Spine and spinal cord trauma

- 5% of patients with brain injury also have a spinal injury
- 25% of patients with spinal injury also have at least a mild brain injury
- 55% of spinal injuries are in the C-spine
- 1% are thoracolumbar, 15% are lumbar and 15% are lumbosacral
- As long as the spine is immobilized, you safely defer the exclusion of a spinal injury until the patient is stable and worked up

In a neurologically intact patient, absence of pain along the spinal column virtually excludes the presence of a significant spinal injury

Sensory and Motor examination can be carried out in the secondary survey

CLASSIFICATION of spinal injury:

- LEVEL:
  - The most caudal segment with NORMAL function
- SEVERITY:
  - Complete or incomplete? Incomplete means some motor function below the level of injury remains preserved
  - Paraplegia or quadriplegia? Count the moving limbs

SPINAL CORD SYNDROMES:

- CENTRAL CORD SYNDROME
  - Power is lost in the UPPER limbs more than in the lower limbs
  - Usually after a hyper-extension injury
  - Usually in a patient with an existing C-spine stenosis
  - Usually a forward fall with a facial impact
  - Usually due to compromise of the anterior spinal artery, which supplies the central cord; and the central cord is where the upper limb fibers are arranged
  - Prognosis is better than that of other incomplete spinal injuries

- ANTERIOR CORD SYNDROME
  - Paraplegia
  - Loss of pain and temperature sensation, but not proprioception
  - Usually due to a complete infarction of the anterior spinal artery territory
  - Poorest prognosis of all the incomplete spinal injuries

- BROWN-SEQUARD SYNDROME
  - Hemisection of the cord, usually due to a penetrating injury
  - On one side, you lose all power and proprioception
  - On the other side, you lose all pain and temperature sensation
  - Some recovery is usually seen
SPECIFIC SPINAL INJURIES:

- ATLANTO-OCCIPITAL DISLOCATION
  - Traumatic flexion and distraction
  - 19% of fatal C-spine injuries
  - Usually they die on scene

- ATLAS FRACTURE
  - 5% of acute C-spine fractures
  - In 40%, the axis is also broken
  - Most frequently, a burst fracture (Jefferson fracture)
    - disruption of both the anterior and the posterior rings, with lateral displacement of the lateral masses
  - Most frequently the mechanism is axial loading
  - On open-mouth views, the lateral masses are too far from the peg

- C1 ROTARY SUBLUXATION
  - Most often seen in children
  - Presents with persistant torticollis
  - On open mouth views, one of the lateral masses is too far from the peg
  - The patient should be immobilized in the rotated position; don’t try to turn their head the right way

- C2 FRACTURE: ODONTOID
  - C2 fractures in general are 18% of C-spine fractures
  - 60% of axis fractures are through the peg
  - TYPE 1: involve the tip of odontoid only, the rarest
  - TYPE 2: through the bas of the dens; most common
  - TYPE 3: start at the base of the dens and then progress through the body of the axis

- C2 FRACTURE: POSTERIOR BODY
  - These are the “hangman” fractures
  - 20% of all axis injuries
  - Usually and extension-type injury
  - There ae also 20% of non-odontoid, non-hangmans fractures

- C3-C7 FRACTURES AND DISLOCATIONS
  - C3 fractures are very uncommon
  - C5 and 6 are where the money is
  - Usually the fracture is through the vertebral body
  - Facet dislocations = more severe spinal cord injury
  - Unilateral face dislocation = 80% have neurological injuries
  - Bilateral facet dislocation = AT LEAST an incomplete injury (84% have complete spinal cord transaction)

- THORACIC SPINE FRACTURES – DOWN TO T10
  - 4 flavours:
    - Anterior wedge compression fractures
      - Axial load injury
      - Amount of wedging is usually small
      - This is a STABLE FRACTURE; all the others are not
    - Burst fractures
      - Axial load injury

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- Chance fractures
  - Transverse fracture through the vertebral body
  - Usually a flexion injury, eg. lapbelt-restrained passenger in the middle rear seat
  - Usually associated with severe visceral and abdominal injuries

- Fracture-dislocations
  - Rare
  - Extreme flexion and severe blunt trauma
  - Usually produce complete cord transaction

- THORACOLUMBAR FRACTURES – T11 TO L1
  - Usually from a combination of acute hyperflexion and rotation
  - Usually unstable
  - Usually in falls from height or unrestrained drivers
  - These people are particularly vulnerable to rotational movement. LOG ROLLING SHOULD BE VERY CAREFUL
  - Tend to cause bladder and bowel dysfunction as well as motor paralysis of the lower limbs

- LUMBAR FRACTURES
  - Same as thoracolumbar
  - Tend not to have complete deficits, because only the cauda equina is injured

- PENETRATING INJURIES
  - USUALLY STABLE INJURIES
    - Unless the bullet destroys a large part of the vertebral body

- BLUNT CAROTID AND VERTEBRAL VASCULAR INJURIES
  - Usually associated with
    - C1-C3 fractures
    - Cervical spine fracture with subluxation
    - Fractures involving the foramen transversarium
  - Of the above patients, 1/3 will have some evidence of carotid or vertebrovascular injury on CT or angiogram

### General Management

- IMMOBILIZATION
  - Spinal board is more effective and less comfortable than the collar
  - The board is remove as a part of the secondary survey, when you do the log roll

- SPINAL SHOCK
  - Typically, hypotension with bradycardia
  - Typically thoracic injury (that’s where the sympathetic chain is)
  - Typically there is limited response to fluid challenges
  - This is a sort of shock where you might consider the use of vasopressors, because if you try to use fluids to bring them back to normotension, you may cause pulmonary oedema

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