PEER REVIEWED

# Assessing and managing pain after spinal cord injury

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Pain following a spinal cord injury can be complex and challenging to manage. Clearer direction for treatment and a number of specific resources now exist to help people with pain after a spinal cord injury and also healthcare professionals involved in the care of these patients.

## Key points

- **Pain following spinal cord injury (SCI) is common, often severe in intensity and has a major impact on physical function, emotional wellbeing and quality of life.**
- **There are several well characterised and classified types of pain that present following SCI with different features and underlying mechanisms.**
- **Assessment should seek to determine the different biological, physical, psychological and environmental contributors to the pain, as well as any potential spinal red flags.**
- **The optimal treatment of pain following SCI relies on an integrated approach that uses the full range of pharmacological and nonpharmacological options to achieve the best outcomes possible.**

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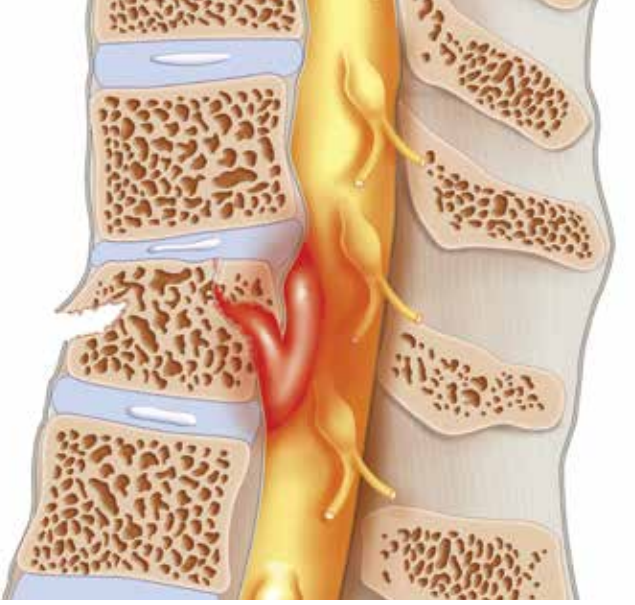




Persistent pain following spinal cord injury (SCI) due to both traumatic and nontraumatic causes is both common and debilitating. It occurs in about two-thirds of people with an SCI,[1,2] with approximately one-third reporting that the intensity of their pain is severe or excruciating[2] and has a major impact on quality of life that often equals or even exceeds other consequences such as loss of mobility.[3]

This article guides the practitioner to provide the best management of people with pain following SCI through facilitating recognition of the different types of pain that can occur, identifying important factors for assessment and providing the most recent information on effective treatments. In addition, the article identifies SCI pain resources that have been recently developed for practitioners and also the patient with SCI pain.

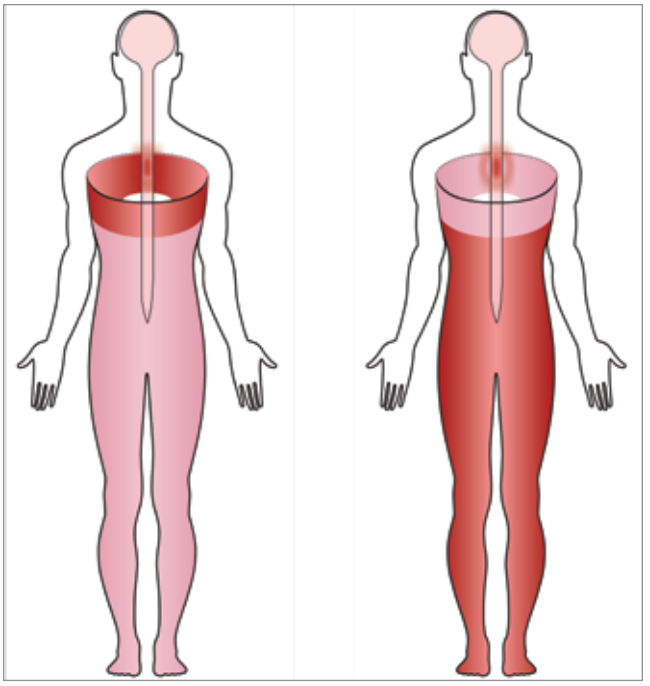
## Types of SCI pain

Four main types of pain are seen clinically following SCI and categorised using the International Spinal Cord Injury Pain (ISCIP) classification.[4] These types are musculoskeletal pain, visceral pain, at-level neuropathic pain and below-level neuropathic pain.

Musculoskeletal pain occurs in a region where there is at least some preserved sensation and where the pain is believed to be arising from musculoskeletal structures. It is typically described as dull or aching and worse with movement or postural changes, accompanied by tenderness on palpation of musculoskeletal structures.

