Cervical Spine Fractures

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CERVICAL SPINE FRACTURES

- **A** Airway
- **B** Breathing
- **C** Circulation

Spinal Immobilization

Radiological evaluation of the C-spine

Plain x- rays

- Should include AP, LAT and open mouth
- Lateral X-ray must include C0-C1and C7-T1

Radiological evaluation of the C-spine

CT Scan

- CT scan is indicated if the upper and lower C- spine is not visualised
- Unconscious intubated patient, CT scan is needed

C0-C1

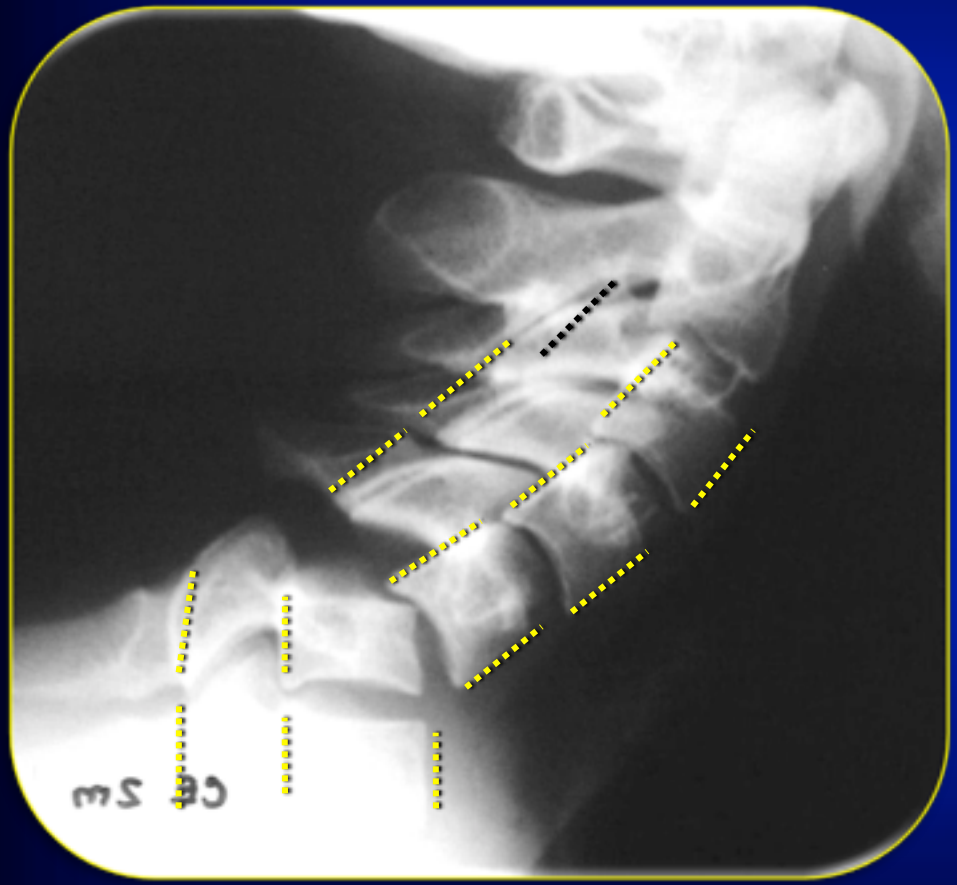
C7-T1

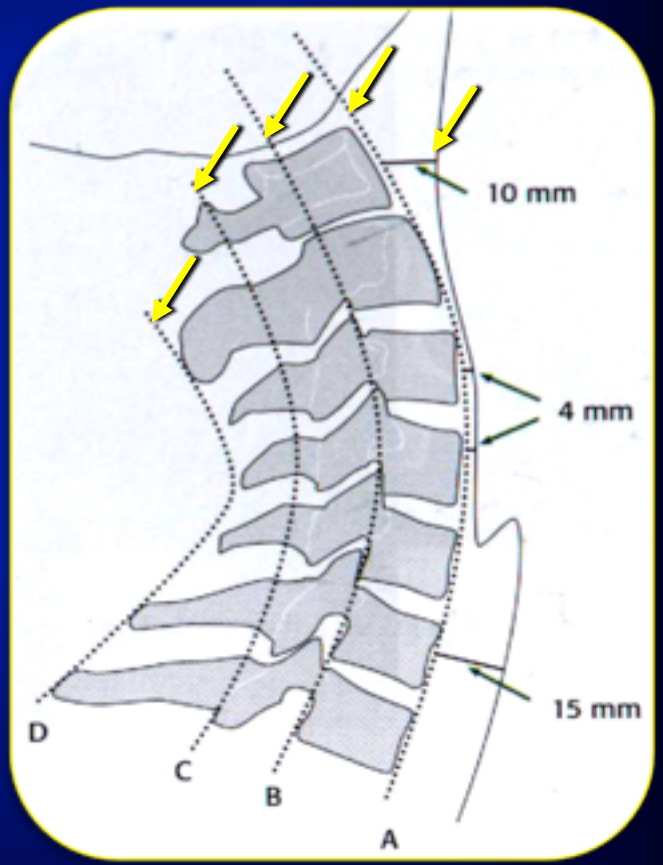
Radiological assessment of soft tissue injury

MRI Scan

- All patients with pure disc and ligamentous disruption should have an MRI scan
- All patients with abnormal neurology or unconscious should also have an MRI scan

Lateral Cervical Spine (Alignment)





