Serious Spinal Pathology 1 Spinal Trauma

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Aims / Objectives

- Be familiar with the epidemiology and main causes of spinal cord injury
- Be familiar with the presenting features of spinal cord injury including spinal shock, neurogenic shock and autonomic dysfunction
- Explain the initial physiological consequences of spinal cord injury on the cardiovascular and respiratory systems
- Explain the concept of complete and incomplete spinal cord injury
- Explain the initial management and investigation of patients with spinal cord injury

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Suspecting Spinal Injury

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Goals of Spine Trauma

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Management Spinal Injury

- ABCDE / ATLS Approach (not typical H&Ex)
- Protection - THINK SPINAL CORD INJURY
  - Maintain airway with spine control
  - Always aim to have a team of 6 for transfers (min 4 for log rolls)
- Detection
  - Level of injury
  - Complete or Incomplete cord injury
  - Spinal or Neurogenic shock
- Management
  - Conservative or Surgical treatment

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Immobilise Entire Spine

Stiff Neck Collar

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The Spinal Board

- Transport device
- Remove ASAP
- Regular log rolls
- Risk of pressure sores
  - Same goes for some collars…

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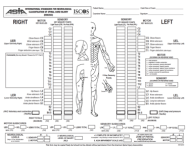
Assessment - Spine

- History
  - Pain
  - Mechanism
  - Immediate post injury neurology
  - Associated injury
- Examination
  - Log roll
  - Tenderness / Gap / Step
  - Marked spasm
  - Spinal cord function incl PR / DRE
- Imaging…



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Examination - SCI

- Complete / Incomplete Spinal Cord Inj…
- **SCI Unconscious Patient**

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"Shock"

- Refers to a state of inadequate organ perfusion and tissue oxygenation

Pump Failure (Heart Obstruction)
Circulatory Failure

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Spinal "Shock"

- **Importance of spinal shock**
  - **determining whether a patient has a complete or incomplete spinal cord injury**

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Neurogenic Shock

- State of inadequate tissue perfusion and oxygenation due to:
- Reduced sympathetic outflow (T1-L2) with resultant unopposed vagal tone

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Spinal Cord Injury (SCI)

- Primary / Secondary
- Complete / Incomplete
- Cord Syndromes

- Will be covered in another lecture!

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Clinical Instability

- The loss of the ability of the spine under normal physiological loads to maintain its pattern of displacement so that there is no initial or additional neurological deficit, no major deformity and no incapacitating pain

Stable ⟷ **Unstable**

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Radiological Instability

Upper Cervical **Lower Cervical**

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Radiological Instability

Thoracolumbar

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Spinal Cord Injury Versus Spinal Column Injury

Stable Versus Unstable Spinal Column Injury

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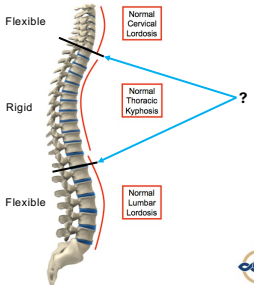
Biomechanics



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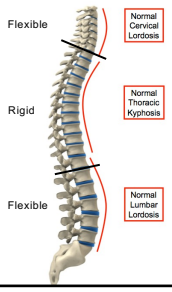
Biomechanics



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Spinal Injury Screening

- Clinically
  - Cooperative patient
  - Alert and orientated
  - Able to concentrate on spine
  - Normal neurological exam
  - No spinal pain or tenderness
  - No pain or tenderness with voluntary movement

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Spinal Injury Screening

- Altered consciousness or symptoms

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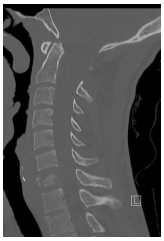
Anterior Column Injury



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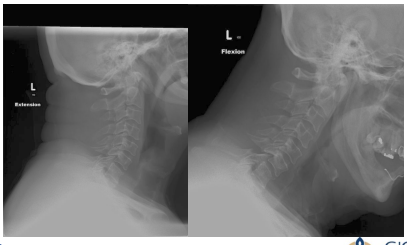
Posterior Column Injury



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Spinal Injury Screening

- Lateral Cervical X-Ray
  - Detects 85% cervical fractures
- Image the entire spine
  - 10% with one fracture have another non contiguous injury

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Orthopaedic Principles

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CT Indications

- Poly trauma – CT Head to Hips
- Plain Radiographs have failed to visualise all the cervical spine
  - Need to see base of skull to cervico-thoracic junction
  - Significant head injury and patient having CT Head (especially if intubated)
- Plain Radiographs show injury
  - Confirm and further categorise extent of injury

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MRI in Spinal Trauma

- Overview for exclusion of injury in difficult cases (ankylosing spondylitis)
- Ligamentous injury
- Unexplained neurology
- Prognosis in neurological injury
  - Compression vs oedema vs haemorrhage vs transection
- Is surgical fixation safe?
  - Extruded disc may be made worse by surgical manipulation / Other discs ligaments may be injured

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Erect XRs

- Normally after discussion with specialist
- Load bearing - physiological
- Normally done in collar
- Useful adjunct after a CT showing a "stable injury" – checks for development of load bearing deformity and ligament injury (cf def of instability above)

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Dynamic XRs

- Normally after discussion with specialist
- Physiological
- Normally done at 2 weeks post injury to check for stability or after treatment in a collar to ensure no latent instability
- Flexion and Extension X-Rays