Visceral pain is generally located in the abdomen, thorax or pelvis and believed to be arising from visceral structures. This type of pain is often described as dull or cramping, vague and poorly localised, and related to visceral function or factors that influence visceral function, such as eating.

Two distinct types of neuropathic pain are seen following SCI: at-level and below-level neuropathic pain. Both pain types have typical neuropathic descriptors, such as electric shock-like, sharp, shooting, squeezing or burning. The difference in the two pain types is location. At-level neuropathic pain is located in a segmental pattern within the dermatome of the neurological level of injury and/or within the three dermatomes below the neurological level of injury, but not extending beyond this (Figure 1a). In contrast, below-level neuropathic pain is located often more diffusely in the region more than three dermatomal levels caudal to the neurological level of injury (Figure 1b).



Figures 1a and b. Distribution of pain. a (left). At-level neuropathic spinal cord injury pain. b (right). Below-level neuropathic spinal cord injury pain. (Light red shading represents region of altered sensation; dark red shading represents region of pain.)

## Mechanisms of SCI pain

The mechanisms underlying musculoskeletal and visceral pain following SCI are the same as in other pain conditions, although there may be specific underlying causes related to the SCI, such as muscle spasticity, bowel impaction and an increased likelihood of urinary tract pathology. On the other hand, neuropathic SCI pain has its own characteristic mechanisms that occur as a result of damage to the spinal cord. It may partly arise from ongoing peripheral inputs. However, some of the strongest evidence now points to structural and functional changes at a spinal and brain level. These include physiological changes in the spinal cord close to the site of injury that result in amplification of peripheral inputs and hypersensitivity to touch. Damage to the cord may also result in abnormal firing of nerve cells that may generate spontaneous pain that is felt in the region of altered sensation.[5-8] In addition, it is also known that upstream central nervous system changes also occur. These include abnormal firing of nerve cells in the thalamus and cortical somatosensory reorganisation. At present, it is difficult to say that any one mechanism is operating in particular individuals with neuropathic pain and almost certainly multiple mechanisms are usually operating. The complex and multifaceted nature of the changes is reflected in the continuing challenge to provide adequate relief of pain in people with SCI.

## Assessment of SCI pain

As with other types of persistent pain, the assessment of people with pain following SCI is based on the biopsychosocial model, taking into consideration biological, physical, psychological and environmental factors. As pain assessment in a person with SCI initially requires a detailed history with an accompanying physical examination, followed by relevant imaging, other appropriate investigations or diagnostic procedures, if indicated.



### 1. Spinal cord injury red flags

- A new pain presentation
- A recent deterioration in neurological function
- Symptoms of autonomic dysreflexia
- A sudden increase in muscle spasms
- Skin breakdown or pressure injury
- Recent change in bowel function
- Recent change in bladder function
- Fever, chills, night sweats, weight loss

### 2. Yellow flags

- Depressive symptoms
- Unhelpful cognitions such as catastrophising or fear avoidance
- Interference with sleep, mood and daily activity
- Substance abuse
- Opioid dependence or misuse

The ISCIP basic data set is a simple and useful one page tool developed to standardise data collection and reporting of pain in people with SCI and contains items assessing pain location, duration, intensity and type, as well as interference with activities, sleep and mood.[9] It is available through the International Spinal Cord Society website (see: www.iscos.org.uk-international-sci-pain-data-sets).

Additional clinical information that is an important component of assessment is identification of spinal cord injury-specific red flags that suggest the need for further investigation or referral of the patient for specialist treatment (see Box 1). New onset or a recent change in pain characteristics, particularly when associated with progressive sensory changes, loss of muscle strength, increased spasticity or other abnormal signs, requires further investigation to exclude post-traumatic syringomyelia. A syrinx is seen as a cystic cavity within the central region of the spinal cord on magnetic resonance imaging and presents with a change in pain and a further deterioration in motor or sensory function.

Finally, comprehensive assessment includes the identification of yellow flags (see Box 2), indicating the need to address comorbid psychosocial issues.

## Management of SCI pain

Once red flags have been excluded, a treatment plan can then be negotiated based on the type(s) of pain present and the presence of any yellow flags. As with other types of musculoskeletal pain, the treatment is often based on addressing the underlying causes or pathology and providing symptomatic relief with simple analgesics and occasionally opioids, or reducing inflammation with short-term use of an NSAID bearing in mind that gastric symptoms may be masked in the person with a SCI. Physical interventions are also used, including individualised physiotherapy, hydrotherapy, exercise

### 3. Spinal cord injury pain resources for patients and healthcare professionals

**NSW Agency for Clinical Innovation**
www.aci.health.nsw.gov.au/chronic-pain/spinal-cord-injury-pain
Online resources developed specifically for people with spinal cord injury pain and healthcare professionals.

