

## Spinal trauma – Causes, types and assessment

### Common causes of spinal trauma

- Falls
- Assault
- Road traffic collisions (RTCs)
- Sporting accidents

### Definitions in spinal trauma

- **Neurogenic shock**
  - Neurogenic shock results from damage to descending sympathetic pathways in the cervical and upper thoracic spinal cord resulting in loss of vasomotor tone and cardiac sympathetic innervation
  - This leads to hypotension and bradycardia, or absence of appropriate tachycardia as vagal tone dominates
  - Hypotension may not be corrected by fluid resuscitation alone and may require the use of vasopressors
- **Spinal shock**
  - Spinal shock refers to flaccidity and areflexia seen after spinal cord injury
  - It may occur completely non-functional although the cord is not necessarily destroyed
  - The duration is variable

### Specific types of spinal injury

- Mechanisms of injury
  - Axial loading
  - Flexion
  - Extension
  - Rotation
  - Lateral flexion
  - Distraction
- Atlanto-occipital dislocation
  - Mechanism: severe traumatic flexion and distraction
  - Most patients die of apnoea or will have severe neurological impairment eg quadriplegia
  - Common cause of death in shaken baby syndrome
- Atlas (C1) fractures
  - Jefferson fracture
    - Burst fracture of both the anterior and posterior rings of C1 with lateral displacement of the lateral masses
    - Mechanism: axial loading
- Axis (C2) fractures
  - Odontoid peg fractures
    - Type I: fracture through the tip of the peg
    - Type II: fracture through the base of the peg
    - Type III: fracture through the base of the peg into the lateral masses of C2
  - Hangman's fracture
    - Fracture of the posterior elements of C2

- Mechanism: hyperextension
- C3-7 fractures
  - Fracture-dislocations
- Thoracic spine fractures
  - Anterior wedge compression injuries
    - Mechanism: axial loading with flexion
  - Burst injuries
    - Mechanism: vertical-axial compression
  - Chance fractures
    - Transverse fractures through vertebral body
    - Mechanism: flexion about an axis anterior to vertebral column eg from wearing lap belts inappropriately high and not over the pelvic girdle
  - Fracture-dislocations

### Clinical features in spinal trauma

- General features
  - Neck pain/tenderness
  - Back pain/tenderness
  - Weakness
  - Absent sensation/sensory level
  - Absent reflexes (initially)
  - Urinary incontinence or retention
  - Loss of anal tone
- Neurogenic shock
  - Hypotension
  - Bradycardia/absence of appropriate tachycardia
- Spinal cord syndromes
  - Brown-Sequard syndrome
    - Caused by hemisection of the spinal cord
    - Results in ipsilateral weakness and sensory deficit with contralateral loss of pain and temperature
  - Central cord syndrome
    - Caused by vascular compromise of the spinal cord in the distribution of the anterior spinal artery, usually due to hyperextension injuries
    - Results in upper limb weakness greater than lower limb weakness (upper limb motor fibres lie more centrally) and a variable, 'cape-like' sensory deficit
  - Anterior cord syndrome
    - Caused vascular insufficiency of the anterior spinal artery
    - Results in bilateral paraparesis and loss of pain and temperature with preservation of dorsal column function

### Clinical assessment in spinal trauma

- Dermatomes
  - A dermatome is an area of skin innervated by sensory axons of a particular spinal nerve root
  - Key dermatomes are
    - C2: posterior head

- C3: neck
- C4: shoulder
- C5: lateral upper arm
- C6: lateral forearm & thumb
- C7: middle finger
- C8: medial hand and little finger
- T1: medial forearm
- T2: medial upper arm
- T4: nipples
- T8: xiphisternum
- T10: umbilicus
- T12: pubic symphysis
- L1: groin
- L2: anterior thigh
- L3: anterior knee
- L4: medial shin
- L5: dorsal foot and first web space
- S1: sole and lateral foot
- S2: posterior leg and thigh
- S3: ischial tuberosity
- S4-5: perianal

- Myotomes

- A myotome is group of muscles innervated by motor axons of a particular spinal nerve root
- Key myotomes are
  - C5: shoulder abduction, deltoid
  - C6: elbow flexion, biceps
  - C7: elbow extension, triceps
  - C8: wrist and finger flexion
  - T1: finger abduction, interossei
  - L2: hip flexion, iliopsoas
  - L3-4: knee extension, quadriceps
  - L4-S1: knee flexion, hamstrings
  - L5: ankle and hallux dorsiflexion, extensor hallucis longus
  - S1: ankle plantarflexion, gastrocnemius

- MRC grading of power

- 5 = normal power
- 4 = weak
- 3 = movement against gravity
- 2 = movement with gravity eliminated
- 1 = flicker of movement
- 0 = complete paralysis