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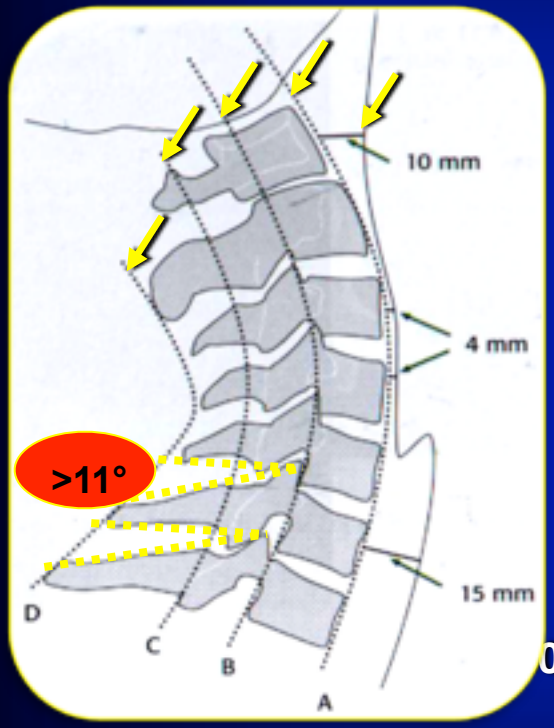
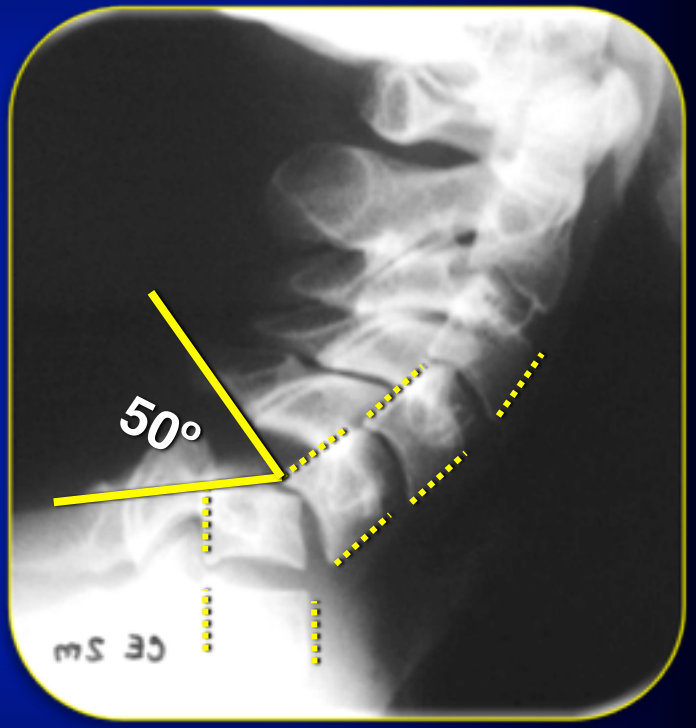
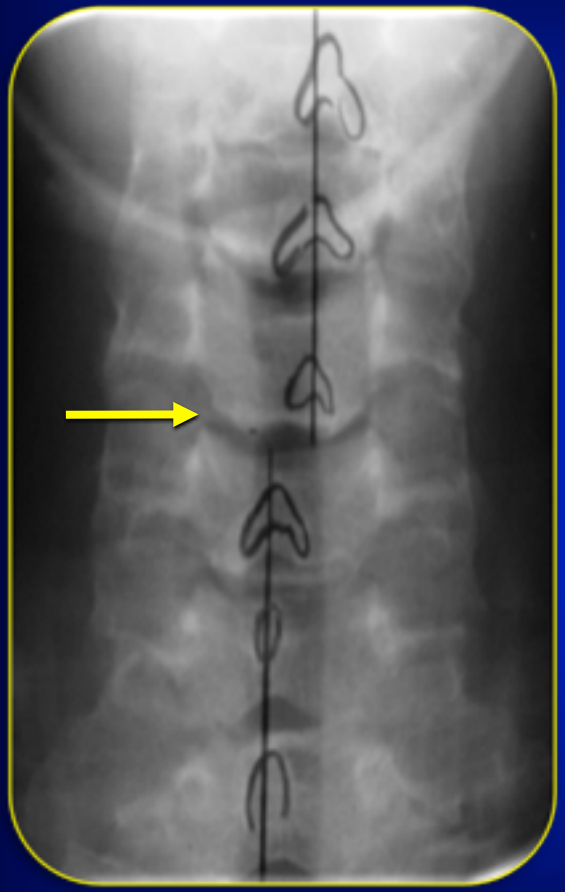
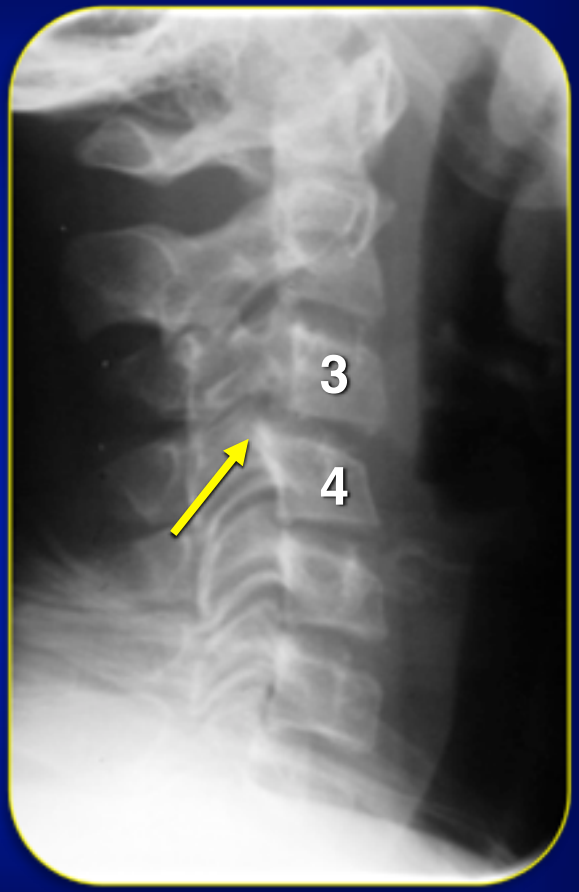




Widening of the interspinous distance

AP and Lat Cervical Spine (Alignment)

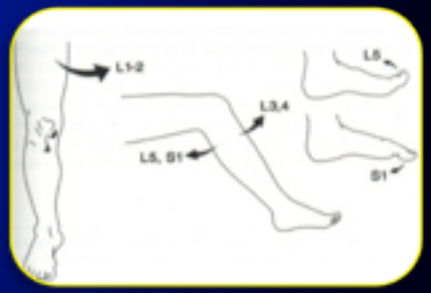




Clinical Evaluation

Complete Neurological Evaluation

- Dermatomal Sensory Testing
- Assessment of Motor Function
- Reflex Examination
- spinal shock