**The Spinal Cord Injury Pain Book**
Written by Siddall and colleagues and currently available from www.hammond.com.au/shop and soon through book stores and online retailers. It is for people with pain following spinal cord injury but is also useful for healthcare professionals.

**SCI Pain Course**
www.ecentreclinic.org/?q=SCIPainCourse
An online cognitive behavioural therapy program specifically designed for people with pain following spinal cord injury.

training,[10] postural education, retraining transfer techniques and environmental modifications, such as use of adaptive equipment and wheelchair adjustment. Muscle spasm is usually managed symptomatically, with baclofen usually being the first choice of drug. Long-term use of benzodiazepines should be avoided.

The general approach to treating visceral pain is to identify and manage any underlying pathology. Management of recurrent symptomatic urinary tract infections requires exclusion of other factors, such as urinary calculi, along with suitable antibiotic treatment (often for a longer period of 10 to 14 days). If the bowel is impacted, disimpaction may be necessary in the short term, with adjustment of bowel regimen and routine in the longer term to resolve constipation. The presence of autonomic dysreflexia with sudden onset of elevated blood pressure (>20 to 40 mmHg) and symptoms of pounding headache, apprehension or anxiety, shortness of breath, bradycardia, blotchy red rash above the level of injury and pallor below the level constitutes a potential medical emergency, requiring prompt identification and removal of the underlying trigger.[11] Potential triggers include constipation, urinary tract infection, distended bladder, pressure sore, ingrown toenail, burns and fractures, and the suspected cause needs to be investigated and treated appropriately.

The treatment of neuropathic pain following SCI is often difficult. Despite a large number of available treatments, results are often disappointing and relief far from adequate. The two types of neuropathic SCI pain – at-and below-level – largely respond to the same treatments and therefore can be considered together.

In general terms, first-line pharmacological management of neuropathic SCI pain is usually an anticonvulsant. The strongest evidence supports the use of pregabalin and gabapentin with little evidence to support the use of older anticonvulsants.[12] The evidence for the effectiveness of amitriptyline (off-label use for neuropathic pain) from controlled trials specifically in people with SCI is not strong. However, based on strong evidence from other neuropathic pain conditions, a low dose of amitriptyline (10 mg initially but possibly increasing to 75 mg) is still a reasonable first-line option either alone or in combination with an antic

mood or sleep.[13]

Second-line management often involves addition of a weak opioid such as tramadol, although tramadol should be avoided in people using antidepressants because of the risk of serotonin syndrome. Newer antidepressants (off-label use for neuropathic pain) are also a second-line option. Although the specific evidence in SCI pain is not strong, the evidence from other neuropathic pain conditions supports the use of serotonin–noradrenaline reuptake inhibitors, such as duloxetine, rather than the selective serotonin reuptake inhibitors (all off-label uses).[14]

Strong opioids are regarded as third-line management. Although often effective in the short term, tolerance often results in dose escalation as well as other side effects.[14] If a decision is made to use a low dose of an opioid medication, slow-release formulations are generally recommended. If a person fails to respond to first- or second-line agents or a low dose of a strong opioid, referral to a specialist spinal cord injury or pain management service with a multidisciplinary pain assessment and treatment program is recommended.

Other options are also available to address specific types of pain. These include procedural interventions such as local corticosteroid injections into affected joints, injection of botulinum toxin for localised spasticity, intrathecal baclofen for spasticity and physical approaches such as addressing seating and posture. Stimulation techniques such as transcutaneous electrical nerve stimulation benefit some people. However, more invasive techniques such as spinal cord stimulation generally provide poor relief.

Psychological intervention may be indicated to address any identified yellow flags. In addition, there is growing evidence that cognitive behavioural therapy interventions are a useful component in providing relief of pain as well as developing self-management strategies.[15-18] Education regarding the nature of the pain is not only often enlightening for the person in pain, but helps them to understand the rationale for treatment, as well as reducing levels of anxiety or catastrophising from misperceptions about the pain. Other interventions such as relaxation, self-hypnosis and meditation techniques have been demonstrated to help reduce muscle tension or stress, improve sleep, reduce pain and enhance coping. These interventions can be applied in a group setting or on an individual basis either face to face or online using resources (see Box 3).

