PHYSIOTHERAPY IN SURGICAL CONDITIONS

[PT 310]

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LECTURE NOTES FOR 3rD GRADE BPT STUDENTS

SPRING SEMESTER 2024-2025

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TISHK INTERNATIONAL UNIVERSITY

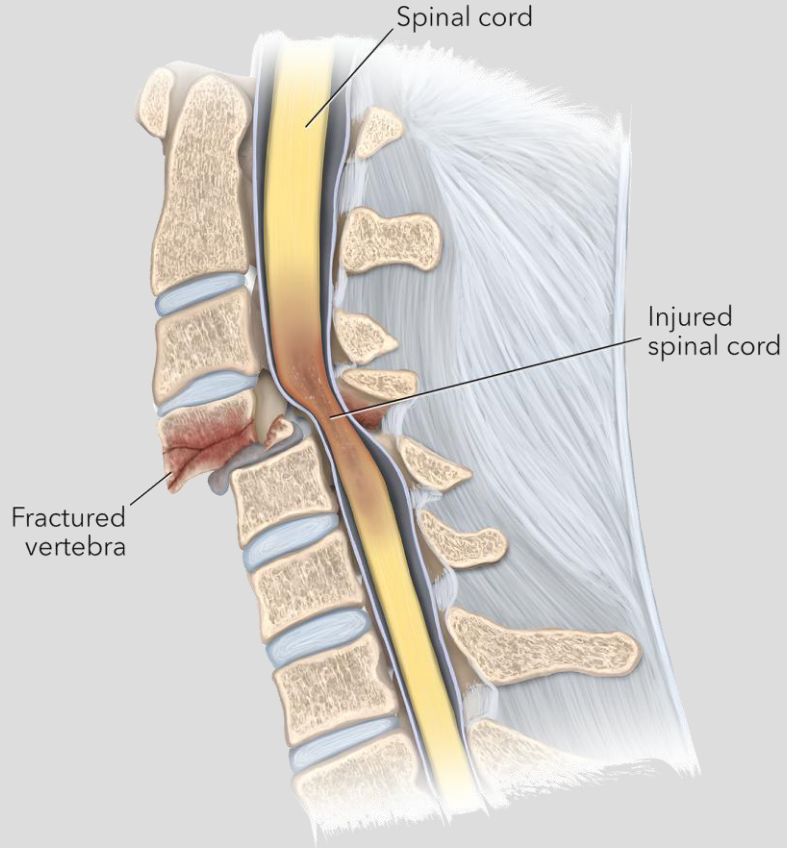
2024/2025

Spinal Cord Injury

CONTENTS

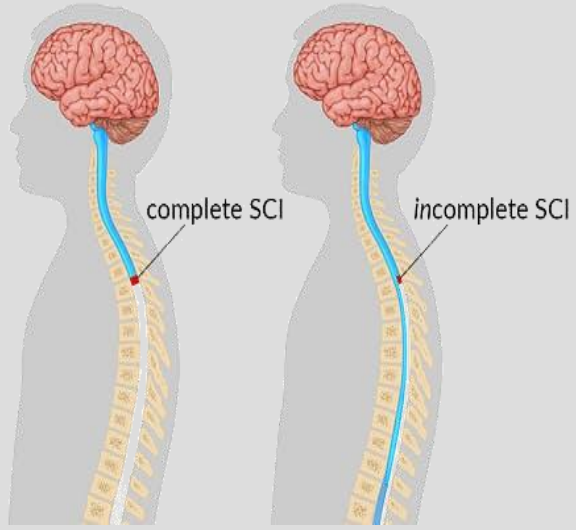
INTRODUCTION

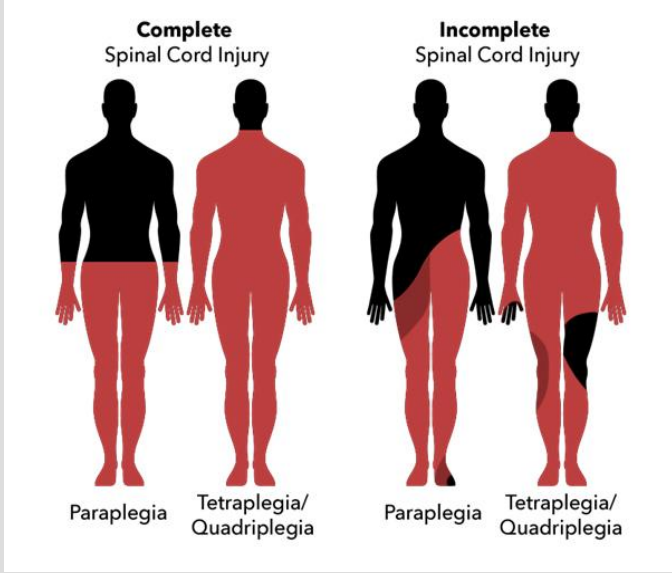
- SCI is a serious and life-altering condition resulting from damage to the spinal cord due to trauma, disease, or degeneration, leading to partial or complete loss of motor, sensory, & autonomic function below the level of injury.
- Rehabilitation is crucial in maximizing recovery, independence, & quality of life for the affected individuals.



CLASSIFICATION OF INJURY

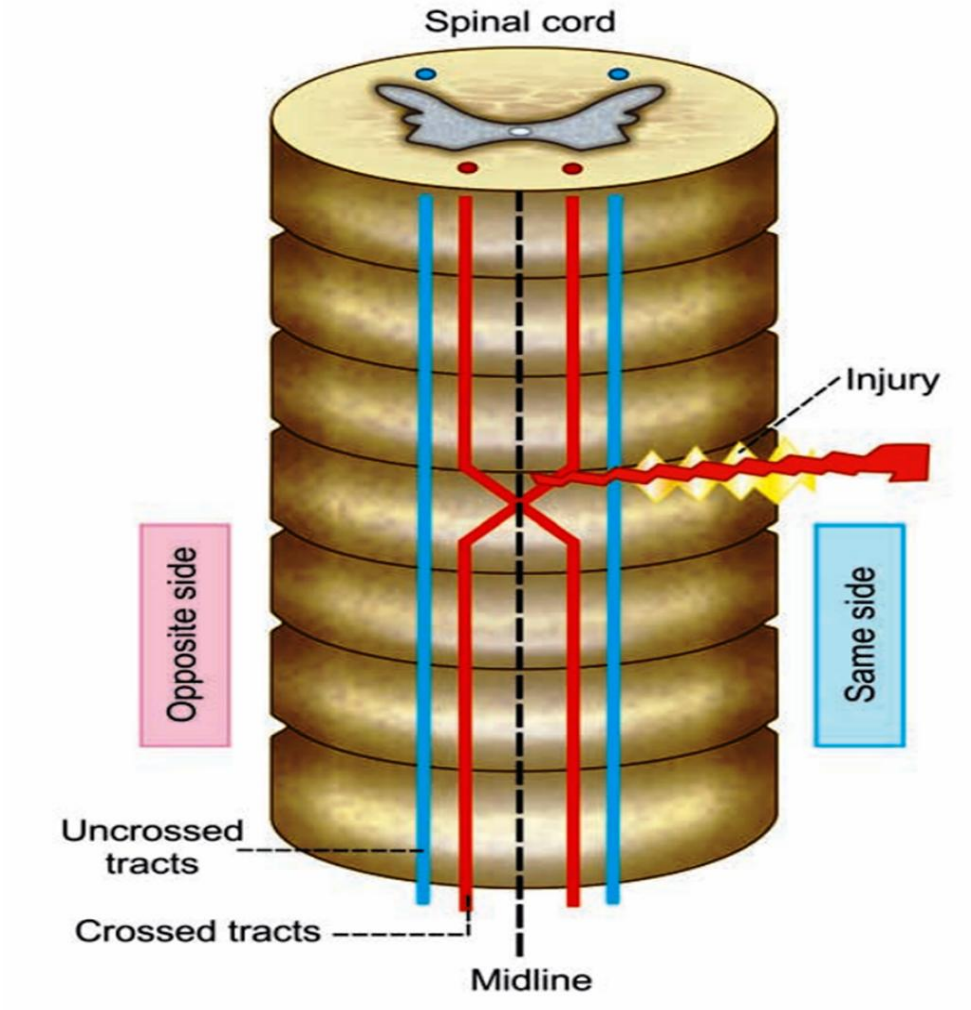
- SCI can be classified as:
  - **Complete injury/transection**: (mainly due to bullet injury)
    - Total loss of motor & sensory function below the level of injury.
    - Characterized by stage of spinal shock, reflex activity, and reflex failure
  - **Incomplete injury/transection**:
    - Partial preservation of motor and/or sensory function below the injury level.
    - Characterized by stage of spinal shock, reflex activity, and reflex failure
  - **Hemisection (Brown-Séquard syndrome):** (mainly due to accidents)
    - Rare and involve lesion of one lateral half of the spinal cord.
    - It can also be produced experimentally in animals.
    - Effects are seen below the level of lesion and at the level of lesion.
    - Effects in these areas differ on the same side and opposite side
    - Symptoms include: immediate spinal shock, loss of muscle tone, flaccidity, loss of reflexes, and sensory & motor changes.





