Spinal Trauma

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Epidemiology

- Spine injury in 6% of trauma patients
- Multiple levels involved in 20% of cases
- 80% of spinal cord injury patients have concurrent other system injuries
  - 41% have head injuries
- South Africa – high incidence of gunshot injuries to the spine

Location

- Most commonly cervical - 60%
  - 6% of all blunt trauma injuries have associated cervical injuries
- Lumbar up to 25% of spinal injuries
- 50% of patients have complete fallout

Neural injury

- primary injury - tissue disruption by mechanical forces
- secondary injury - biologic response initiated by the trauma

Primary injury

se

Secondary injury

- Ischemia contributes to delayed secondary injury
- Severity of neurological injury is proportional to the duration of cord deformation
- Reversible injury may become irreversible from local ischemia and inflammation.

Goal of treatment

- Restoration of the patient to maximal possible function
- Protect all patients until a spinal injury is definitively excluded or identified
- Identify associated injuries
- Protecting uninjured neural tissues
  - Maximize recovery of injured neural tissues
  - Optimize musculoskeletal portions of the spinal column

Initial management

- All trauma patients are at risk for spinal injury
- TABLE 31-4. SUMMARY OF NASCIS I, II, AND III PROTOCOLS

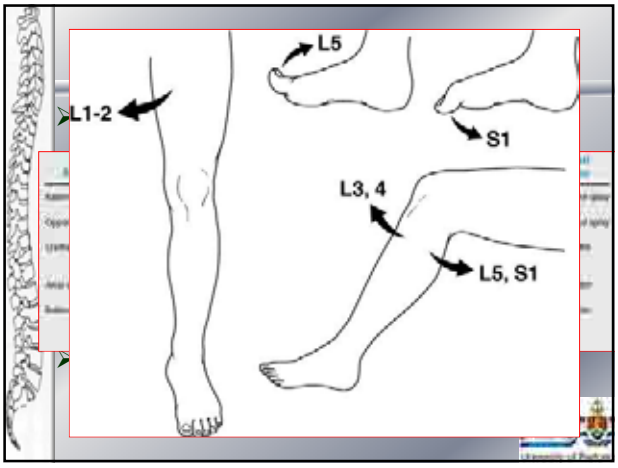
Methylprednisolone bolus 30 mg/kg then infusion 5.4 mg/kg/h
Infusion for 24 hours if bolus given within 3 hours of injury
Infusion for 48 hours if bolus given within 3 to 8 hours after injury
No benefit if methylprednisolone started more than 8 hours after injury

  children
- Steroid should be administered as soon as Dx of cord pathology is made
- Transport as soon as stable – time is NB

Casualty

- Continue resuscitation
  - Urinary catheter
- S
- Analysis of hemodynamic parameters
  - Hemodinamic shock
  - Neurogenic shock
  - Spinal shock

Neurogenic Shock[a] (101,172)	Hypovolemic Shock
Due to loss of sympathetic outflow	Due to hemorrhage
Hypotension	Hypotension
Bradycardia	Tachycardia
Warm extremities	Cold extremities
Normal urine output	Low urine output



Casualty

- Com ation
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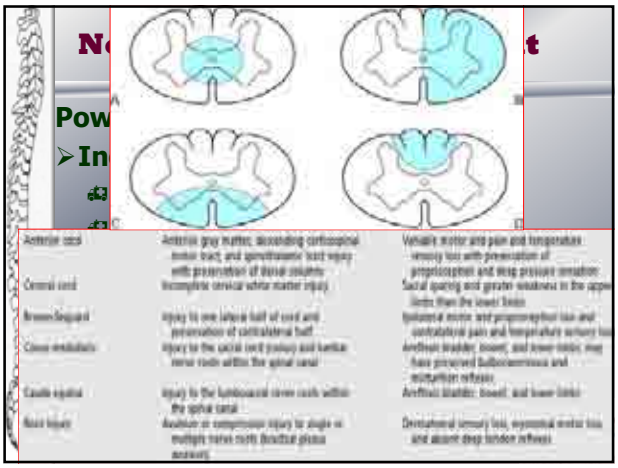
    - B
    - C
    - D
    - E
- Neu and caud sens

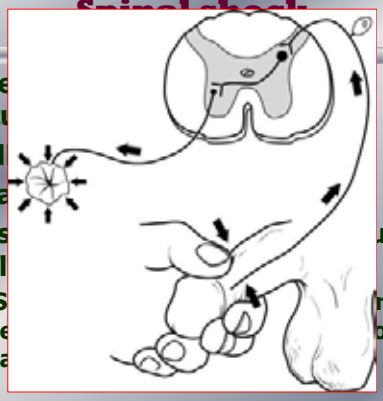


Unresponsive patient

- Spontaneous extremity motion
- Response to noxious stimuli
- Reflexes
- Rectal tone
- Spontaneous respiration
  - Elevation and separation of the costal margins