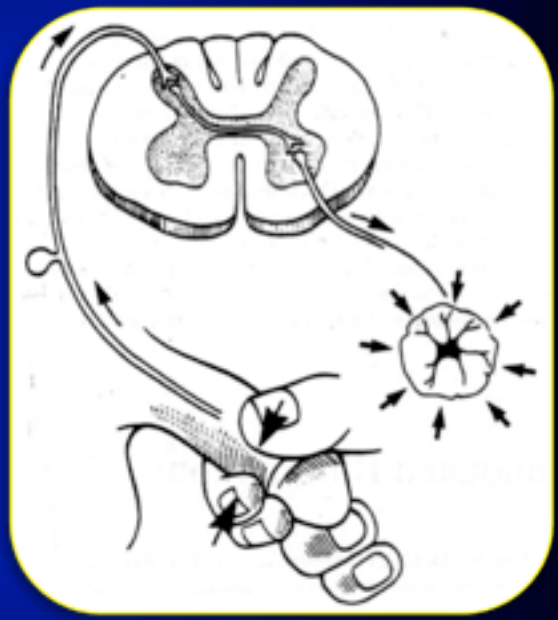


Spinal shock

- Spinal shock is a state of transient reflex depression of cord function below the level of injury
- The symptoms tend to last up to 24-48 hours until the reflex arcs below the level of injury begin to function again

Spinal shock

- Increased blood pressure
- Flaccid paralysis
- Loss of bladder & bowel function
- Sustained priapism
- Bulbocavernosus reflex



- Presence of sacral sparing after 48 hrs indicates incomplete cord injury

Classification of Spinal Cord injury

Many Grading Systems

- Frankel
- ASIA (American Spinal Injury Association)

Grading of Spinal Cord Injury
Frankel classification

A. Absent motor and sensory function

B. Sensation present, motor function absent

C. sensation present, motor function active but not useful (grade 2-3/5)

D. Sensation present, motor function active and useful (grade 4/5)

E. Normal motor and sensory function

ASIA Classification

A	Complete	No motor or sensory function is preserved in the sacral segments S4 and S5
B	Incomplete	Sensory but not motor function is preserved below the neurological level and extends through the sacral segments S4 and S5
C	Incomplete	Motor function is preserved below the neurological level, and the majority of key muscles below neurological level have a muscle grade less than 3
D	Incomplete	Motor function is preserved below the neurological level and the majority of key muscles below the neurological level have a muscle grade greater than or equal to 3
E	Normal	Motor and sensory function is normal

CLASSIFICATION OF CERVICAL CORD INJURY

- Central Cord Syndrome
- Anterior Cord Syndrome
- Posterior Cord Syndrome
- Brown-Sequard Syndrome

Central Cord Syndrome

- Greater weakness in the upper limbs
- Sacral Sensory Sparing

Dorsal

Ventral

Central Cord Syndrome

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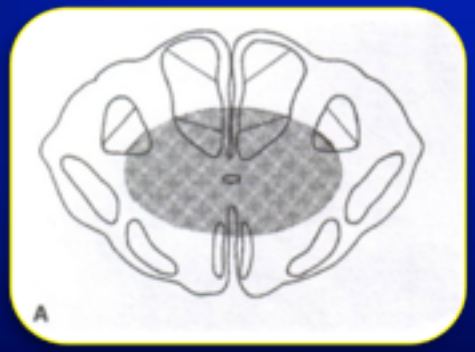
- Sacral Sensory Sparing

Dorsal



Ventral

Anterior Cord Syndrome

- Variable loss of motor function and sensitivity to pain and temperature
- Proprioception is preserved

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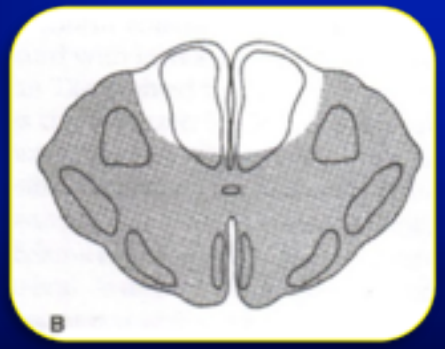
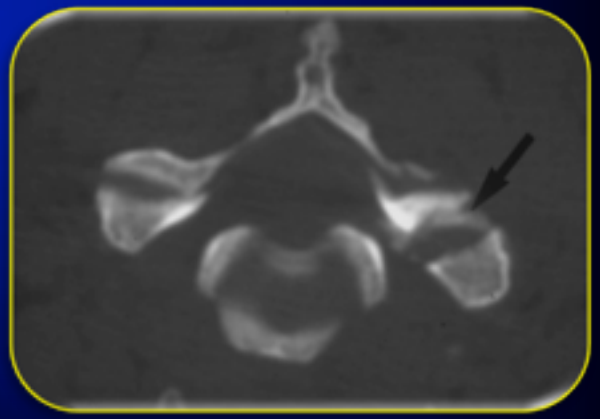


Brown-Sequard Syndrome

- Hemi- section of the cord and associated with ibsilateral loss of motor & proprioception
- Contra lateral loss of pain & temperature

Dorsal



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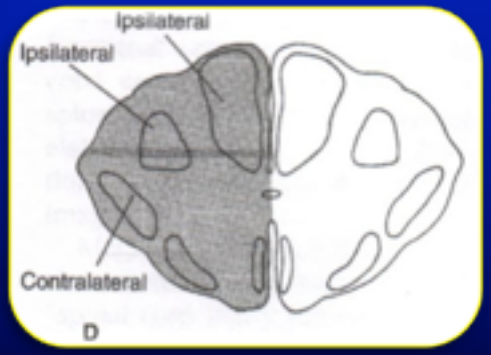

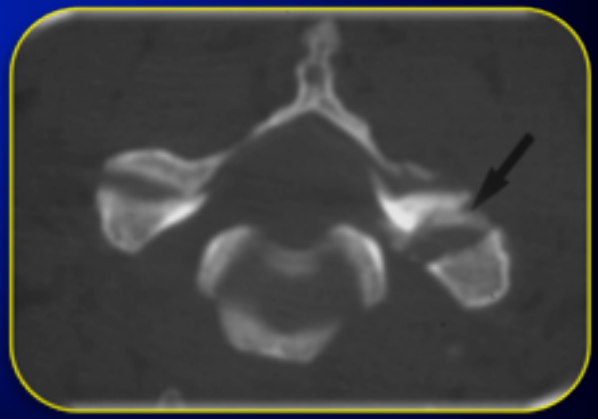

Ventral

Posterior cord syndrome

Dorsal

- Direct injury to the posterior column
- Injury to the posterior spinal artery
- Very rare condition
- May present as Brown-Sequard Syndrome
- Loss of sensations below the level of involvement

