

PAIN WITH SPINAL CORD INJURY



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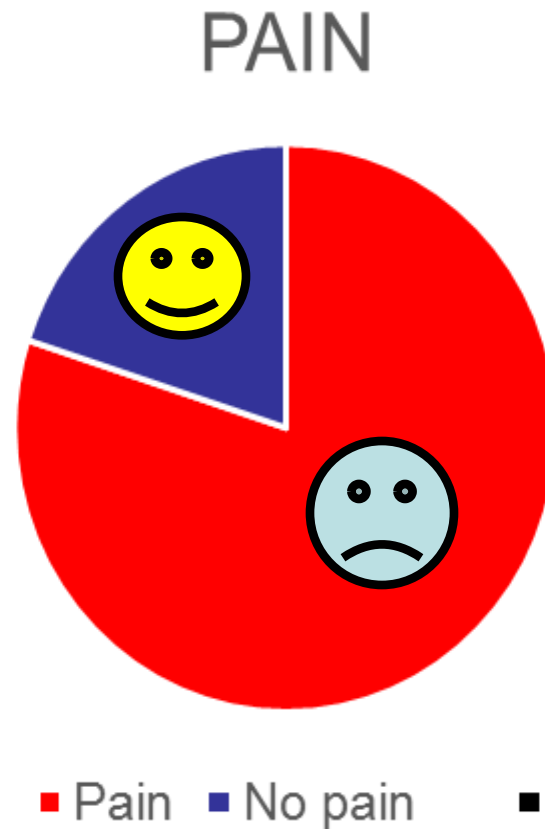
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Disclosure statement

- I do not have any financial relationships or affiliations that may have a direct bearing on the subject matter in this medical education activity
- I will be discussing off label use of medications for pain from spinal cord injury

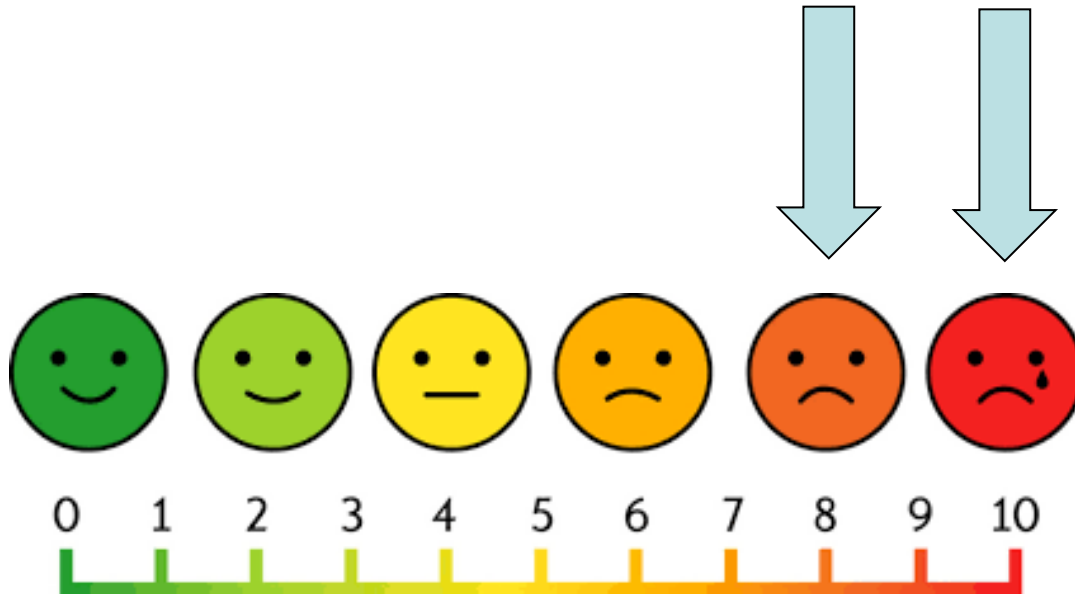
Chronic pain after SCI

- Very common (70-80%)



Chronic pain after SCI

- Often severe (>50% rate pain >6/10)



Chronic pain after SCI

- Increases disability (63%)
 - Problems sleeping
 - Unable to exercise
 - Unable to do home chores or go to work
 - Unable to do ADLs



Types of Pain with SCI

- Central neuropathic pain
- End zone (dermatomal) neuropathic pain
- Musculoskeletal pain

Types of Chronic Pain with SCI

- Central neuropathic pain ← **MOST COMMON**
- End zone (dermatomal) neuropathic pain
- Musculoskeletal pain

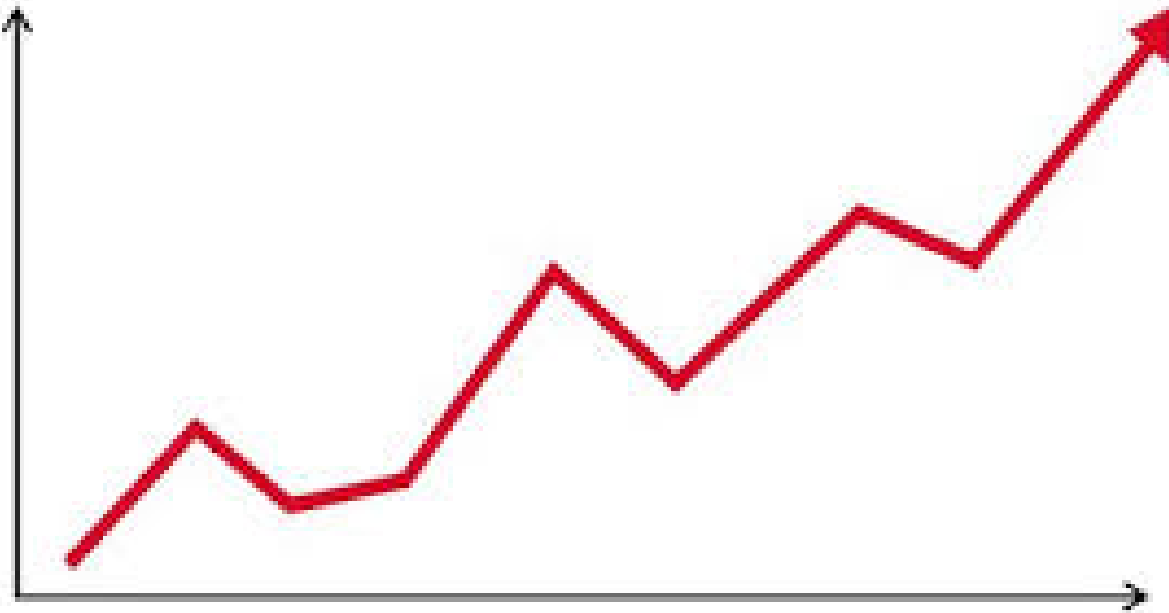
Central Neuropathic Pain

- Location of pain is anywhere ,level of injury, where person is numb
 - Rectum, abdomen, legs, back, genitals/urethra