CLASSIFICATION OF INJURY

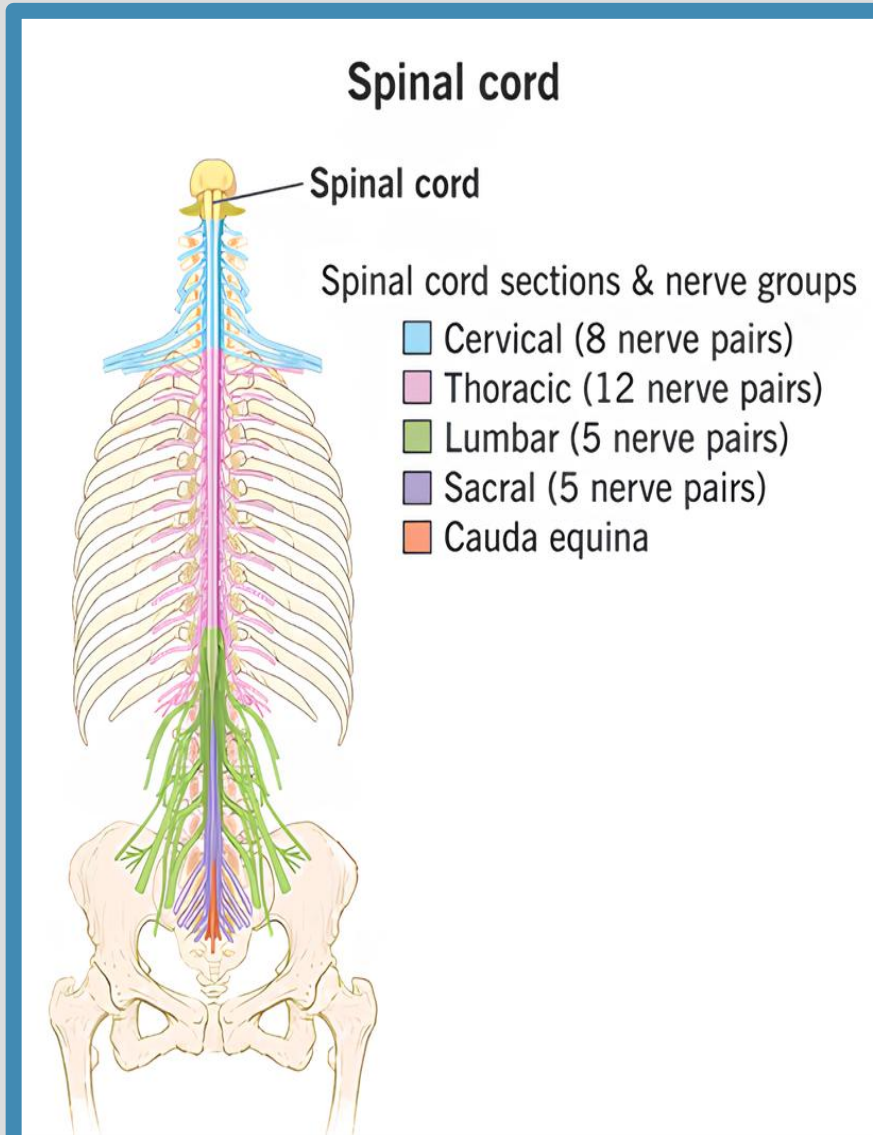
- **Hemisection (Brown-Séquard syndrome):**



Below the level of lesion:
Same side = loss of sensations carried by uncrossed fibers,
Opposite side = loss of sensations carried by crossed fibers.
At the level of lesion:
Same side = complete anesthesia,
Opposite side = loss of sensations carried by crossed fibers.