Ventral

- shooting and burning pain , but temperature sensation is preserved

Posterior cord syndrome

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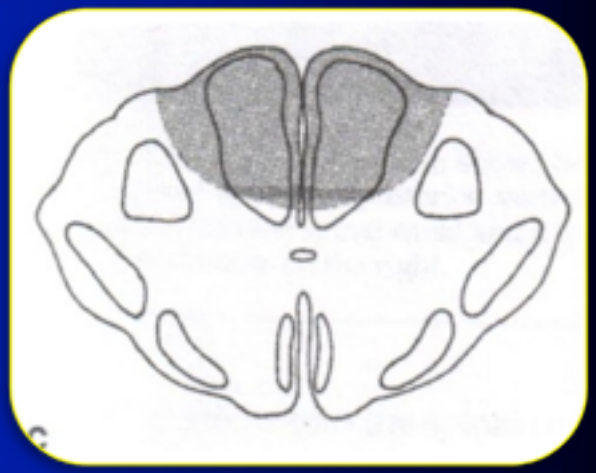


Spectrum of Cervical Injuries

- Nerve root or brachial plexus injuries
- Acute cervical sprains / strains
- Intervertebral disc injuries
- Cervical fractures and dislocations
- Cervical stenosis

Nerve Root or Brachial Plexus Injury Stingers / Burners

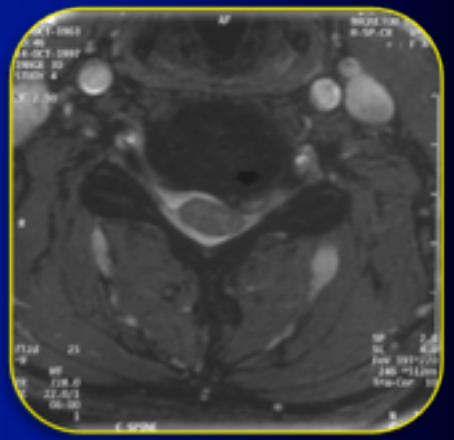
- The most common cervical injury is transient loss of function with sharp pain down one arm following a collision
- Distraction or stretch injury to the upper cords of the brachial plexus
- Duration of symptoms are from 2-10 minutes to 24 hours

Acute Cervical Sprains / Strains

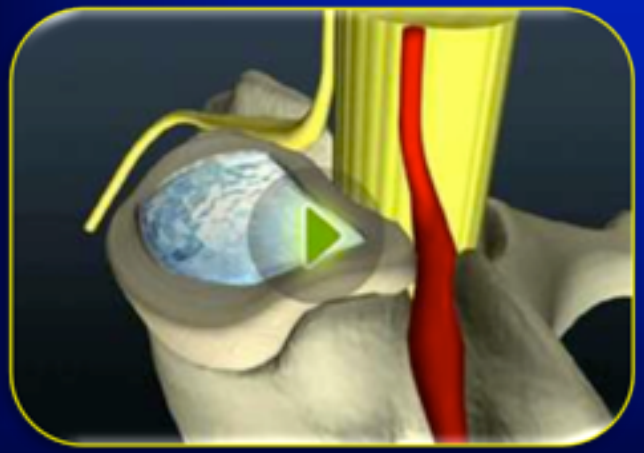
- A sprain is defined as an injury to the paraspinal musculotendinous unit
- A strain is defined as an injury of the paraspinal muscle itself
- Localized pain in the C-spine associated with limited ROM

Intervertebral Disc Prolapse

- Acute disc herniation is rare
- Symptoms of herniation vary from radiculopathy To anterior cord syndrome