NO FINAL NEUROLOGICAL LEVEL UNTIL SPINAL SHOCK IS OVER

Spinal shock



- Ove… retu…
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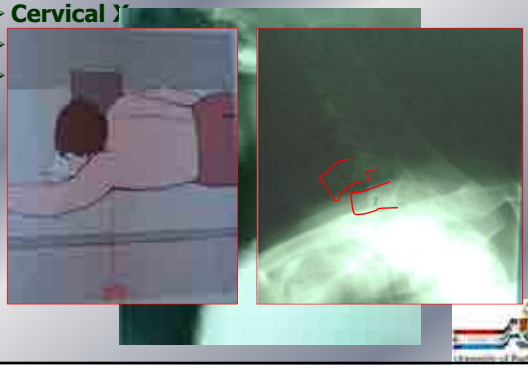
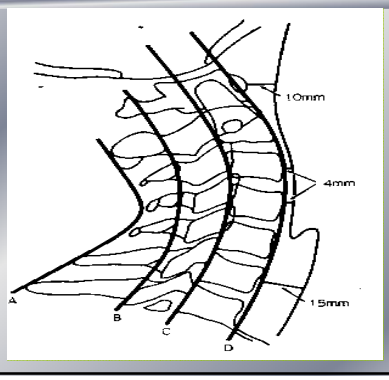
Radiographic evaluation

- Cervical X…
- …
- …



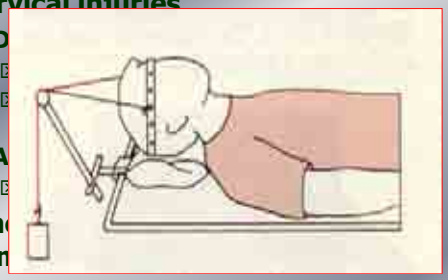
Cervical XR



Radiographic evaluation

Immobilization

- Cervical injuries
  - D…
  - A…
- A n… imm…



C spine injury

- Incomplete and complete neurology
  - Immediate closed reduction
    - Up to 70% of body weight is safe
  - MRI should not delay reduction
    - Post reduction MRI
  - Awake patient!!!!!
- Intact/obtunded patients
  - MRI before reduction
  - Surgery

Traction Technique

- Arbitrary starting weight of 3 pounds per injury level
- Caveat fracture dislocation C2
  - Levine + Edwards Type IIA
  - Ankylosing spondilitis
- Added every 10-15 min
- Monitoring
- No upper weight limit

Traction Technique

- Stop adding weights:
  - Reduction
  - Intractable pain
  - Worsening neurology
  - Over distraction on XR
  - Impractical to add weight
    - Pt sliding up in the bed
  - Decision that reduction has failed

Thoracolumbar

- Positional immobilization
- Reduction and decompression can not be performed closed
- Surgery usually necessary in cases of neurological compromise
  - Instability is already implied

Special cases

- Significant spinal cord injury trauma without any fractures or ligamentous ruptures
  - SCIWORA
  - Commonly children <10 years of age
  - Patients > 50yrs
    - Bulging of ligamentum flavum
- Gunshot Injuries
  - Rarely cause spine instability
  - Decompression does not improve recovery
  - Traversed the oropharynx or colon
    - intravenous antibiotics 3 days for infection prophylaxis

Checklist spinal cord injury

- IV line
- Nasogastric tube
- Bladder catherization
- CVP
- O2
- DVT
- Prevention of gastric ulcers

Complications

- Skin and pressure sores
- Bladder and bowel
- Muscle and joints
- Hyper-reflexia syndrome
- Heterotopic ossification
- Physiological set-up

Prognosis

- Initial management
- Age
- Severity of spinal injury
- General condition of patient
- Associated injuries
- Definitive management
- Rehabilitation

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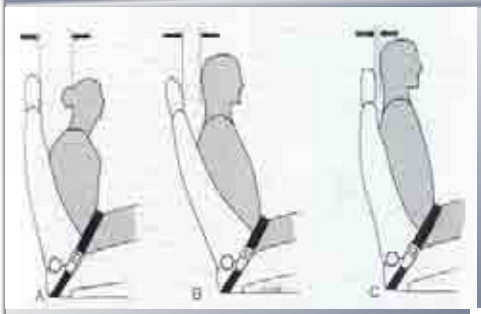
Cervical fractures