## Summary

Pain following an SCI can be difficult to treat. However, we now have clearer direction for treatment and a number of specific resources to help both people with pain and healthcare professionals. A comprehensive approach that uses a combination of pharmacological and nonpharmacological approaches can provide optimal pain management and improved outcomes. **PMT**

### References

A list of references is included in the website version (www.medicinetoday.com.au) of this article.

COMPETING INTERESTS: Professor Siddall has received no direct or indirect benefits from pharmaceutical companies in the past five years. He contributed to the resources on the NSW Agency for Clinical Innovation website and is one of the authors of The Spinal Cord Injury Pain Book but receives no payments from sales of the book. Associate Professor Middleton contributed to the resources on the Agency for Clinical Innovation website.

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## References

1. Störmer S, Gerner HJ, Grüninger W, et al. Chronic pain/dysaesthesiae in spinal cord injury patients: results of a multicentre study. Spinal Cord 1997; 35: 446-455.
2. Siddall PJ, McClelland JM, Rutkowski SB, Cousins MJ. A longitudinal study of the prevalence and characteristics of pain in the first 5 years following spinal cord injury. Pain 2003; 103: 249-257.
3. Widerström-Noga EG, Felipe-Cuervo E, Broton JG, Duncan RC, Yezierski RP. Perceived difficulty in dealing with consequences of spinal cord injury. Arch Phys Med Rehabil 1999; 80: 580-586.
4. Bryce TN, Biering-Sorensen F, Finnerup NB, et al. International Spinal Cord Injury Pain Classification: part I. Background and description. Spinal Cord 2012; 50: 413-417.
5. Hains BC, Waxman SG. Sodium channel expression and the molecular pathophysiology of pain after SCI. Prog Brain Res 2007; 161: 195-203.
6. Yezierski RP. Pathophysiology and animal models of spinal cord injury pain, In: Yezierski RP, Burchiel KJ, eds. Spinal cord injury pain: assessment, mechanisms. Seattle: IASP Press, 2002; p. 117-136.
7. Finnerup NB, Jensen TS. Spinal cord injury pain – mechanisms and treatment. Eur J Neurol 2004; 11: 73-82.
8. Hulsebosch CE, Hains BC, Crown ED, Carlton SM. Mechanisms of chronic central neuropathic pain after spinal cord injury. Brain Res Rev 2009; 60: 202-213.
9. Widerström-Noga E, Biering-Sorensen F, Bryce TN, et al. The International Spinal Cord Injury Pain Basic Data Set (version 2.0). Spinal Cord 2014; 52: 282-286.
10. Hicks AL, Martin KA, Ditor DS, et al. Long-term exercise training in persons with spinal cord injury: effects on strength, arm ergometry performance and psychological well-being. Spinal Cord 2003; 41: 34-43.
11. Middleton J, Ramakrishnan K, Cameron I. Treatment of autonomic dysreflexia for adults and adolescents with spinal cord injuries. Sydney: Agency for Clinical Innovation; 2014. Available online at: http://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0007/155149/Autonomic-Dysreflexia-Treatment.pdf (accessed December 2014).
12. Guy S, Mehta S, Leff L, Teasell R, Loh E. Anticonvulsant medication use for the management of pain following spinal cord injury: systematic review and effectiveness analysis. Spinal Cord 2014; 52: 89-96.
13. Rintala DH, Holmes SA, Courtade D, Fiess RN, Tastard LV, Loubser PG. Comparison of the effectiveness of amitriptyline and gabapentin on chronic neuropathic pain in persons with spinal cord injury. Arch Phys Med Rehabil 2007; 88: 1547-1560.
14. Dworkin RH, O'Connor AB, Backonja M, et al. Pharmacologic management of neuropathic pain: evidence-based recommendations. Pain 2007; 132: 237-251.
15. Norrbrink Budh C, Kowalski J, Lundeberg T. A comprehensive pain management programme comprising educational, cognitive and behavioural interventions for neuropathic pain following spinal cord injury. J Rehabil Med 2006; 38: 172-180.
16. Ehde DM, Jensen MP, Engel JM, Turner JA, Hoffman AJ, Cardenas DD. Chronic pain secondary to disability: a review. Clin J Pain 2003; 19: 3-17.
17. Heutink M, Post MWM, Bongers-Janssen HMH, et al. The CONECSI trial: Results of a randomized controlled trial of a multidisciplinary cognitive behavioral program for coping with chronic neuropathic pain after spinal cord injury. Pain 2012; 153: 120-128.
18. Nicholson Perry K, Nicholas MK, Middleton JW. Comparison of a pain management program with usual care in a pain management center for people with spinal cord injury-related chronic pain. Clin J Pain 2010; 26: 206-216.