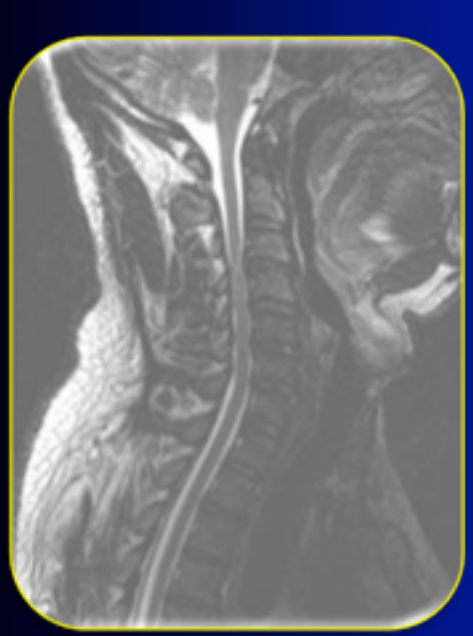
Disc Replacement



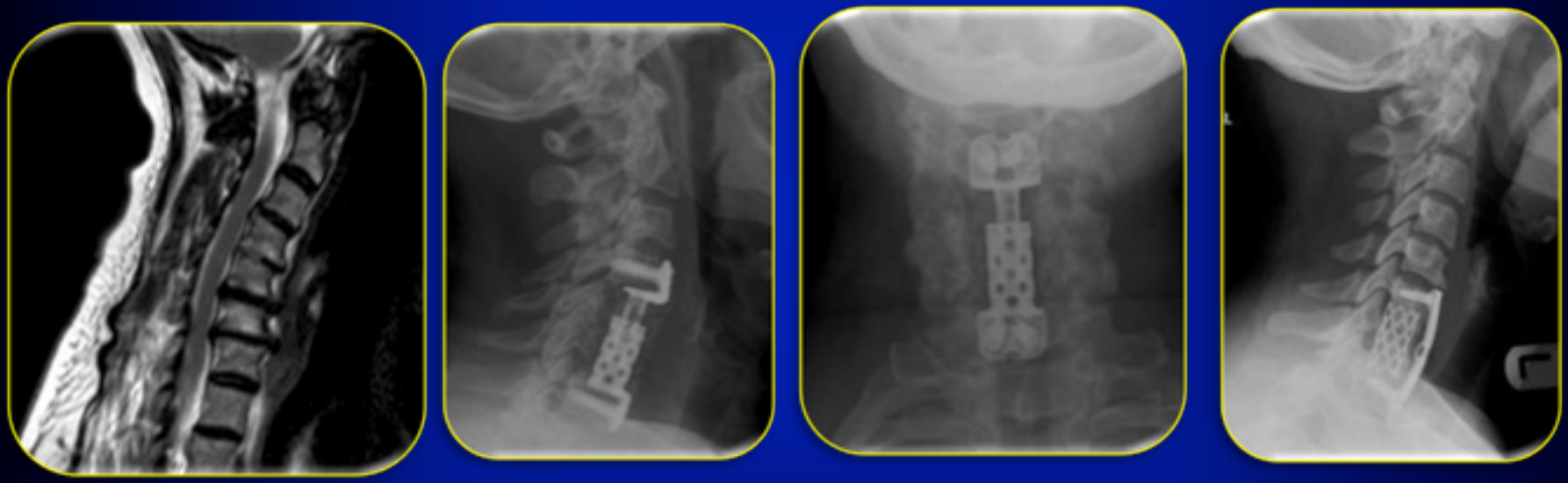
Cervical Stenosis

- Constant loading of the C-spine in contact sports leads to chronic degeneration and stenosis
- Contact activity should be stopped until painless full ROM of the C-spine is regained

