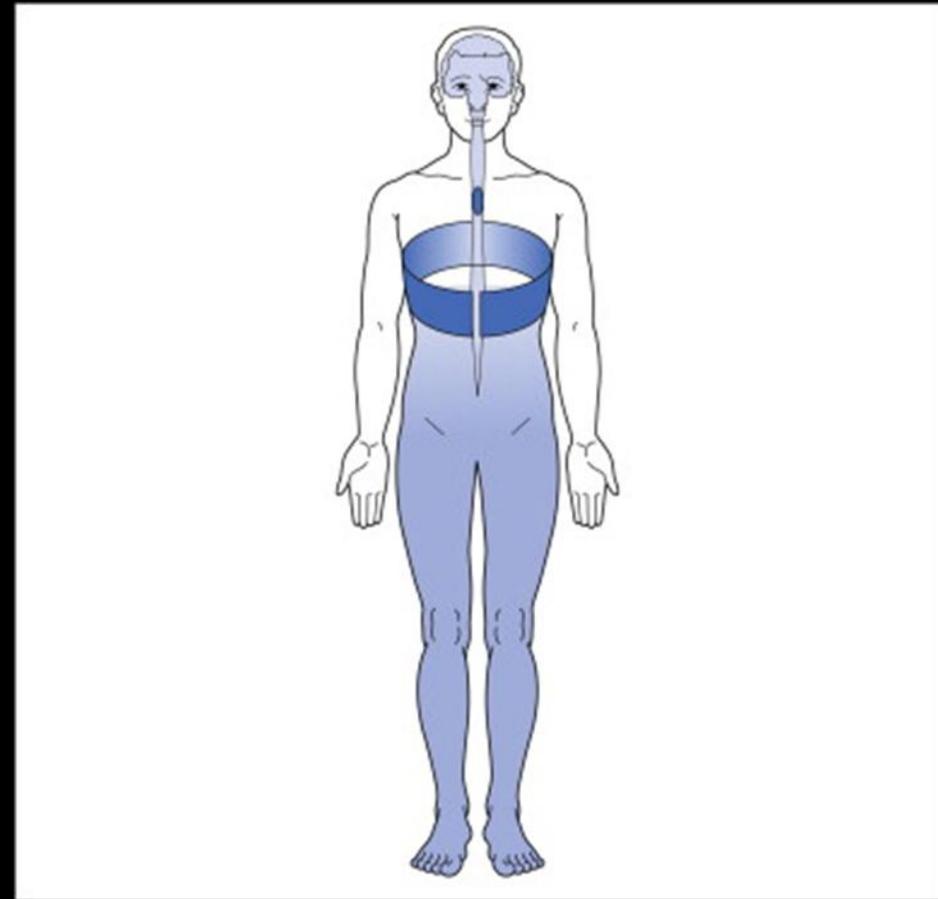
AT-LEVEL NEUROPATHIC PAIN

- At-level neuropathic pain refers to pain that occurs in a segmental or dermatomal pattern within the dermatome at the level of neurological injury and three dermatomes below this level
- It is often associated with allodynia or hyperesthesia of the affected dermatomes
- At-level neuropathic pain may be due to damage to either nerve roots or the spinal cord itself. Pain arising from nerve root damage is typically unilateral and suggested by characteristics such as increased pain in relation to spinal movement. The pain may be due to direct damage to the nerve root during the initial injury or be secondary to spinal column instability and impingement by facet or disc material



