

Spinal trauma – Anatomy

Spinal anatomy relating to trauma

- **Spinal column**

- The spinal column consists of:
 - Seven cervical vertebrae
 - Twelve thoracic vertebrae
 - Five lumbar vertebrae
 - Sacrum
 - Coccyx
- The incidence of cervical spine fractures is relatively high due to its mobility and exposure
- The upper cervical canal from the foramen magnum to C2 is relatively wide and so vertebral column injury may not necessarily cause spinal cord injury
- However, if spinal cord injury does occur at this level, it is usually fatal as it results in apnoea due to loss of diaphragmatic innervation by the phrenic nerve (C3, 4, 5 keeps the diaphragm alive!)
- Below the level of C3 the spinal canal is much narrower and vertebral column injury is more likely to cause spinal cord injury
- The incidence of thoracic spine fractures is much lower due to its reduced mobility and additional support from the rib cage
- Most fractures are wedge compression fractures and do not cause spinal cord injury
- However, fracture-dislocations almost always cause spinal cord injury due to the relatively narrow thoracic canal
- The thoracolumbar junction acts as a hinge between the thoracic and lumbar spines, making it relatively vulnerable to injury
- Because the spinal cord terminates at the level of L1, lumbar spine fractures are unlikely to cause complete neurological deficit as only the cauda equina is involved

- **Spinal cord**

- The spinal cord begins at the caudal medulla oblongata at the level of the foramen magnum and terminates as the conus medullaris at the level of the L1 vertebra
- It is composed of numerous paired tracts which can be injured on one or both sides

{picture of cord section here}

- Only three tracts can be assessed clinically
 - Corticospinal tract
 - Location: posterolateral cord
 - Function: motor innervation
 - Decussates: medulla
 - Injury: ipsilateral weakness
 - Dorsal columns
 - Location: posteromedial cord
 - Function: light touch and proprioception innervation
 - Decussates: medulla
 - Injury: ipsilateral loss of sensation
 - Spinothalamic tract
 - Location: anterolateral cord
 - Function: pain and temperature innervation
 - Decussates: immediately on entering spinal cord
 - Injury: contralateral loss of pain and temperature
- Cervical cord injury leads to quadriplegia (upper and lower limb weakness)

- Thoracic cord injury leads to paraplegia (lower limb weakness)
- The neurological level is the most caudal spinal cord segment with normal motor and sensory function
 - The sensory level refers to the most caudal spinal cord segment with normal sensory function
 - The motor level refers to the most caudal spinal cord segment with power grade $\geq 3/5$
- Complete spinal cord injury refers to the total absence motor and sensory function below a certain level; this diagnosis cannot be made acutely due to the possibility of spinal shock
- Partial/incomplete spinal cord injury refers to that in which any degree of motor or sensory function remains and may vary from near normal function to only sparing of sensation in the perianal region (sacral sparing)