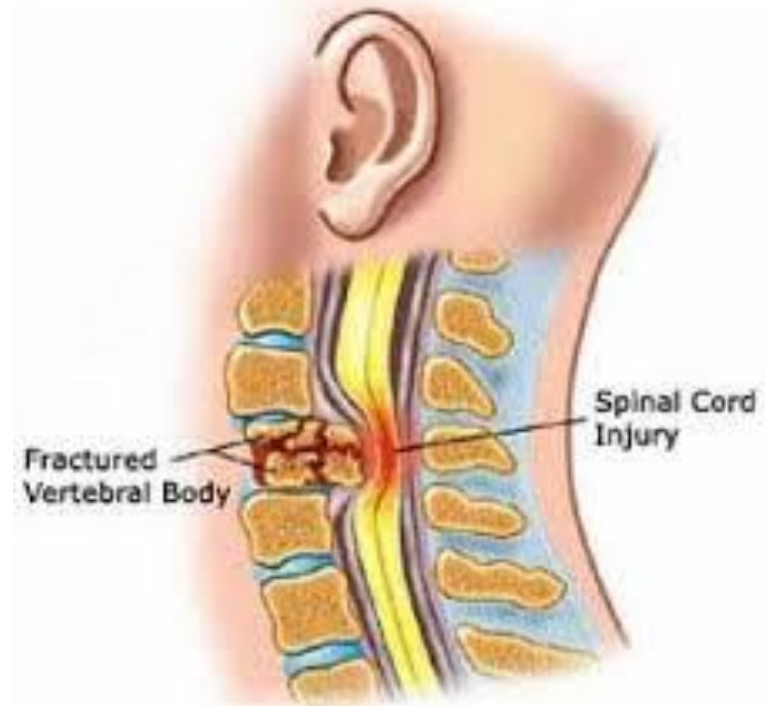
Central Neuropathic Pain

- Worsens over time



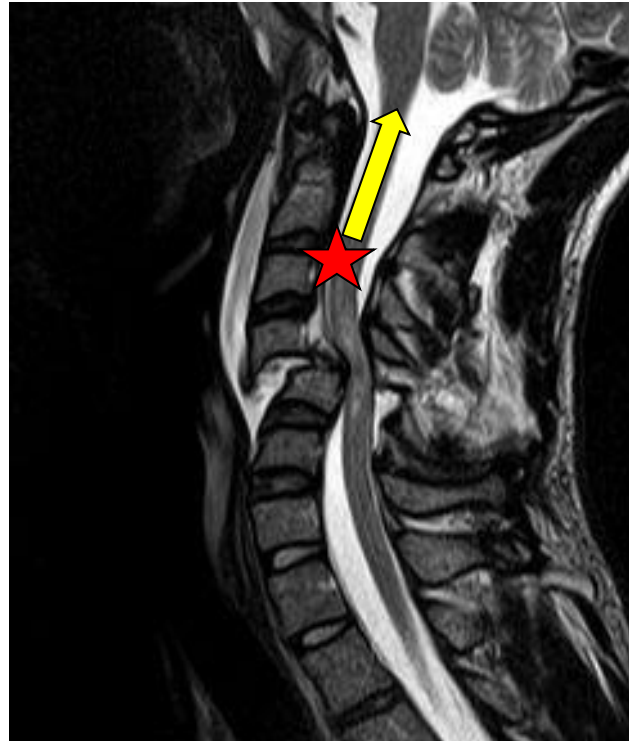
Central Neuropathic Pain

- Generated by spinal cord



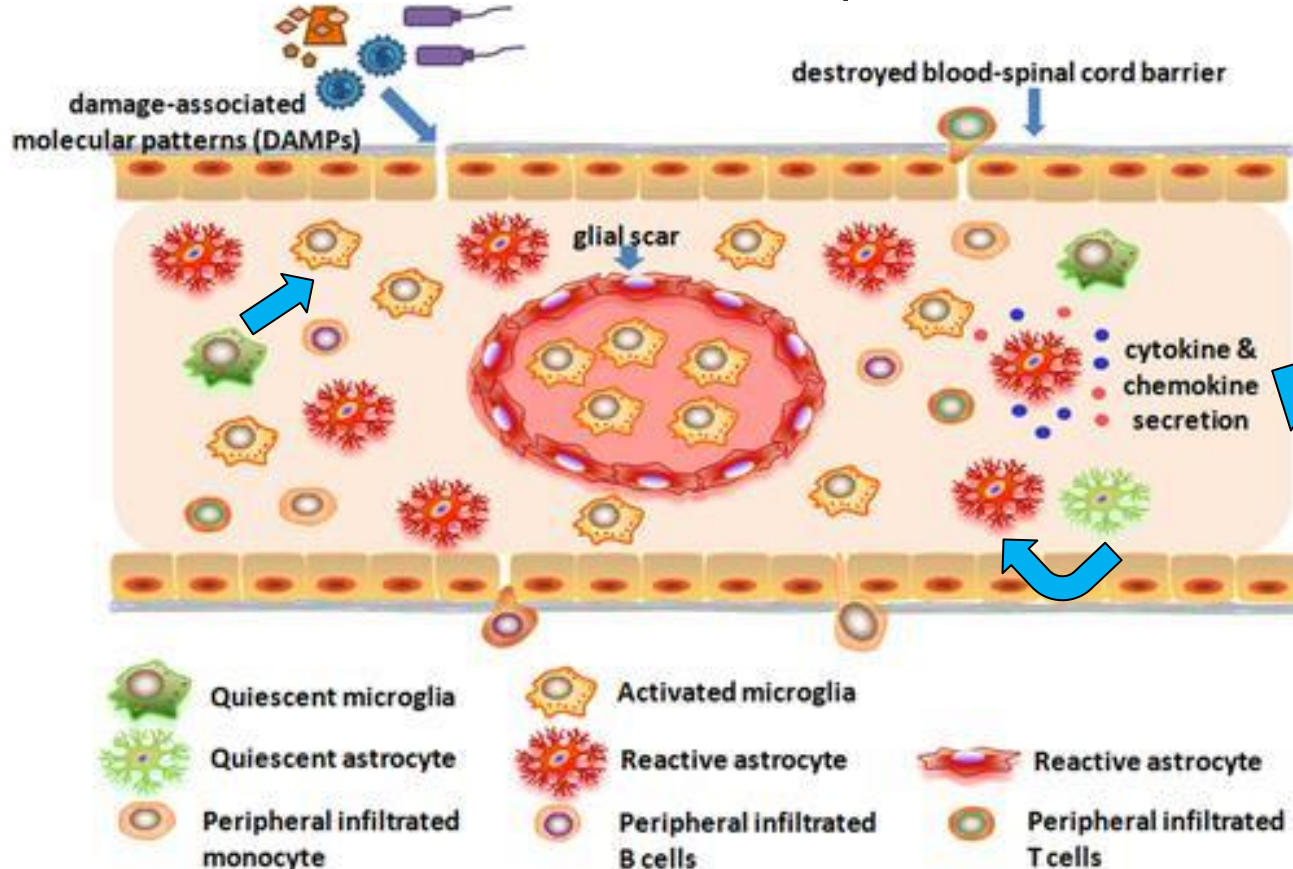
Central Neuropathic Pain

- Studies show pain signals to brain originate about 2 spinal cord levels above injury level