Cervical spine injuries

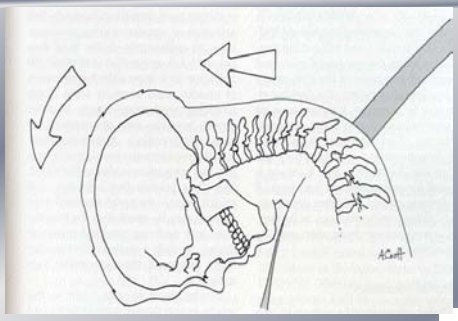
- Whiplash
- C1 (Jefferson fracture)
- C1 / C2 rotatory subluxation
- C2 odontoid fracture or dislocation
- Hangmans C2 fracture
- C3 to C7 fracture and dislocations
- Facet dislocations

Whiplash

Whiplash



Whiplash



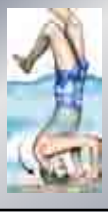
Whiplash

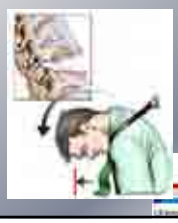
- Purely soft tissue injury
- Can lead to neurological compromise in severe cases
- Most cases need only conservative treatment
- Important to exclude serious injury with flexion extension views
  - Before discharge
  - 85% of fatalities associated with blunt trauma to the craniocervical spine are purely ligamentous injuries

Mechanism of injury

Mechanism of Injury

- Axial **Force**:
- Distraction **Force**





Cervical Trauma

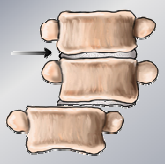
Mechanism of Injury

- Flexion:
- Extension:

Cervical Trauma

Mechanism of Injury

- Shear:
  - A force parallel to the surface on which it acts
- Rotational
  - A torsional force that rotates tissue fibers



Functional units

- Cervical vertebrae divided into 2 functional units
  - Upper cervical region C1 – C2
  - Lower cervical region C3 – T1

Upper cervical spine

- Neurological symptoms vary
  - Locked in syndrome
  - Brown Sequart syndrome
  - Most used to be incompatible with life
  - No neurology – due to large "empty space"
- Clinical - look for haematoma and swelling

Lateral C… for up…

- Op…
- If … s

Open mouth view

- Normal AP cannot see upper cervical area

Fractures of the Atlas

- Usually due to axial compression
- Can be stable or unstable
- Combine… …mm = unstable
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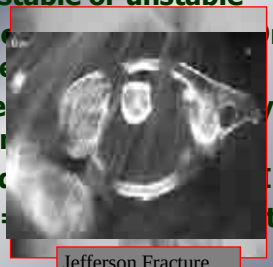
- Can be … …
- Stable … …tment



Jefferson Fracture

Atlantoaxial Rotary subluxation

Odontoid Fractures

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Hangman's fracture

- Traun of the Axis

Lower cervical spine

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  - P

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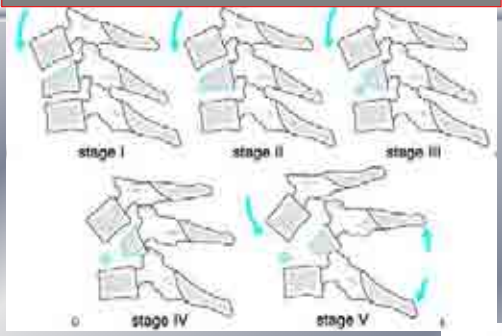
TABLE 33-5 WHITE AND PANJABI INSTABILITY CHECKLIST*

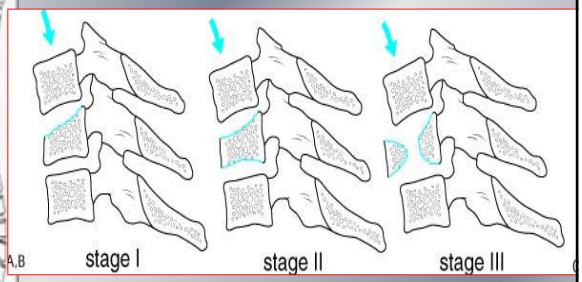
Clinical Finding	Points
Anterior element destruction	1
Posterior element destruction	1
Translation > 3.5 mm	2
Angulation > 11 degrees	2
Positive stretch test	2
Spinal cord injury	2
Nerve root injury	1
Disk narrowing	1
Anticipated large loads	1

*This simplified approach to determining instability assigns point values to each clinical finding. An injury with an instability score of 5 or greater can be considered unstable.