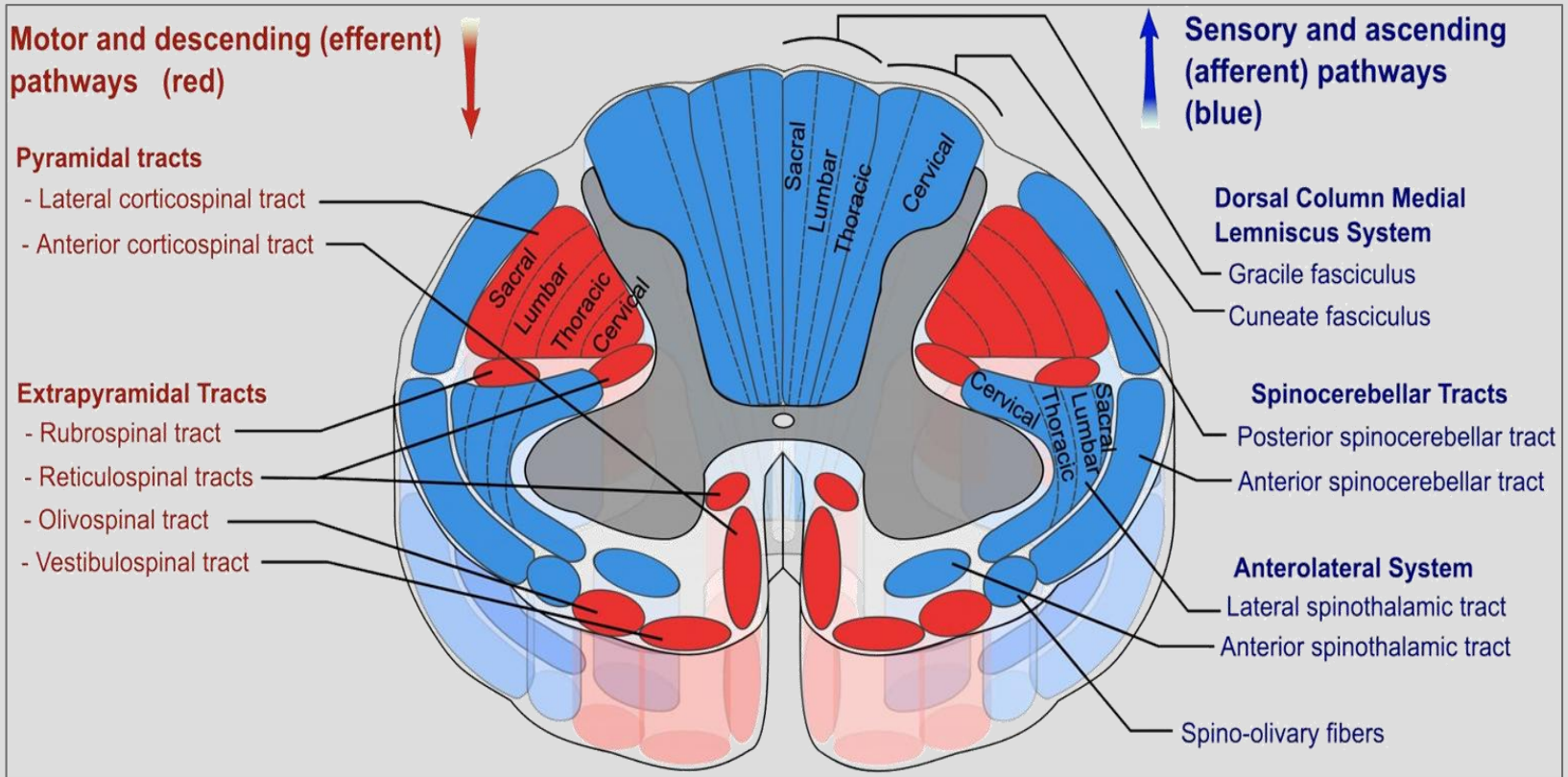
BRIEF RELEVANT ANATOMY

- The spinal cord runs from the brainstem (medulla oblongata) down to the lumbar region.
- It is protected by the vertebral column & is organized into four main regions:
  - Cervical (C1-C8) - controls breathing, upper limb movement, & neck functions.
  - Thoracic (T1-T12) - controls chest & upper abdominal muscles.
  - Lumbar (L1-L5) - controls lower limb movements.
  - Sacral (S1-S5) - governs bowel, bladder, & sexual functions.