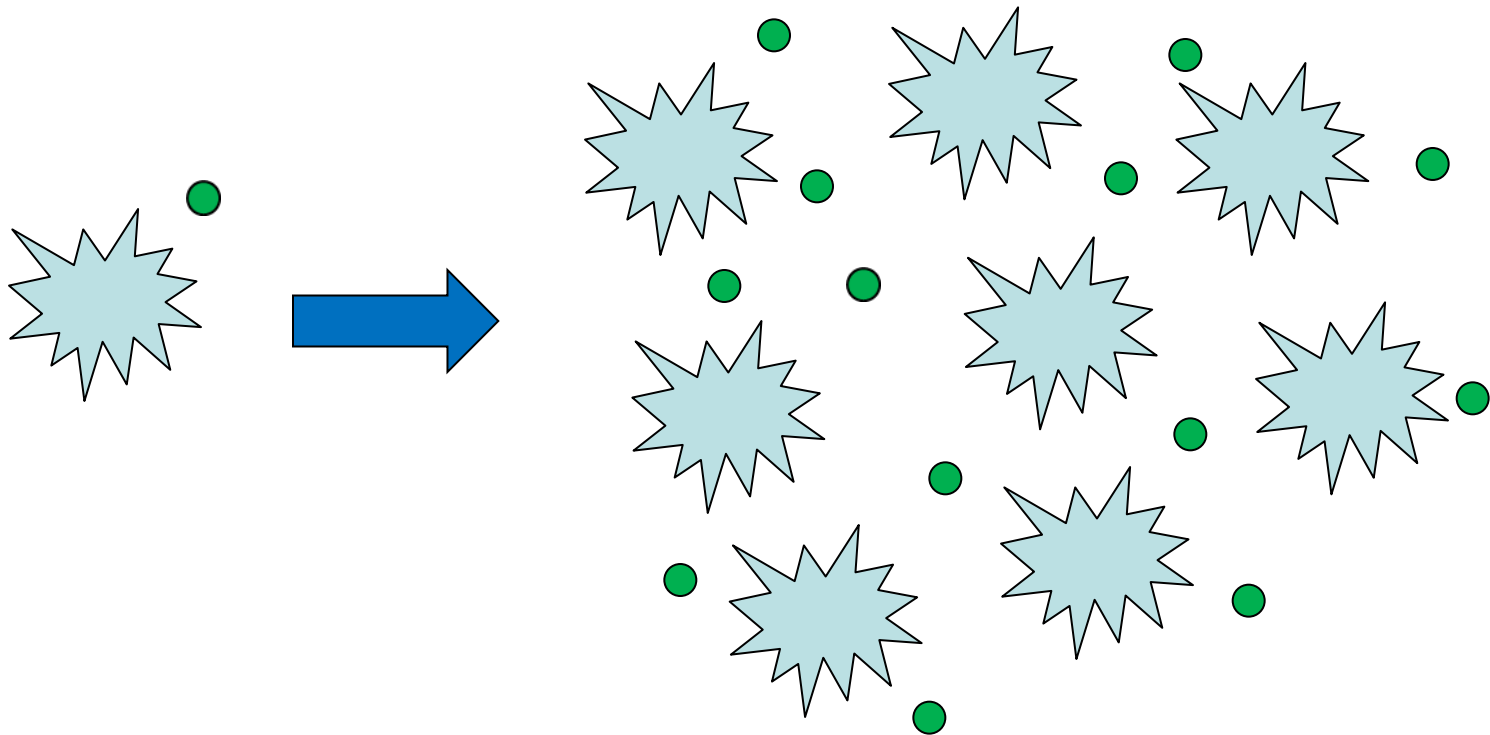
Central Neuropathic Pain

- Pathophysiology of central pain in SCI:
 - **Microglia and astrocytes** in spinal cord are activated by the tissue damage from cord injury
 - These cells then produce excessive pro-inflammatory **chemokines & cytokines** to 2-3 times the level in SCI patients without central pain



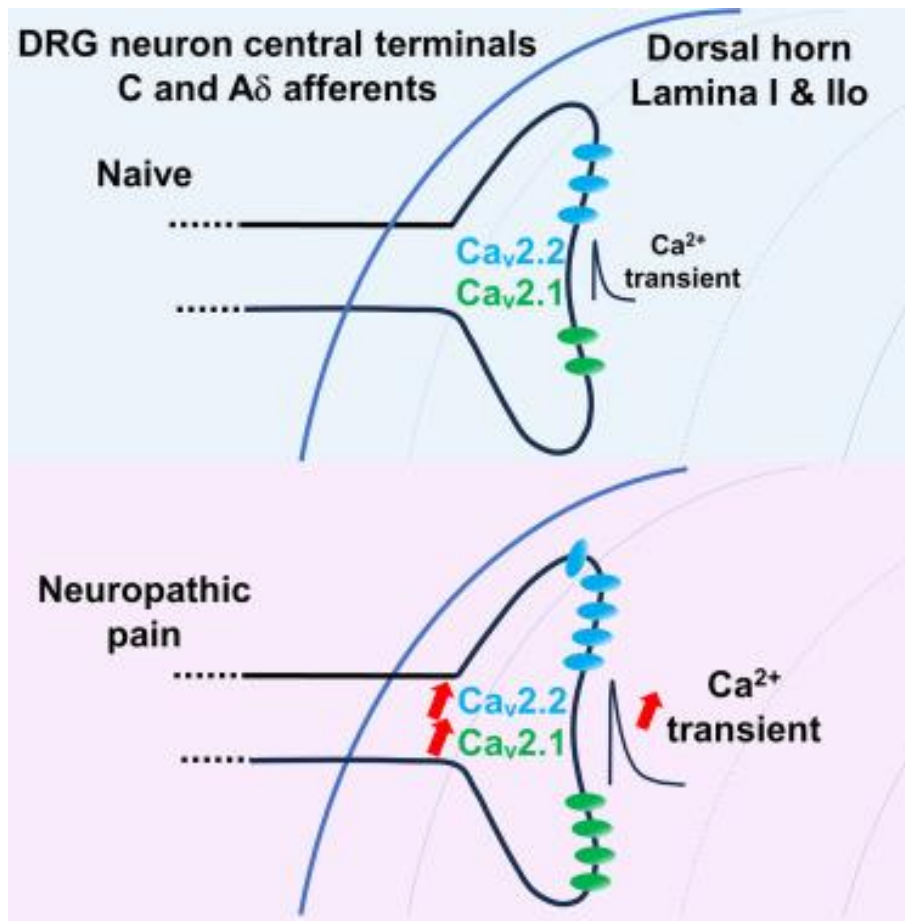
Central Neuropathic Pain

- Increase in inflammatory molecules results in
 - Proliferation of microglia and astrocytes, that produce further increase in inflammatory mediators