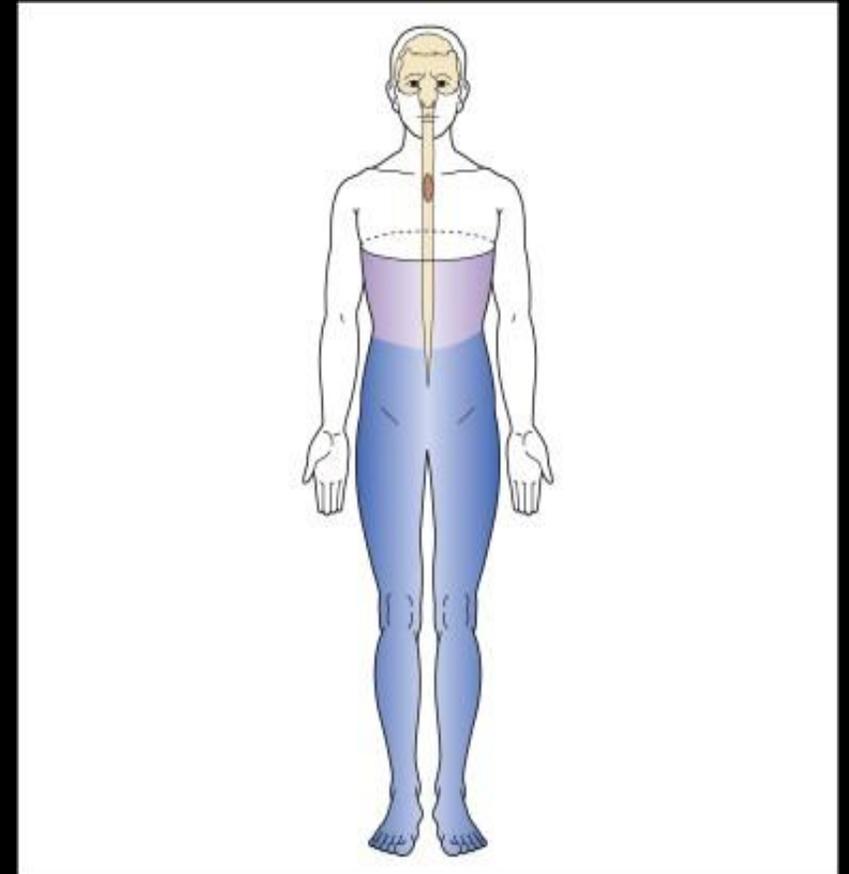
AT-LEVEL NEUROPATHIC PAIN

- Syringomyelia must always be considered in patients with delayed onset of segmental pain, especially when it is associated with a rising level of sensory loss
- An important variant of at-level neuropathic pain is seen after injury to the cauda equina. Even though pain caused by damage to the cauda equina may occur in a diffuse distribution in the lower limbs, it is classified as at-level neuropathic pain because it is due to nerve root damage. Cauda equina pain is reported in the lower lumbar and sacral dermatomes and is usually described as burning, stabbing, and hot. It is constant but may fluctuate with activity or autonomic activation.



BELOW-LEVEL NEUROPATHIC PAIN

- It is spontaneous and/or evoked pain that is often diffusely caudal to the level of SCI. It is defined as neuropathic pain and occurs in the region more than three dermatomes below the neurological level of injury. Sudden noises or jarring movements may trigger this type of pain.
- Both complete and partial injuries may be associated with the diffuse, burning pain that appears to be related to spinothalamic tract damage
- Incomplete injuries are more likely to have an allodynic component because of sparing of tracts conveying touch sensation



Management

- Ideally, management should be aimed at the various contributing biopsychosocial factors identified in an individual person
- Even though some treatments may reduce the severity of pain, complete relief is uncommon

ASSESS AND TREAT PSYCHOSOCIAL AND ENVIRONMENTAL CONTRIBUTORS AND CONSEQUENCES
(HISTORY, OBSERVATION, QUESTIONNAIRES, FAMILY MEETING, ETC.)

PAIN

Located in a region of normal sensation

NOCICEPTIVE

NEUROPATHIC

Related to position, activity, movement, somatic tenderness

Related to visceral function located in abdomen

Located at the level of lesion

Located below the level of lesion

MUSCULOSKELETAL

VISCERAL

AT-LEVEL NEUROPATHIC

BELOW-LEVEL NEUROPATHIC

Instability on exam, structural changes on imaging

Related to repetitive movement

Increased muscle tone

Hypertensive

Obstructive symptoms pathology on AXR, ultrasound, CT

Febrile WCC, urinalysis, microbiology

POOR PACING, UNHELPFUL, COGNITION, MOOD, DYSFUNCTION, ETC.

FRACTURE-DISLOCATION

"OVERUSE SYNDROME"

MUSCLE SPASM

AUTONOMIC DYSREFLEXIA

OBSTRUCTION

INFECTION

Cognitive-behavioral modification
+/-
Anxiolytics, antidepressants

Fusion

Rest exercise, physiotherapy, posture/wheelchair adjustment

Oral baclofen, diazepam, tizanidine

Identify and treat cause
BP-lowering drugs

Disimpact, change bowel routine, r/o calculus

Antispasmodics

Antibiotics

NSAIDs, opioids (short term)

