Spinal Cord Injury (SCI)

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Resources

- Suzanne - Ch13 SCI[martinNeurologicInterventionsPhysical2021a?]

Functional Categories

Spinal cord injuries can be divided into two functional categories: tetraplegia and paraplegia[1]

Tetraplegia

- Motor and/or sensory impairment of all four extremities and trunk[1]
  - Including the respiratory muscles[1]
- Results from lesions of the cervical cord[1]

Paraplegia

- Motor and/or sensory impairment of all or part of the trunk and both lower extremities (LEs)[1]
- Results from lesions of the thoracic or lumbar spinal cord or cauda equina[1]

Anatomy

Read more about the Anatomy and function of the spinal cord.

Determining Lesion Level and Severity

It is important for clinicians to be able to determine lesion level and completeness in order to establish prognosis. The standardized method to assess this is the ISNCSCI.

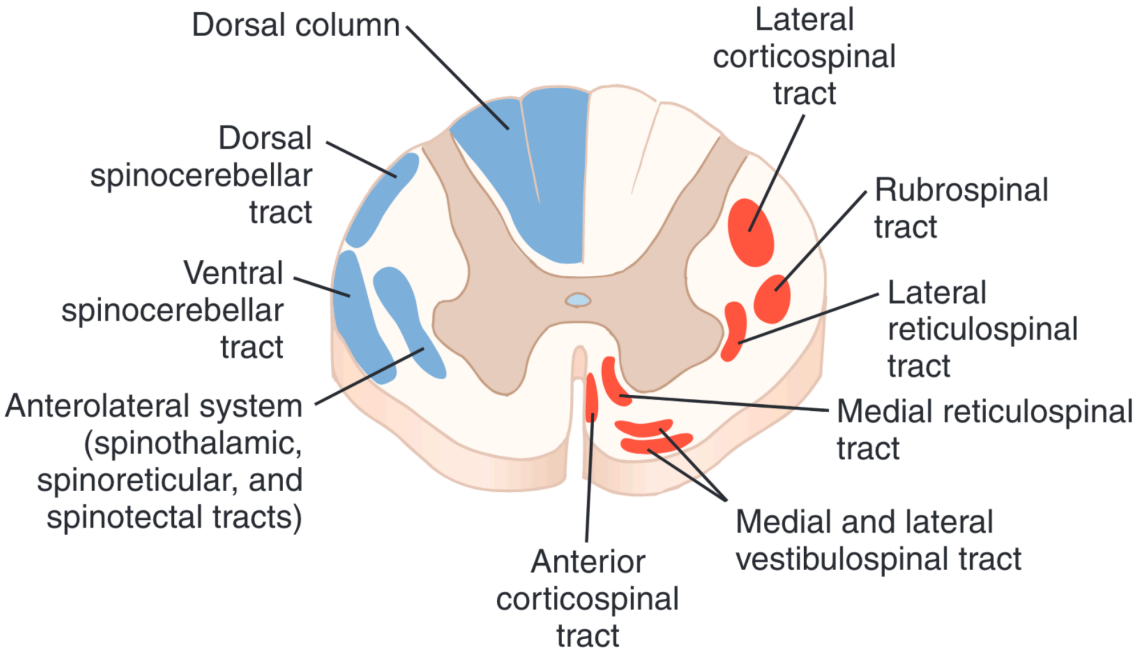

Figure 1: Spinal Cord Cross section[1]

Clinical Syndromes

- Clinical syndromes refer to common patterns in SCI presentations[1].
- $\sim\frac{1}{5}$ of clinical presentations follow clinical SCI syndromes[1].

> Clinical Significance
>
> Clinicians should use clinical syndromes to anticipate sensory and motor functions, which they can use for goal-setting, predicting outcomes, and guiding the plan of care (POC)[1].

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Brown-Sequard Syndrome

- Brown-Sequard Syndrome
- Generally due to penetration injuries
- Hemisection

Anterior Cord Syndrome

- Anterior Cord Syndrome
- Flexion injury (generally)[1]
- BIL Corticospinal tract damage
- BIL Spinothalamic tract damage
- DCML Preservation

Central Cord Syndrome

- The most common SCI syndrome[1]
- C/S Hyperextension injury[1]

Cardiovascular complications

Disruptions of cardiovascular control following spinal cord injury are directly related to the level and degree of the injury[2]

Timing

Acute

> "Immediately after a spinal cord injury, there is in almost all patients a sudden loss of the autonomic effect of the smooth muscle in the walls of the blood vessels, and as a result vasodilation occurs. The acute loss of sympathetic stimulation results in bradycardia. During the acute phase, the arterial hypotension (neurogenic shock) may be misinterpreted as loss of volume."[2]

Peripheral Nerves

Vagus Nerve

- The vagus nerve is hypersensitive immediately after an injury[2].
- This normally lasts for 2–3 weeks, but can last longer[2].
- Treatment
  - Implantation of a temporary or permanent pacemaker is required.
  - Atropine should be available[2]
- Precautions:
  - During this period, it is important to avoid activating the n. vagus to avoid reinforcing the vagal reflexes.
  - Avoid Hyperventilation (Hypoxia increases vagal activity)[2]
  - All forms of tube in the nose/mouth and throat may cause bradycardia and increased vagal reflexes[2].
- This can be a life-long problem in patients with high, complete injuries, whereas in patients with lower and/or incomplete injuries the situation may normalise after 4–5 weeks[2]

Complete Cervical

"complete cervical injury, the connection between the upper autonomic centres in the brain and the intermediolateral cell column at level T1–L2 of the spinal cord will be destroyed. Patients with cervical injuries have a higher risk of bradycardia (29 %), sudden unprovoked cardiac arrest (16 %) and conduction system disturbances, particularly in the first few weeks after the injury (5). Sudden death is not unusual either."[2]

Clinical Presentation

Pain

> **Note**
>
> - Bonica's Managmenet of Pain ch40: Pain Following Spinal Cord Injury[3]
> - Welzack Chapter 68 Pain Following Spinal Cord Injury[4]

Intervention

Stem Cells

- Paul video:
  - one guy said that it significantly worsened pain and spasticity
- See "Systematic Review of Cell Therapy Efficacy in Human Chronic Spinal Cord Injury"[5]

Virtual Reality

Examination

Participation

QOL:

- Sickness Impact Profile 68 (SIP-68)

1. O'Sullivan SB, Schmitz TJ, Fulk GD, eds. *Physical Rehabilitation*. 7th ed. F.A. Davis Company; 2019.
2. Hagen EM, Rekand T, Grønning M, Færestrand S. Cardiovascular complications of spinal cord injury. *Tidsskrift for Den Norske Laegeforening: Tidsskrift for Praktisk Medicin, Ny Raekke*. 2012;132(9):1115-1120. doi:10.4045/tidsskr.11.0551
3. Ballantyne J, Fishman S, Rathmell JP, eds. *Bonica's Management of Pain*. 5th ed. Wolters Kluwer; 2019.
4. McMahon SB, ed. *Wall and Melzack's Textbook of Pain*. 6th ed. Elsevier/Saunders; 2013.
5. Abolghasemi R, Davoudi-Monfared E, Allahyari F, Farzanegan G. Systematic Review of Cell Therapy Efficacy in Human Chronic Spinal Cord Injury. *Tissue Engineering Part B, Reviews*. Published online December 2023. doi:10.1089/ten.TEB.2023.0130