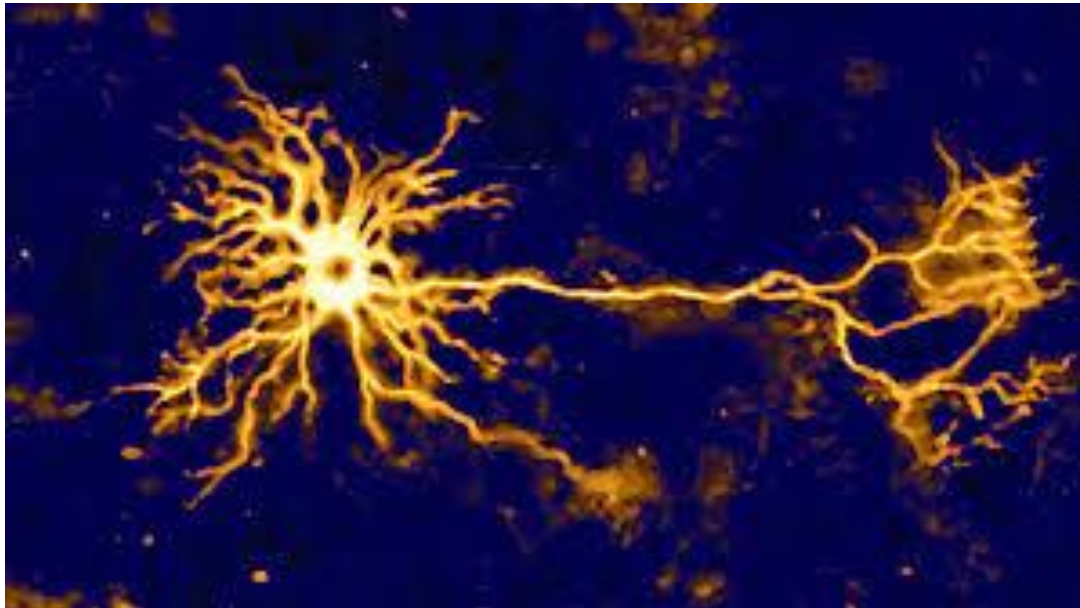
Central Neuropathic Pain

- Increase in inflammatory mediators results in
 - Increased number of **voltage-gated calcium channels** on nerves



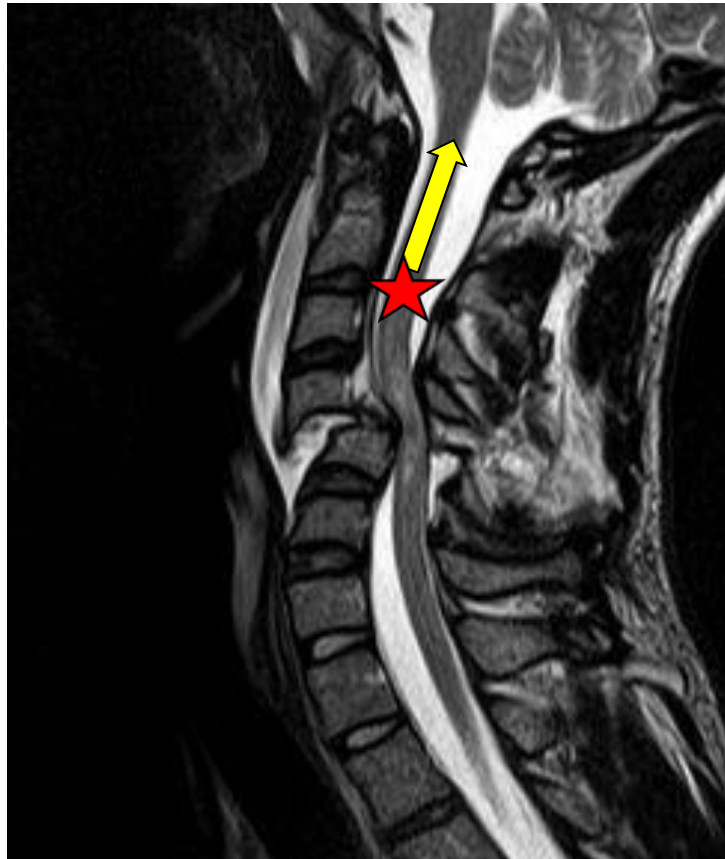
Central Neuropathic Pain

- Increase in nerve calcium channels results in
 - More calcium flowing through these nerves
 - Increased nerve excitability
 - These nerves then **generate ongoing pain without a pain stimulus**