Cervical Stenosis




Cervical Stenosis

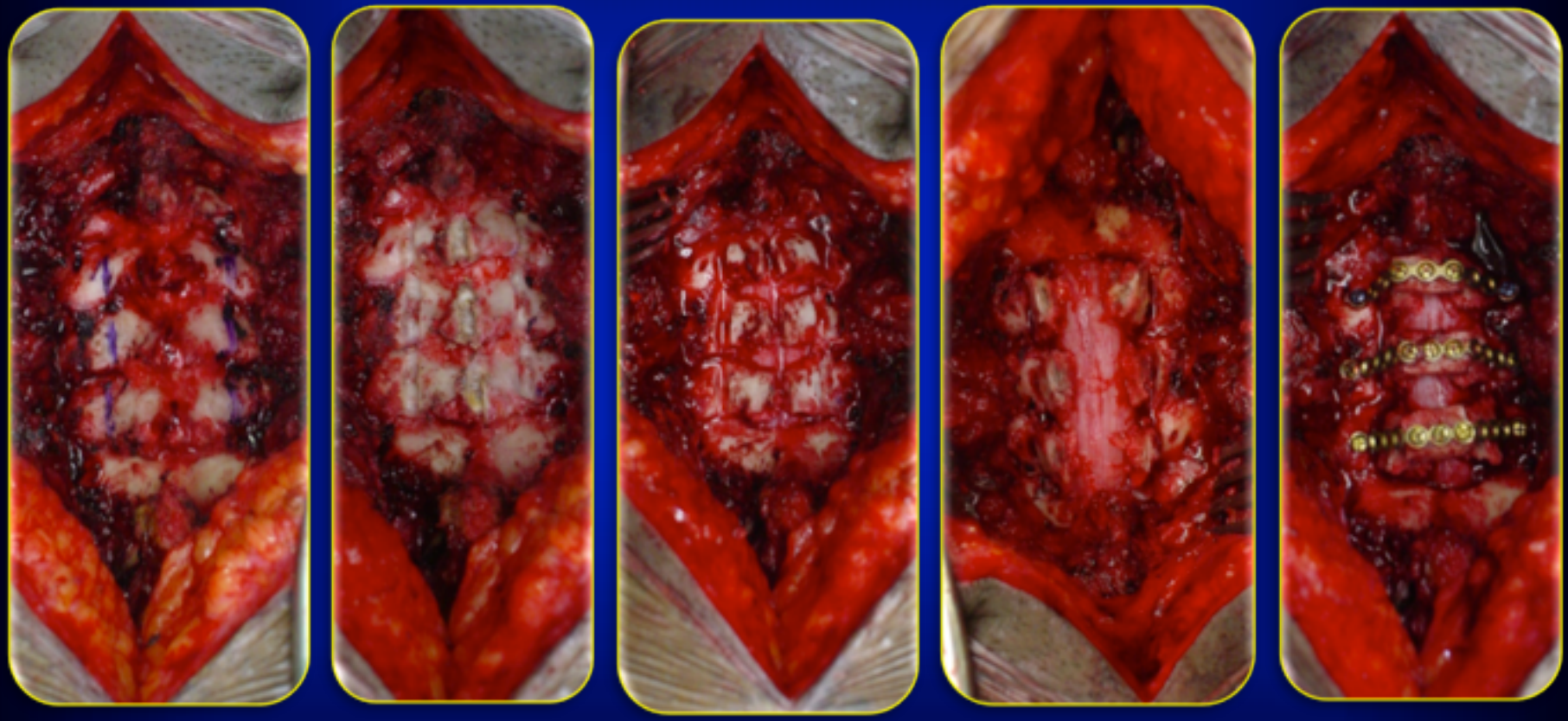


Cervical Stenosis

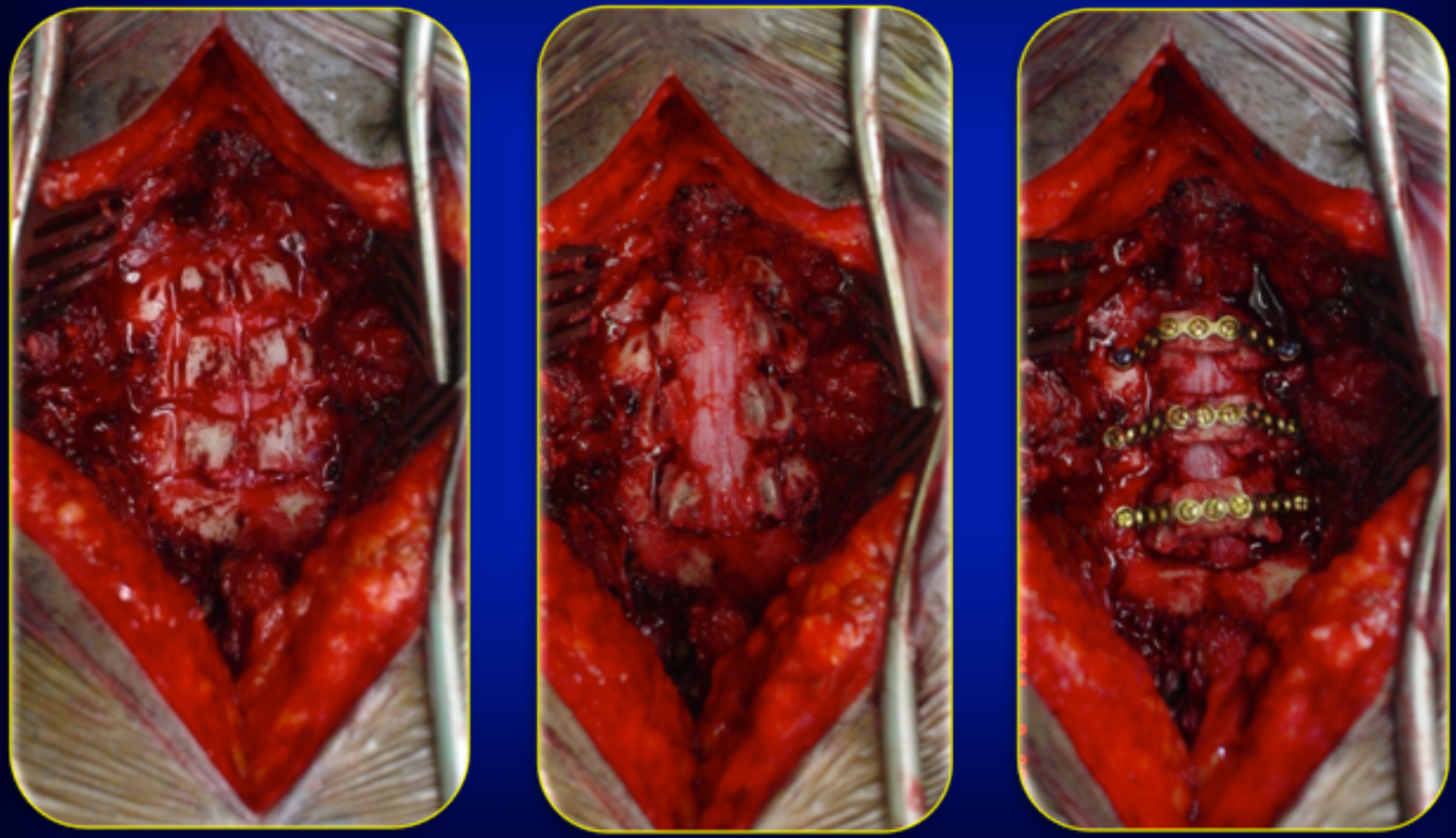