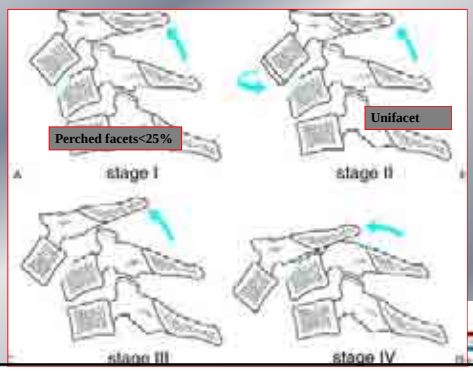
COMPRESSION FLEXION



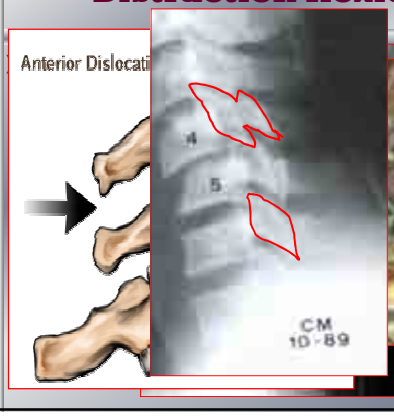
Vertical compression



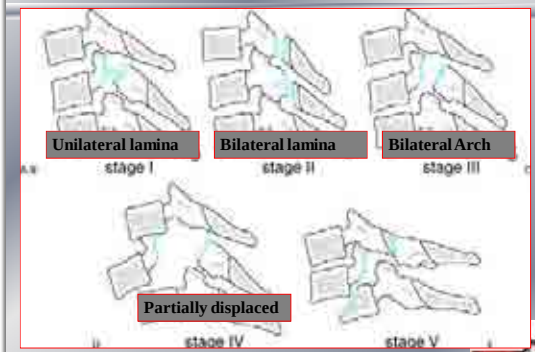
Distraction-flexion



Distraction flexion



Compression extension



Distraction extension

Lateral flexion

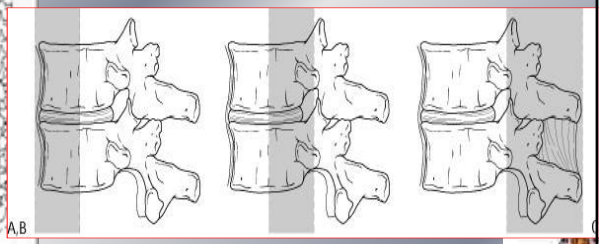
Thoracolumbar fractures

Physical Examination

- Log-rolled to the side + cervical spine immobilized
- Entire length of the spine should be inspected
- Abrasions, ecchymoses, deformity
  - Spinous processes should be palpated for step-offs or interspinous widening
- Backboard in lateral turning is recommended

Classification

- No ideal system available
- Denis 3 column system



Fractures

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- Mid em
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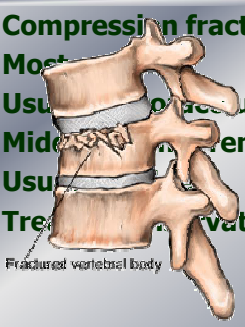
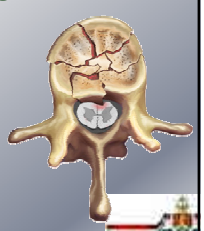


Burst fractu

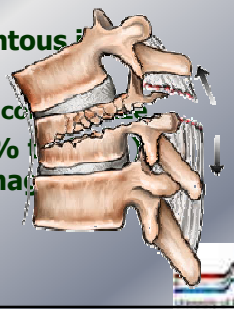
- Failure of anterior and r columns
- Often retropulsion of fra into canal



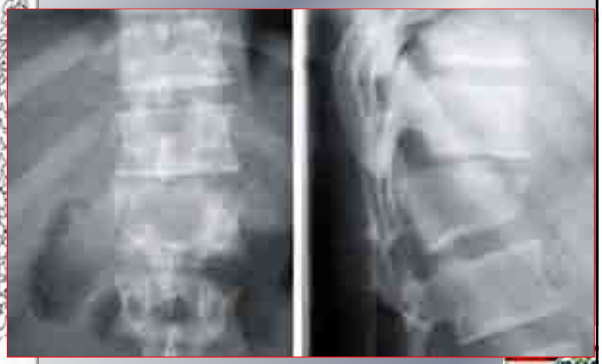
Burst fractures

- Radiological signs
  - More than 50% compression
  - Retropulsion of fagments
  - Widening of interpendicular distance on AP view
- Usually unstable
- Brace or operative treatment

Flexion-distraction



Fracture-Dislocations



Sacral fractures

- Usually treated conservatively