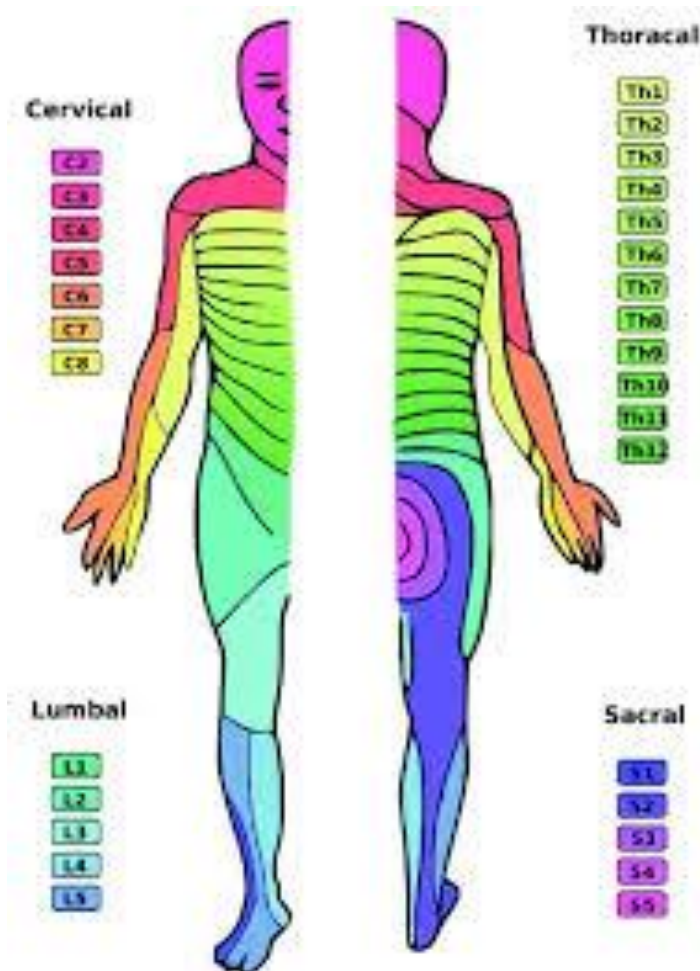
Central Neuropathic Pain

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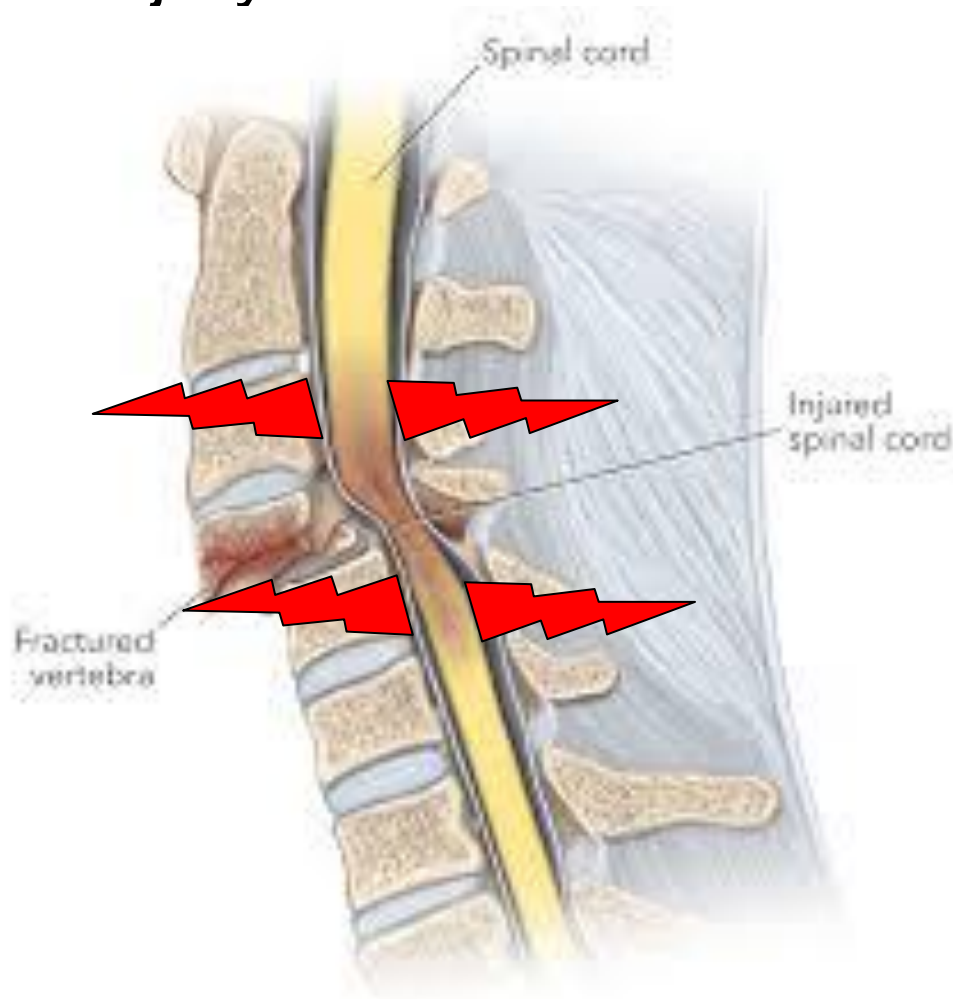
Types of Pain with SCI