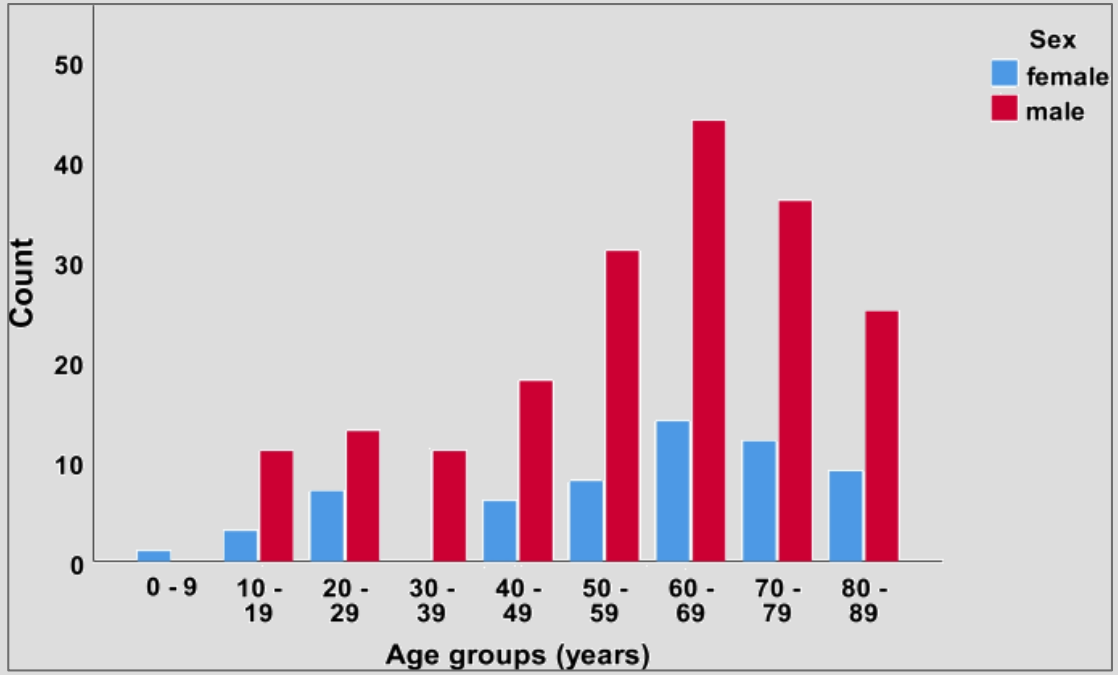
BRIEF RELEVANT ANATOMY

- The spinal cord transmits motor, sensory, and autonomic signals between the brain & the body via nerve tracts:
  - Ascending tracts (sensory pathways): carry information from the body to the brain.
  - Descending tracts (motor pathways): transmit signals from the brain to muscles.



BRIEF EPIDEMIOLOGY

- Global incidence is estimated at 10-83 cases per million people per year.
- Commonly affected are young adults (especially males aged 16-30) & elderly due to falls.
- SCI is a leading cause of disability, with high financial & social burdens.



CAUSES/AETIOLOGY

SCI can be caused by traumatic or non-traumatic factors:

Traumatic causes (most common, ~80%)

- Road traffic accidents (RTAs): leading cause of SCI in young adults

- Falls: common in older adults

- Violence: gunshot or stab wounds affecting the spine

- Sports & recreational injuries: contact sports like football

- Alcohol & drug use: increases the risk of accidents due to impaired judgment

CAUSES/AETIOLOGY

Traumatic causes

CAUSES/AETIOLOGY

Non-traumatic causes:

- Degenerative diseases e.g. spinal stenosis, spondylosis.
- Tumors e.g. spinal cord neoplasms
- Infections e.g. tuberculosis (Pott's disease), meningitis, transverse myelitis.
- Vascular disorders e.g. spinal cord infarctions, arteriovenous malformations.
- Autoimmune conditions e.g. multiple sclerosis.