Cervical Stenosis

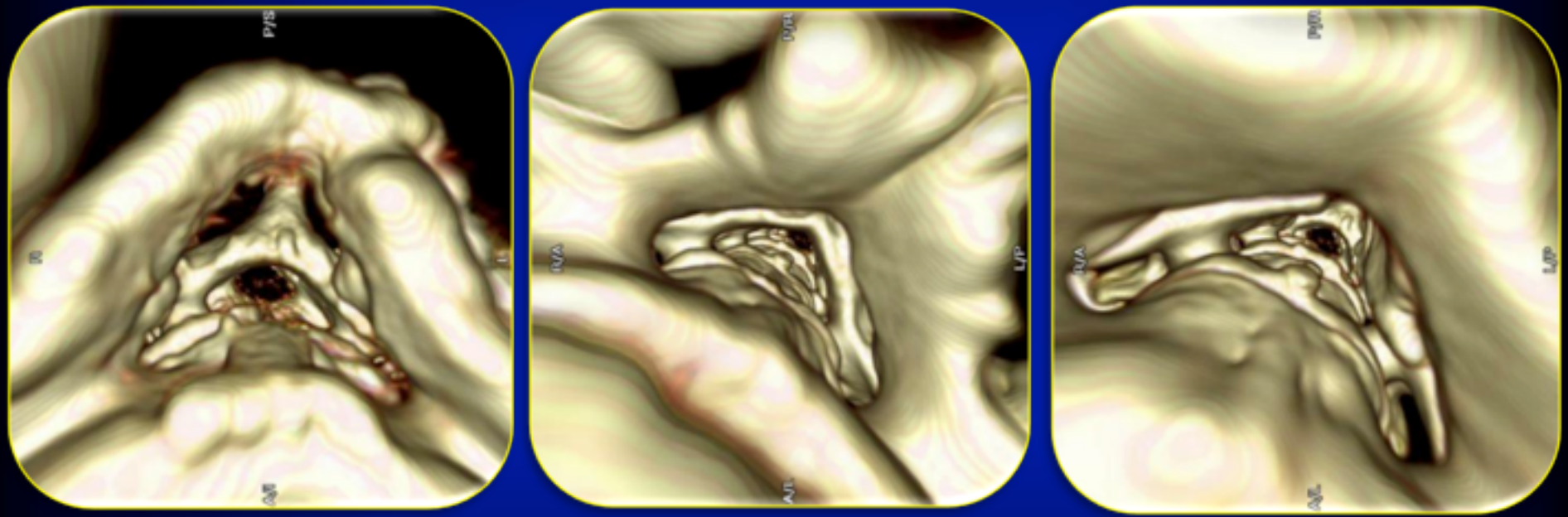
Kurokawa 1982

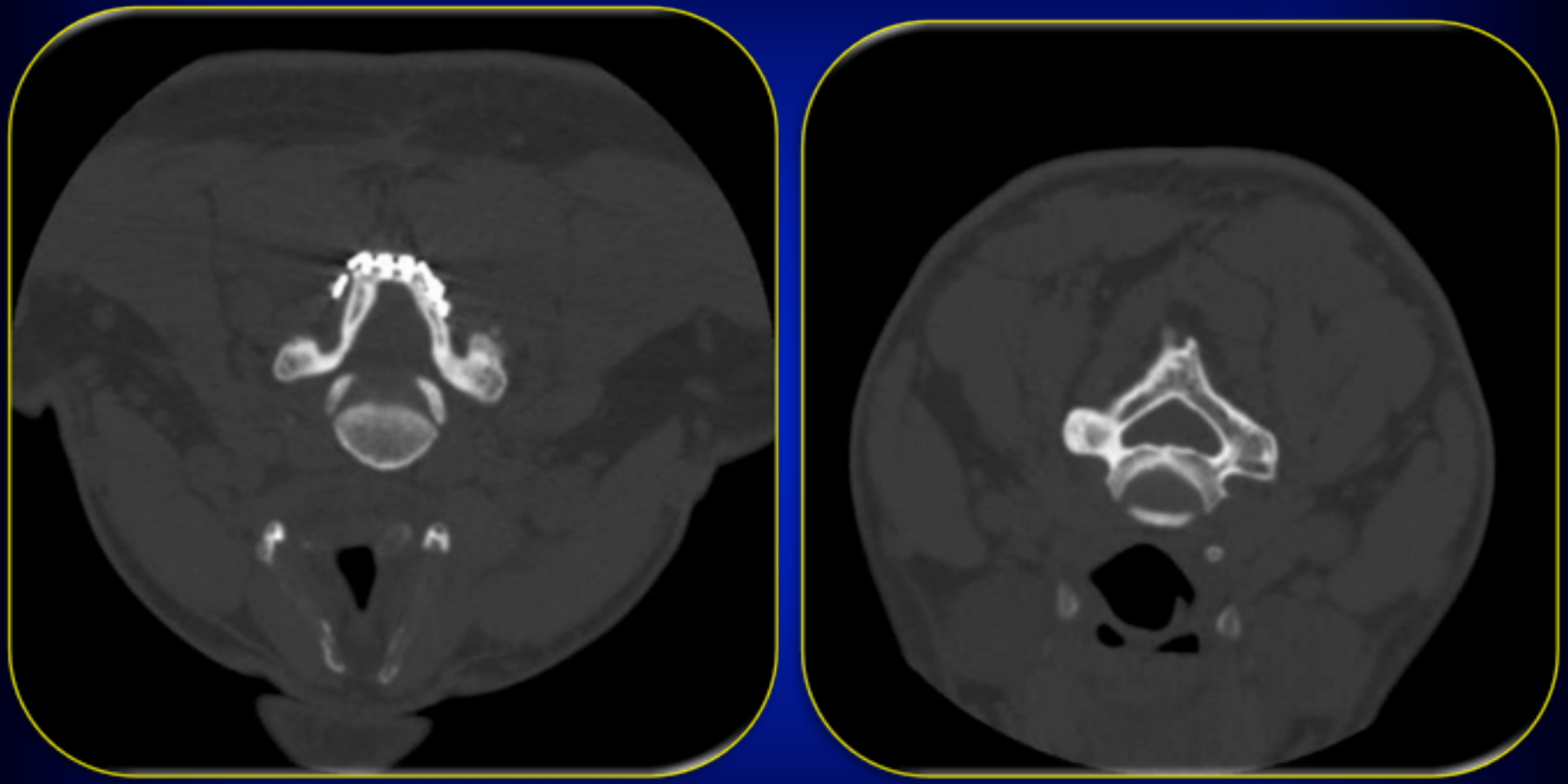
Double Door Laminoplasty (Median split)