- Central neuropathic pain ✓
- End zone (dermatomal) neuropathic pain



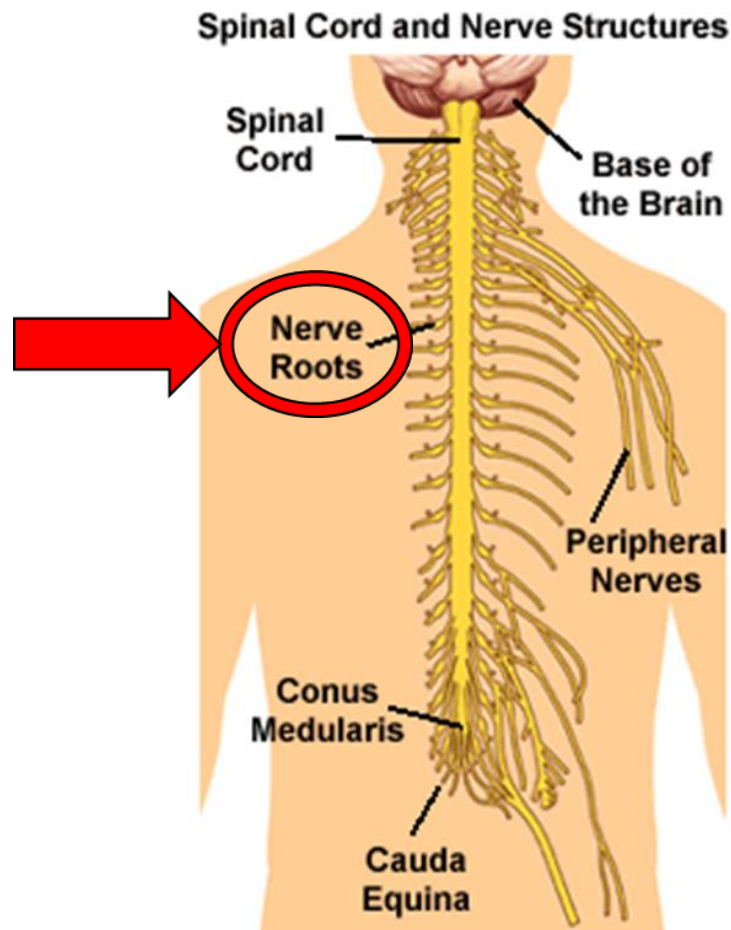
End zone (dermatomal) Neuropathic Pain

- From injury to cord



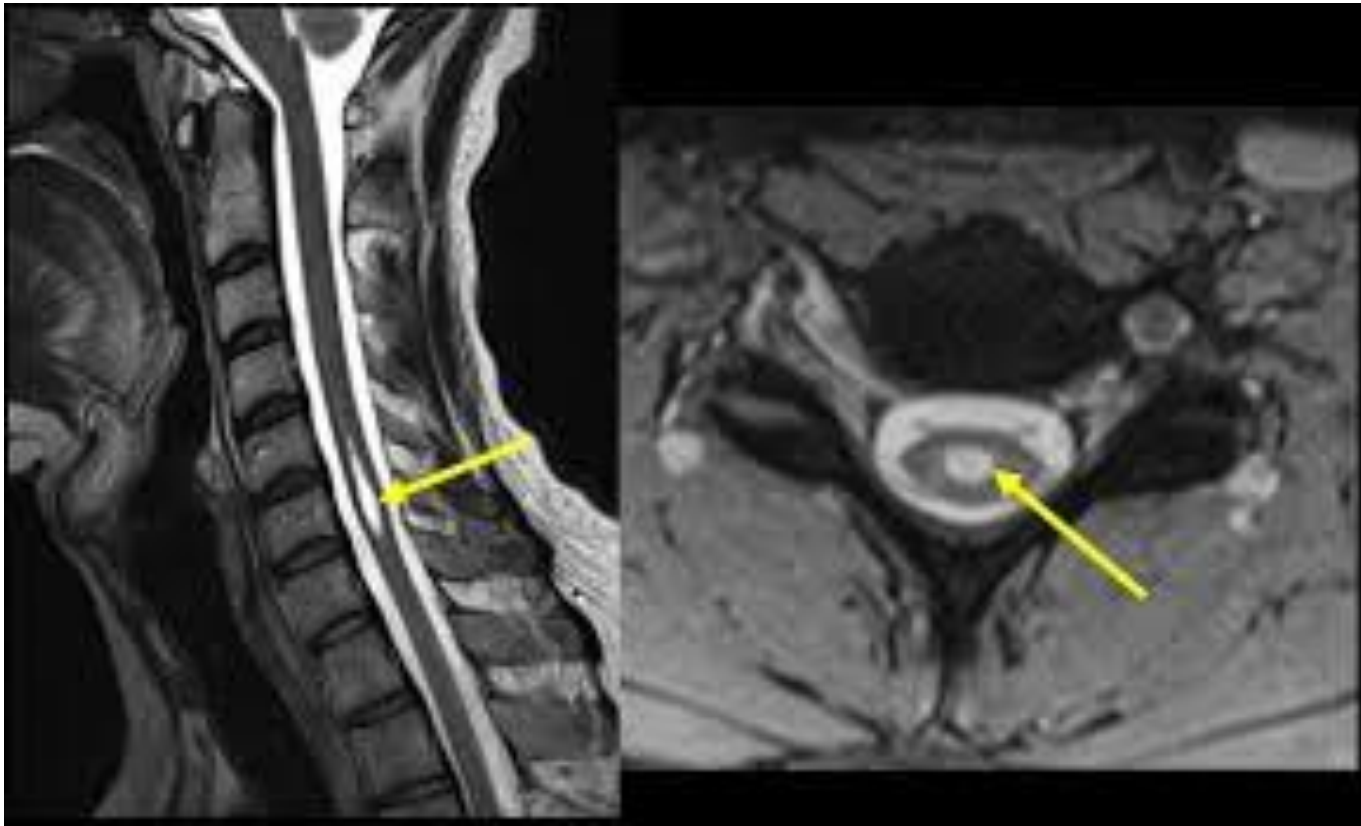
End zone (dermatomal) Neuropathic Pain

- From injury to nerve roots



End zone (dermatomal) Neuropathic Pain

- From post-traumatic syringomyelia



Location of End Zone Pain

- **Cervical SCI:** most often in neck and UEs



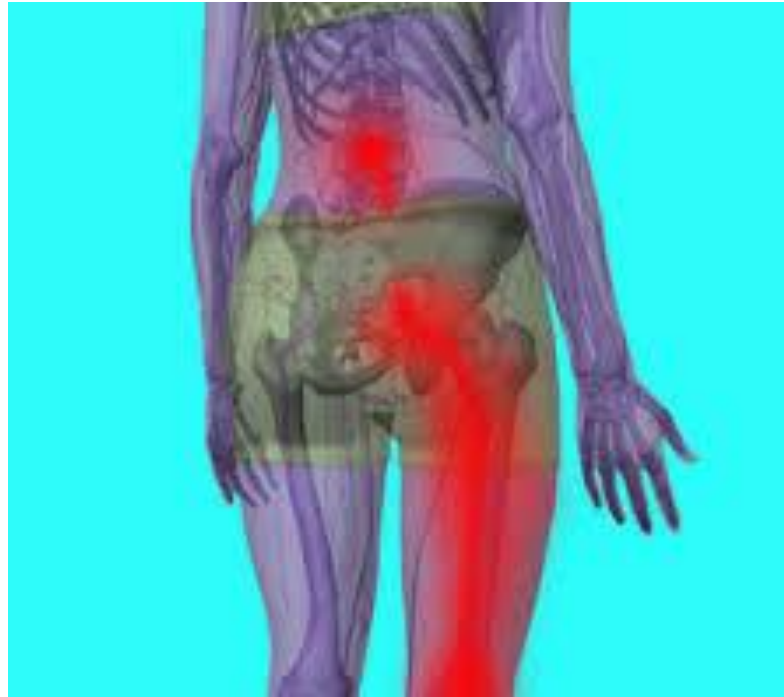
End zone (dermatomal) Neuropathic Pain

- For **thoracic SCIs**, feels like tight band or belt around chest or abdomen



Location of End Zone Pain

- **Lumbar (cauda equina) injury:** most often in back and LEs



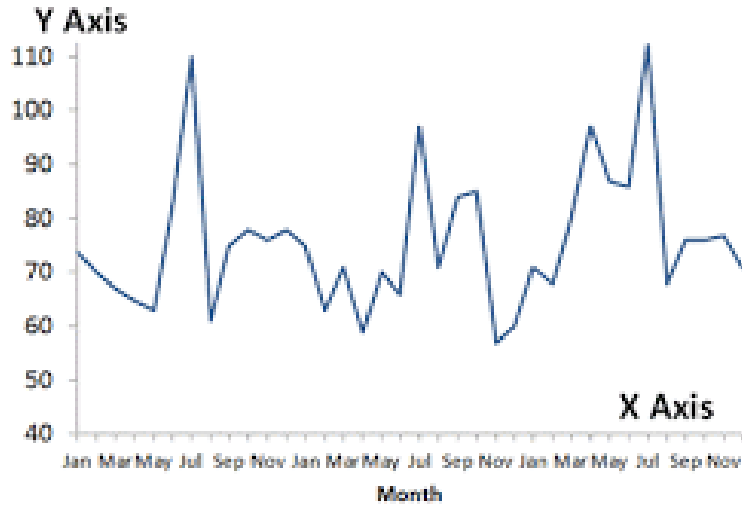
Central and End Zone Neuropathic Pain

- Burning, stabbing, electrical jolt, icy cold



Central and End Zone SCI Neuropathic Pain

- Most often intermittent (but can be constant)
- Worse in evening and night



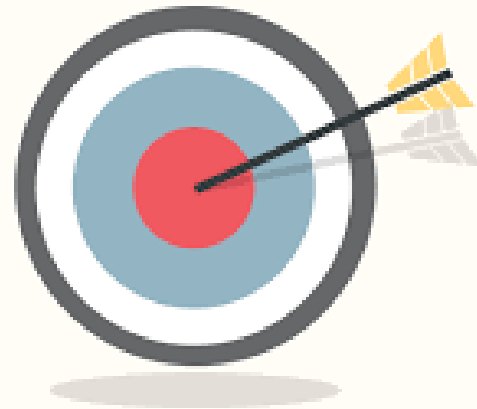
Central and End Zone Neuropathic Pain

- Smoking makes SCI neuropathic pain worse
- Quitting smoking lessens SCI neuropathic pain



Neuropathic Pain Treatment with SCI

- Notoriously difficult to treat!
- Give realistic expectations: I tell patients a realistic goal is to cut their pain score in half (e.g. from 8/10 to 4/10), not to eliminate the pain



Neuropathic Pain Treatment with SCI

- Medications
- Devices and surgeries
- Alternative, complementary treatments



Neuropathic pain meds

★ All off label except Pregabalin

- Pregabalin --best with SCI
 - Only med FDA approved for SCI neuropathic pain
 - Sedation, dizziness, swelling, weight gain, drop in plts
- Gabapentin Sedation, dizziness, tremor
- Amitriptyline Sedation, constipation, dry mouth
 - Helps with insomnia & bladder spasms
- Duloxetine
 - Less benefit with SCI than others (?)