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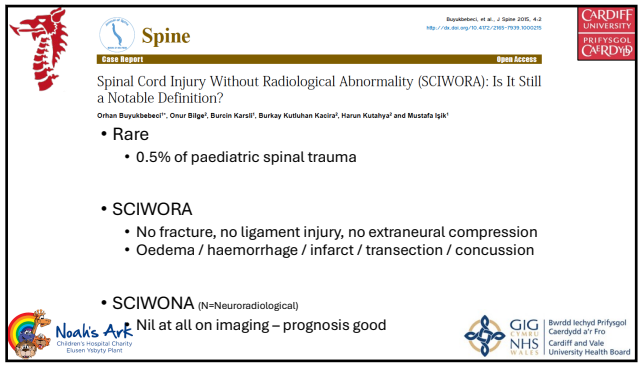

Spine

Case Report — Open Access

Spinal Cord Injury Without Radiological Abnormality (SCIWORA): Is It Still a Notable Definition?

- Rare
  - 0.5% of paediatric spinal trauma
- SCIWORA
  - No fracture, no ligament injury, no extraneural compression
  - Oedema / haemorrhage / infarct / transection / concussion
- SCIWONA (N=Neuroradiological)
  - Nil at all on imaging – prognosis good

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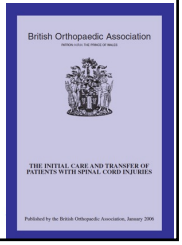
Spinal Cord Injury (SCI)

- Of 569 patients admitted to Spinal Cord Injuries Centre in UK:
  - 9% missed at presentation
  - 5% experienced further avoidable deterioration
  - ⅓ of those missed had significant head injury
- Multiple Fractures in 5%
- Use of Steroids
  - NOT recommended



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Acute Consequences SCI

- (Paralysed…)
- Inadequate ventilation
- Abdominal evaluation compromised
- Occult compartment syndrome (limbs)

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Management Spinal Injury

- Treat life threatening injuries first

- Ventilation and Oxygenation
- Maintain blood pressure
- Maintain spinal cord perfusion

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Management Hypotension

- In Major Trauma:

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Management Spinal Injury

- ABCDE / ATLS Approach ✓
- Protection - THINK SPINAL CORD INJURY ✓
  - Maintain airway with spine control
  - Always aim to have a team of 6 for transfers (min 4 for log rolls)
- Detection ✓
  - Level of injury
  - Complete or Incomplete cord injury
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  - Conservative or Surgical treatment

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Indications for Conservative Treatment

- Stable Fracture
- Some Polytrauma patients
- Unfit for surgery
- Osteoporotic bones

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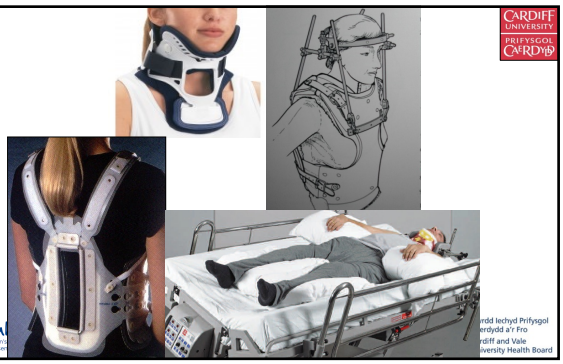

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Principles

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The Personalities

- Personality of the patient
  - Age
  - Comorbidity
  - Bone stock
  - Energy of injury / other injuries
  - Time since injury

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The Personalities

- Personality of the fracture
  - Canal compromise
  - Neurologic compromise
  - Kyphosis / Scoliosis
  - Anterior collapse
  - Progression

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The Personalities

- Personality of the surgeon

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Complications SCI

- Pneumonia
- Postural Hypotension
- DVT / PE
- Autonomic Dysreflexia
- Renal Failure
- Pseudo-obstruction
- Sexual Dysfunction
- Pressure Sores
- Psychological Problems

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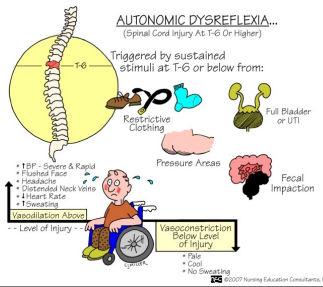
Autonomic Dysreflexia



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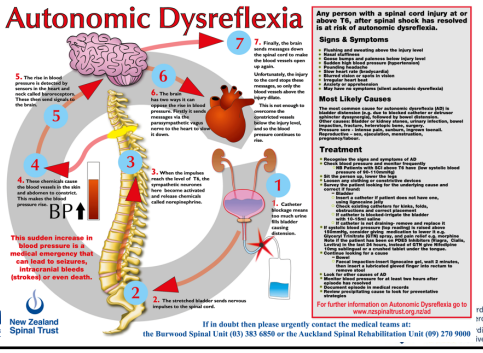
Autonomic Dysreflexia



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Outcomes Paralysis 1

- 25yr tetraplegic >60% normal life expectancy (level below C5)
- 25yr paraplegic >80% normal life expectancy
- 25yr partial paraplegic with mobility >85%normal life expectancy
- 90% of patients with complete tetraplegia will recover some level of function in the muscles below the neurologic level of injury

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Outcomes Paralysis

- MRC 1-2/5 at 30 days have 97% chance progressing to 3/5 at 1 year
- MRC 0/5 at 30 days only 57% recover to 1/5 and 27% to 3/5 at 1 year
- 80% of patients with incomplete paraplegia recover to grade 3/5 in their hip flexors and knee extensors at 1 year (enough to stand with aids)

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