Intrathecal baclofen

Spinal Drug Delivery			
Morphine and clonidine	Siddall et al 2000	Positive	Invasive, tolerance, hypotension, respiratory depression, drowsiness
Baclofen	Herman et al 1992	Positive	Outcomes not clear, invasive, reports of increased neuropathic pain
Lidocaine	Loubser and Donovan 1991	Positive	50–100 mg, subarachnoid delivery; invasive, CNS disturbance
Miscellaneous			
Dronabinol	Rintala et al 2010	Negative	<i>N</i> = 5; dry mouth, constipation, fatigue, drowsiness
Intravenous ketamine	Eide et al 1995b	Positive	Short-term relief, invasive, dysphoria
	Kvarnstrom et al 2004	Positive	
	Amr 2010	Positive	
Intravenous propofol	Canavero et al 1995	Positive	Bolus of 0.2 mg/kg, short-term relief; invasive, hypotension, arrhythmias, bradycardia
Tramadol	Norrbrink and Lundeberg 2009	Positive	Side effects frequent, e.g., tiredness, dry mouth, dizziness

Non-pharmacological Management

Stimulation Techniques

Transcutaneous Electrical Nerve Stimulation

- Evidence of the effectiveness of transcutaneous electrical nerve stimulation (TENS) in treating SCI pain is limited
 - Long-term use of TENS may be associated with postural detrusor sphincter dyssynergia in some tetraplegics

Acupuncture

- The non-specific components of the treatments (placebo) significantly contributed to the pain relief achieved.

Spinal Cord Stimulation

- To obtain success, at least partial preservation of sensation in the area of pain is normally required
 - In many cases of neuropathic SCI pain it is difficult to achieve perceived paresthesia in the area of pain
- There are reports that SCS may be more useful if the spinal cord lesion is incomplete (Cioni et al 1995)
- Efficacy may also be dependent on the type of pain. SCS appears to be more effective for at-level than for below-level neuropathic SCI pain (Cioni et al 1995)
- Evidence from case series suggests that SCS may be effective initially in 20–75% of selected patients but that long-term efficacy declines to 10–40% (Richardson et al 1980)

Brain Stimulation

- Thalamus, periventricular gray matter, internal capsule, and motor cortex

Surgical Treatment

Dorsal Root Entry Zone Lesions

- Dorsal root entry zone (DREZ) lesions involve two to three spinal segments
- Interruption of ascending pain pathways, or rebalancing of inhibitory and excitatory input within a damaged sensory network (Nashold and Bullitt 1981)
- The reported efficacy of DREZ lesions varies. Most studies indicate that 50–85% will obtain good (>50%) relief of their pain (Nashold and Bullitt 1981 Sindou et al 2001)
- Those who have unilateral, radicular cauda equina pain or intermittent, at-level neuropathic pain are more likely to have a favorable outcome, whereas those who have sacral, continuous, below-level neuropathic pain or a syrinx are less likely to do well (Nashold and Bullitt 1981 Edgar et al 1993 Sindou et al 2001)
- Despite positive effects in some people, DREZ lesions can be associated with a number of serious adverse effects, and even if initially successful, the pain may return

Cordotomy

- Associated severe adverse effects (including induction of a higher level of sensory loss) and pain recurrence have limited the ongoing use of this approach

Corpectomy

- The use of corpectomy as a pain-relieving measure is controversial

Physical Treatment

- Physical treatment is important in the management of SCI pain, particularly in those with musculoskeletal pain
- Changes in posture, exercise (Hicks et al 2003), adjustments to wheelchairs, and other forms of physical treatment modalities such as massage and heat (Norrbrink Budh and Lundeberg 2004) may be helpful in treating pain that is arising from a mechanical source. In particular, exercises may be helpful in addressing the shoulder pain that can occur in long-term wheelchair users (Curtis et al 1999)
- Pain syndromes associated with overuse or pressure can often be managed with physical measures alone. Prosthetic devices, orthotics, attention to seating, and exercise routines may assist in the management of these problems

Psychological Treatment

- Psychological assessment should be part of the evaluation of every SCI patient with persistent pain of any type
- Psychological factors may both contribute to and be a consequence of persistent pain. Reports of pain may be an expression of difficulty in adjustment, and therefore psychological approaches that attempt to deal with these issues may be helpful in reducing the experience of pain
- Use of pain management strategies based on a cognitive–behavioral therapy approach can reduce the distress associated with pain, improve mood (particularly in those with high levels of depression), and help in long-term adjustment and return to maximal functional status (Umlauf 1992 Craig et al 1997)
- Joining a community SCI association may also be a positive step for some people.



Thank you for paying attention!