RISK FACTORS

- **Age** (young adults and elderly)

- **Male gender** (more prone to traumatic injuries)

- **Risky behaviours** (e.g., reckless driving, extreme sports)

- **Poor bone health** (e.g., osteoporosis)

CLINICAL PRESENTATIONS/SIGNS AND SYMPTOMS

Muscle weakness

Sensory Loss

Bladder Dysfunction

Loss of Movement

Neuropathic pain

DIAGNOSIS

Clinical Evaluation:

- History & physical examination
- Neurological assessment (ASIA scale)

Imaging:

- X-ray (spinal alignment, fractures)
- MRI (cord damage, compression, hematoma)
- CT scan (detailed bone injuries)

Additional tests:

- Electromyography (EMG)
- Somatosensory evoked potentials (SSEPs)

DIFFERENTIAL DIAGNOSIS

Central nervous system pathologies

- **Cerebrovascular accident:** A sudden interruption of blood flow to the brain, causing loss of neurological function.
- **Postictal (Todd) paralysis:** Temporary weakness or paralysis following a seizure, usually resolving within 48 hours.
- **Hemiplegic migraine:** A rare migraine that causes temporary one-sided paralysis and headache.
- **Multiple sclerosis:** A chronic autoimmune disease where the immune system attacks the nerve covering in the CNS.

Peripheral nerve pathologies

- **Guillain-Barré syndrome:** An autoimmune disorder where the body's immune system attacks the peripheral nerves, leading to weakness & paralysis.
- **Transverse myelitis:** Inflammation of the spinal cord that disrupts communication between the brain and body, causing motor & sensory symptoms.
- **Tick paralysis:** A rare condition caused by a chemical from tick saliva that can lead to rapid ascending paralysis.

Neuromuscular junction pathologies

- **Organophosphate toxicity:** A type of poisoning from some pesticides that affects how nerves send signals to muscles.

SURGICAL MANAGEMENT

Goals of surgical treatment:

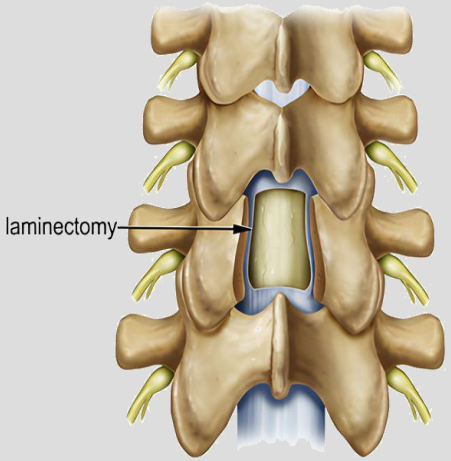
- To decompress the spinal cord
- To stabilize the spine
- To prevent further neurological deterioration
- To correct spinal alignment

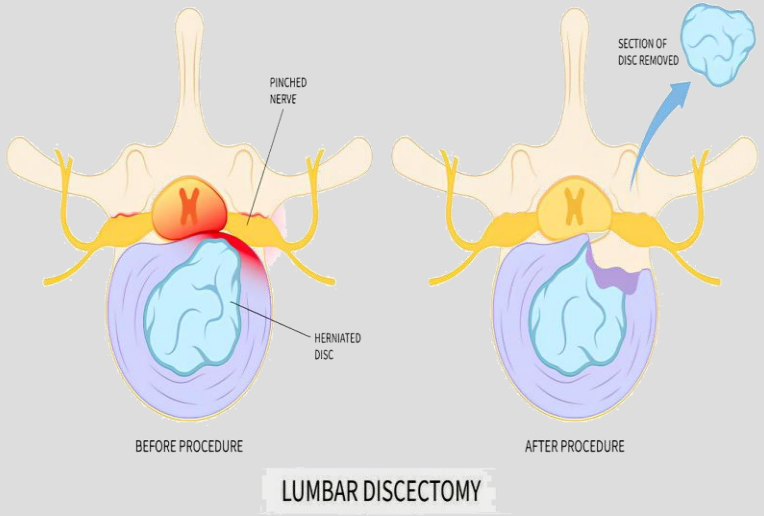
Indications for surgery:

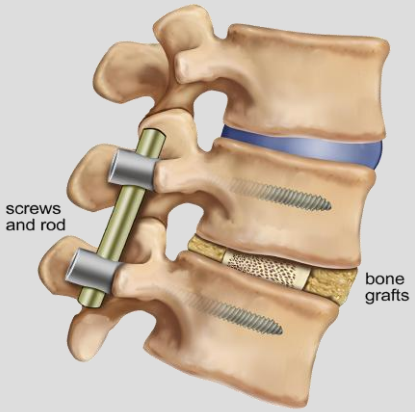
- Progressive neurological deficits
- Spinal instability (fracture, dislocation)
- Spinal cord compression (bone fragments, herniated disc, hematoma)
- Severe pain unresponsive to conservative treatment

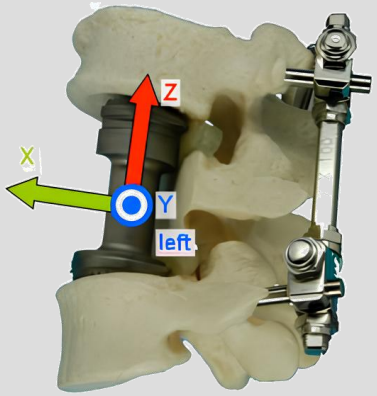
SURGICAL MANAGEMENT

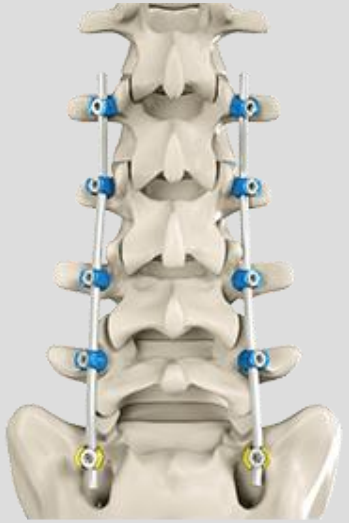
- **Common surgical procedures:**
- Laminectomy
- Discectomy
- Spinal fusion
- Vertebral body replacement
- Internal fixation











PHYSIOTHERAPY MANAGEMENT

Acute and subacute rehabilitation phase

Goals:

- To stabilize neurological status (6–12 week bed period)
- To prevent long-term complications

Key interventions:

- **Passive ROM exercises**: Prevent contractures, atrophy, & pain
- **Joint positioning**: Use pillows, sandbags, splints, orthotics (AFO, KAFO)
- **Stretching**: Protect the tenodesis effect in the flaccid stage (especially in tetraplegia)
- **Trunk exercises**: Active/assisted based on injury level
- **Respiratory exercises**: Preserve lung capacity, improve respiratory function
- **Bed mobility and positioning education**

PHYSIOTHERAPY MANAGEMENT

Acute and subacute rehabilitation phase cont

Preventing complications:

- **Contractures**: ROM 1–3x/day based on spasticity
- **Decubitus ulcers**: Reposition every 2–3 hrs, keep skin clean
- **Spasticity**: Manage with positioning & elimination of triggers

Strength & mobility training:

- **Upper limb strengthening**: Dumbbells, resistance bands
- **Electrical stimulation** for muscle fatigue
- **Balance & sitting training** for transfers

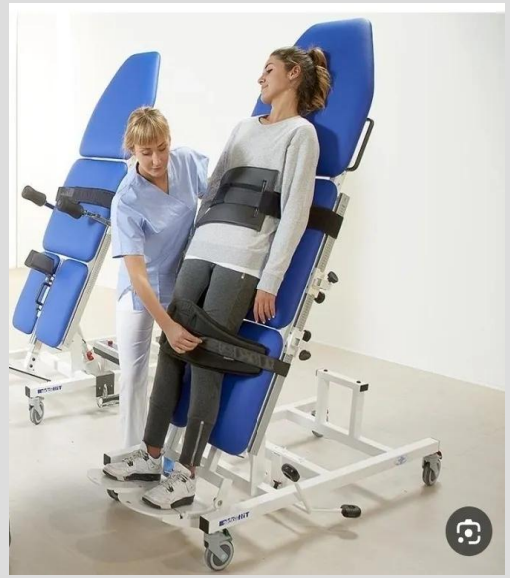
Resistance band arm exercise

Dumbbell exercise

Equipment & positioning:

- Use **corsets** (Knight-Taylor brace) for spine support
- **Tilt table**: For orthostatic hypotension & upright tolerance
- Initiate **wheelchair training** & **bed-to-wheelchair transfers**

Knight-Taylor brace



Tilt table

PHYSIOTHERAPY MANAGEMENT

Chronic rehabilitation phase

Goals:

- Achieve **maximum independence**
- Enable **community integration**
- Restore **psychological well-being**

Ambulation is crucial:

- Social, domestic, or exercise-based walking
- Affected by injury level, motivation, spasticity, & health
- Devices: Walkers, crutches, orthoses

PHYSIOTHERAPY MANAGEMENT

Chronic rehabilitation phase cont.

Functional training:

- Standing & walking in parallel bars
- Hybrid devices: Functional electrical stimulation + orthoses
- Robotic gait training

Home modifications:

- Wider doors (81.5–86.5 cm), ramp access
- Accessible kitchen/bathroom equipment
- Remove carpets, use lever handles

Occupational therapy

- Promote hobbies, creativity, & role reintegration
- Involve family in care planning

PHYSIOTHERAPY MANAGEMENT

Robotic gait training

COMPLICATIONS

Acute complications

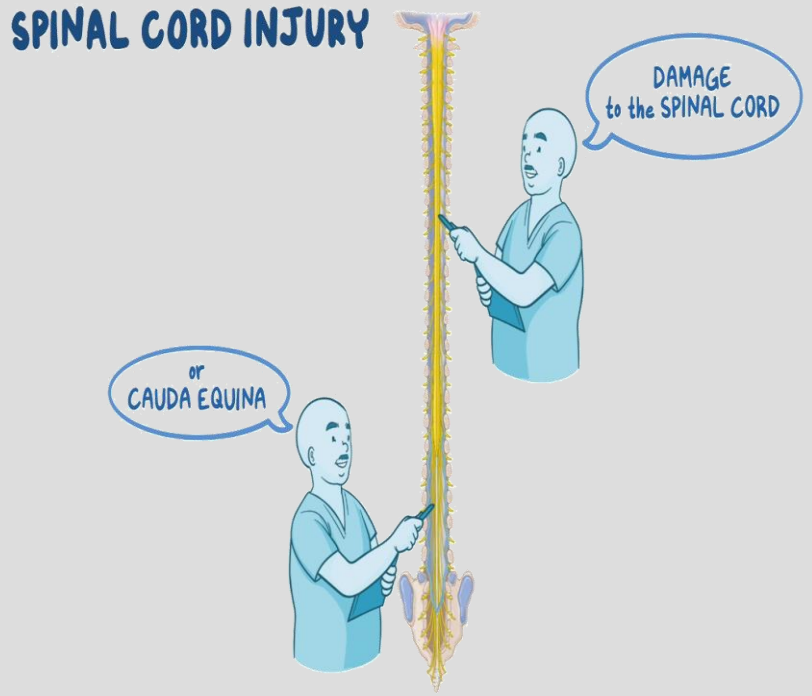
- Neurogenic shock
- ⚡ Autonomic dysreflexia
- ❤ Cardiac arrhythmias
- 🌡 Thermoregulatory issues
- Vasodilation

Chronic complications

- Respiratory complications
- 💓 Cardiovascular issues
- 🚻 Urinary & bowel dysfunction
- Spasticity & pain syndromes
- 🛏Pressure ulcers
- Osteoporosis & fractures

PROGNOSIS

- SCI is a sudden, life-altering condition with a generally poor prognosis.
- Less than 1% recover full function before hospital discharge.
- No current treatment leads to full neurological recovery.
- Prognosis worsens with higher-level injuries (e.g., cervical).



PROGNOSIS

Prognosis – Complete vs incomplete injuries

- Complete SCI:
  - **10–20%** convert to incomplete within 1 year.
  - Very limited or no motor recovery.
  - Functional ambulation is rare.

- Incomplete SCI:
  - Recovery is highly variable.
  - **20–75%** regain some walking ability by 1 year.
  - **20–50%** with motor complete, sensory incomplete may walk.

Recovery timeline

- The majority of recovery occurs within **9–12 months** post-injury.
- A functional plateau is typically reached by **12–18 months**.

REVIEW

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THANK YOU FOR LISTENING!