Neuropathic pain meds

Need higher doses than other types of
with neuropathic pain

- Pregabalin (200-300mg BID)
- Gabapentin (800 to 1200mg TID)
- Amitriptyline (25-100mg QHS—may need to avoid higher doses as affects results of SCI bowel program)
- Duloxetine (up to 60mg BID)



Neuropathic pain meds (high doses needed with SCI)

LESS COMMONLY USED:

- Oxcarbazepine
- Carbamazepine
- Lamotrigine



Neuropathic pain meds

- Recent studies on SCI central neuropathic pain show possible benefits (more studies needed) with the following meds:
 - Ziconotide (Prialt ®) (centrally acting non-opioid pain med used in intrathecal pumps)
 - Oral Baclofen



Opioid meds for neuropathic pain (last choice)

- **Opioids not very effective for neuro pain, so need high doses,** and many SCI patients are young, so **high risk** of dependence and of opioid use disorder
- SCI Medical organizations have made official statements recommending that **opioid** meds **not be used** for SCI neuropathic pain
- Studies have shown some benefit from opioids; Best are **Methadone, Oxycodone and Tramadol** which can be used as 2nd or 3rd line treatment.

Medicinal Cannabis



- Studies for SCI pain are limited and show mixed results

Electrical devices for neuropathic SCI pain

- TENS unit
- Spinal cord stimulator



TENS unit for SCI pain

- Good randomized controlled trial with TENS vs. sham TENS control group, shows **significant pain reduction in central neuropathic pain after SCI**
- Watch for pressure sores from leaning against electrode wires in wheelchair



Inplanted Spinal Cord Stimulator

- Research study shows **40%** of SCI patients with trial of percutaneous spinal cord stimulation had good pain reduction (better for musculoskeletal pain than neuropathic pain)
 - After surgical implantation of those patients, **long term relief after 3 years** only in **18%** of original study subjects

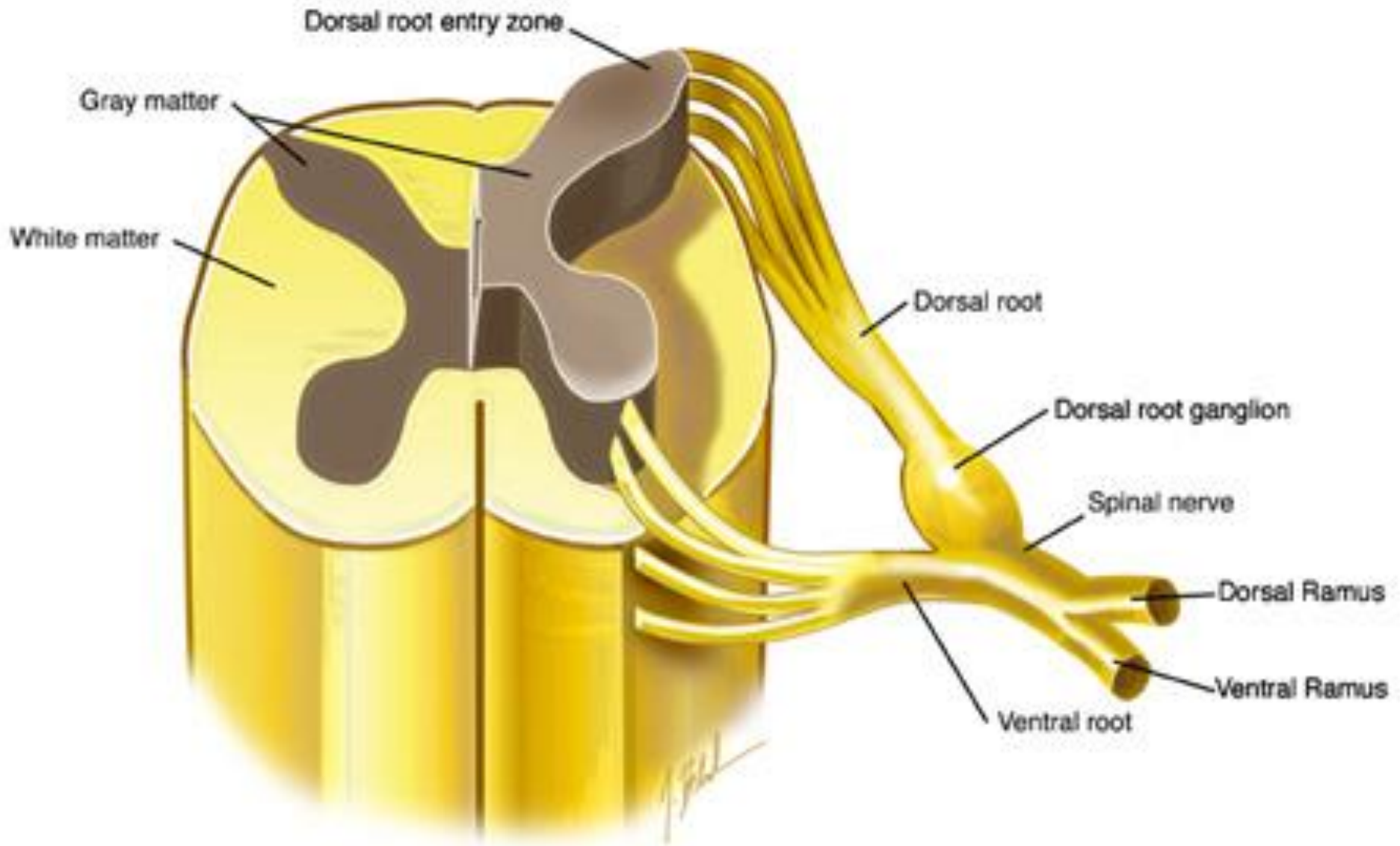


Surgical solutions for neuropathic SCI pain



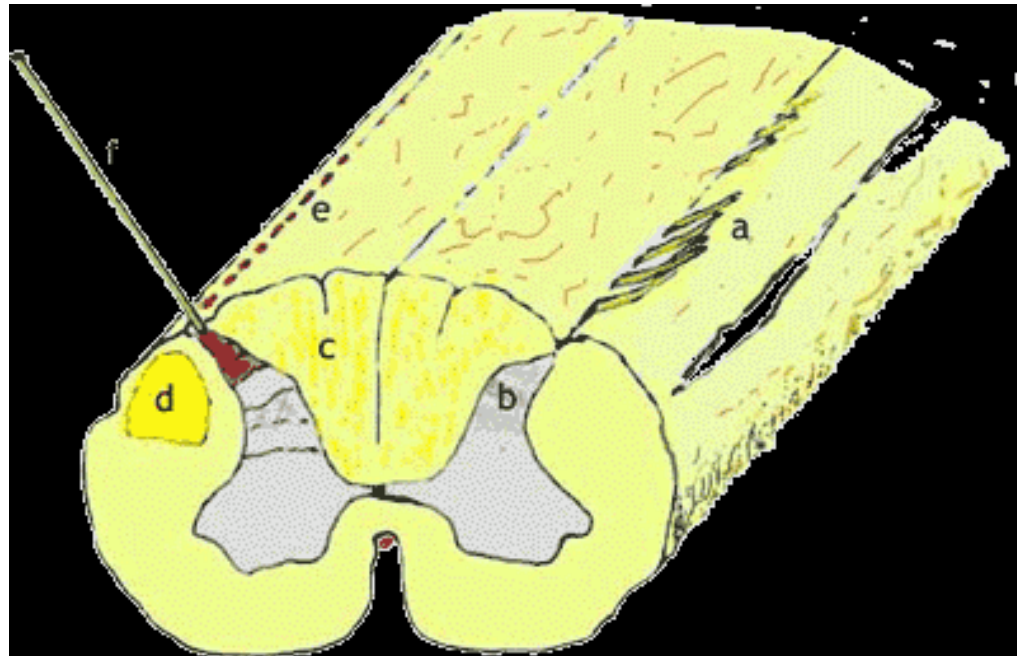
- DREZ ablation—improved pain in 55.8% of SCI patients

DREZ Surgery



DREZ surgery

- Thermo-coagulation (cautery) ablation of the dorsal root entry zone from 2 levels above cord lesion to 1 level below lesion



Nutritional Supplements for Pain

- Amino Acids



Amino Acids

- Three key pain-lessening neurotransmitter proteins in CNS:
 - Endorphin
 - Serotonin
 - GABA (gamma amino butyric acid)
- Precursor amino acids taken as a supplement increase levels of these proteins in CNS
 - **D-phenylalanine** raises endorphin level
 - **L-tryptophan** raises serotonin
 - **L-glutamine** raises GABA



Amino Acids

- Research on these 3 amino acid supplements used together, show good benefit vs. placebo for SCI neuropathic pain.
- Dose is 500 mg TID for all 3 (except skip AM dose for L-tryptophan)
 - D-phenylalanine (500mg TID)
 - L-tryptophan (500mg BID, pm & hs)
 - L-glutamine (500mg TID)

Acupuncture for SCI pain

- Research studies on acupuncture with SCI shows:
 - 50% of people with chronic pain from SCI get pain reduction
 - This reduction in pain has been shown to be due to inhibiting enzyme activation in astrocytes, lessening # of activated astrocytes in dorsal horn of spinal cord, and inhibiting microglial activation and lessening inflammation within cord



Types of Pain with SCI

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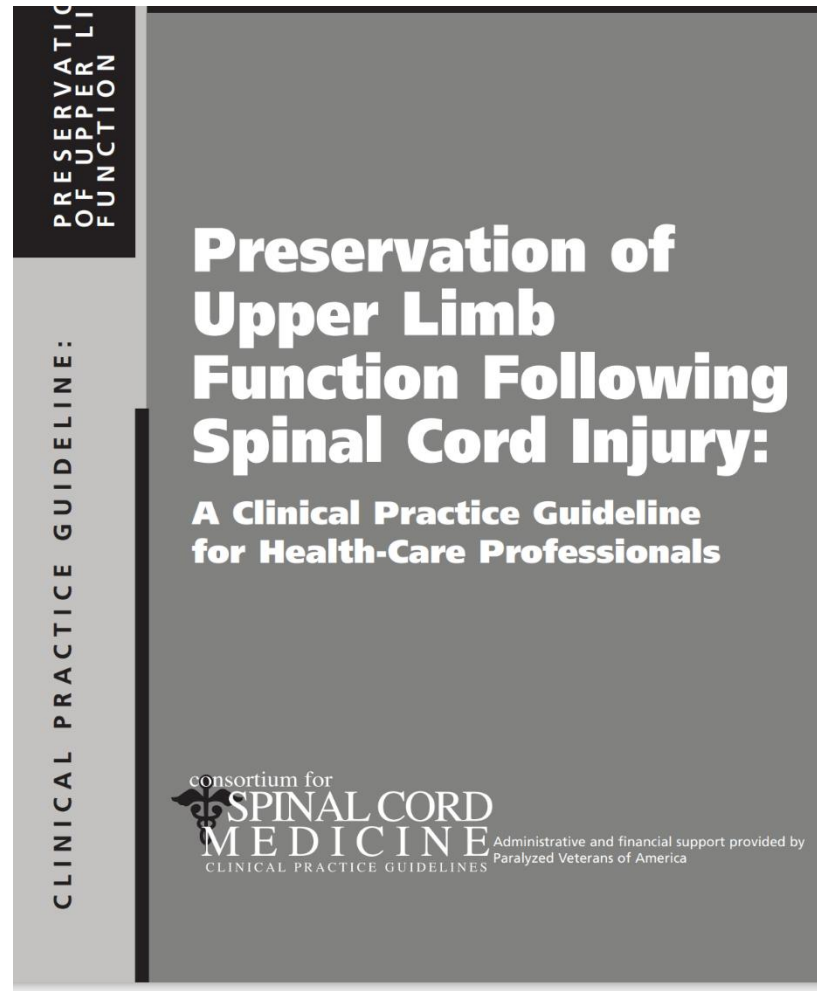


Musculoskeletal Pain

- Upper extremity overuse syndromes from propelling wheelchair is **very common**
 - Rotator cuff tendinosis
 - Carpal tunnel syndrome
 - Lateral epicondylitis



Musculoskeletal Pain



**Consortium for Spinal Cord Medicine
Member Organizations**

Musculoskeletal Pain

- **Treatment** includes **adjusting wheelchair axle** to lessen strain on shoulders and hands



SUMMARY

- SCI pain can be central, end-zone (dermatomal) or musculoskeletal
- Central neuropathic pain is very common, usually severe and worsens disability
- Treatment options include
 - Prescription medications (**high doses needed**, avoid opioid meds)
 - Many complementary/alternative treatments
 - Surgical treatment (DREZ ablation)

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