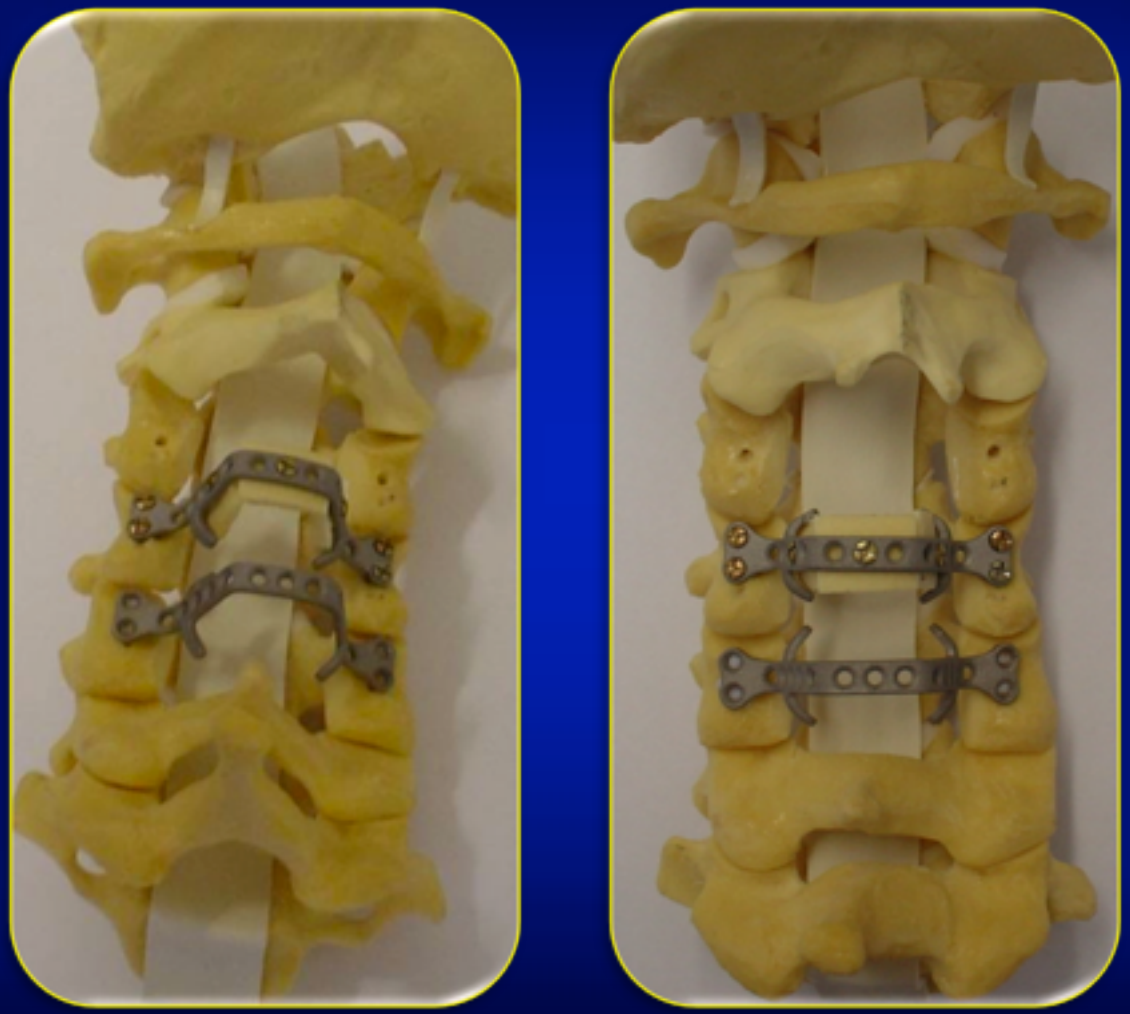
Double Door Laminoplasty





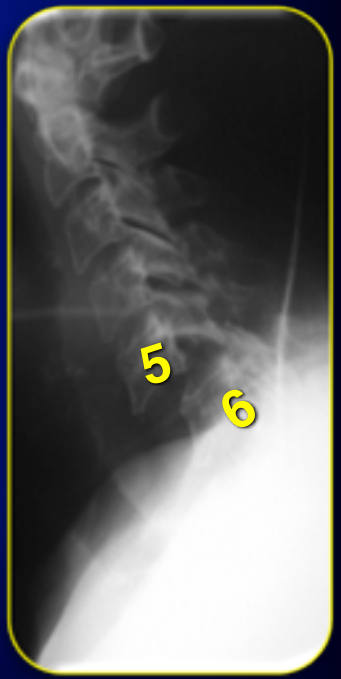


Laminoplasty Plate



Cervical Fractures and Dislocations

- Can occur when the axial loading forces applied to the C-spine are greater than the yield strength of the vertebral bodies
- The spectrum of pathology includes subluxation, dislocation, fractures with or without neurology



Cervical Instability Lable Radiological

- Displacement > 3.5 mm in the horizontal plane
- Translation > 20%
- Angular measurement between motion segment >20º

ATLANTO OCCIPITAL DISLOCATION

- Usually are fatal secondary to complete respiratory arrest
- Cervical traction is contraindicated
- Treatment, place the patient in a halo vest and fusion should be performed

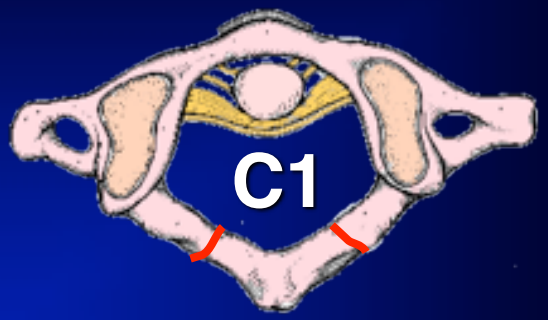
Atlas fractures

Jefferson (1920)

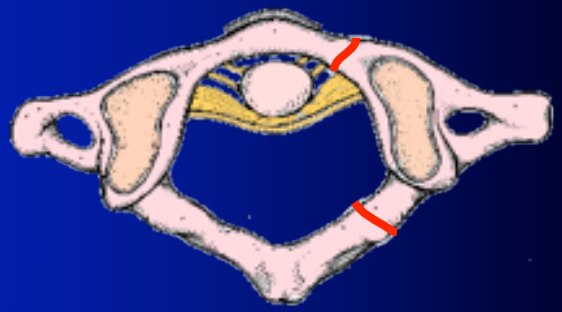
Levine

Axial loading

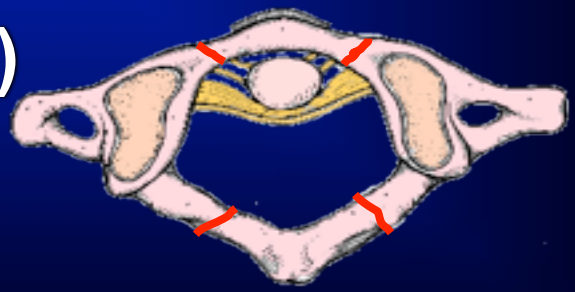
Type I :posterior arch



Type II :lateral mass



Type III : Burst fractur (**Jefferson**)



Atlas fractures

Treatment

- All Atlas fractures can be treated with Halo-vest

Atlas fractures

Surgical treatment

- Combined C1 and C2 fractures
- Late instability, following halo-vest treatment

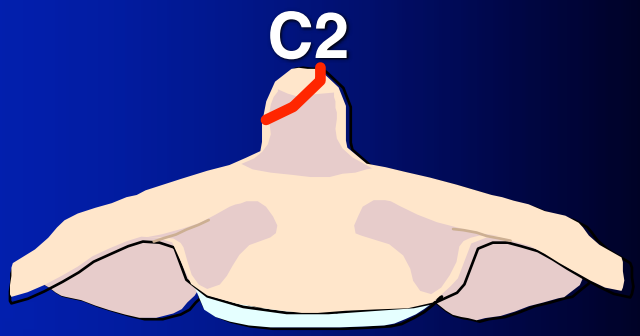
Odontoid fractures

Anderson , D'Alonzo

Hyperextension, Flexion / Rotation

Treatment

- Type I (C- Collar)



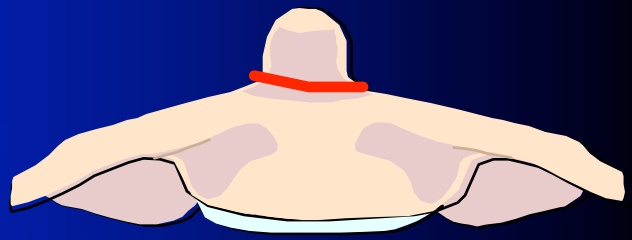
Odontoid fractures

Hyperextension, Flexion / Rotation

Treatment

Type II

- Undisplaced (Halo Jacket)
- Displaced (Fusion/ inst)



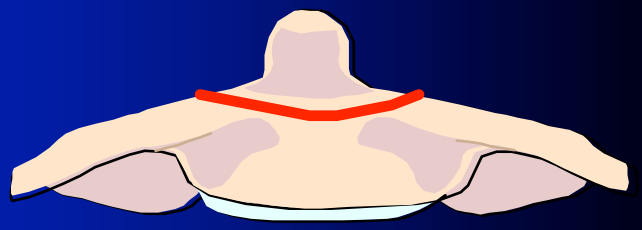
Odontoid fractures

Hyperextension, Flexion / Rotation

Treatment

Type III

- C- Collar / Halo Jacket (union ↑)



Fracture through body

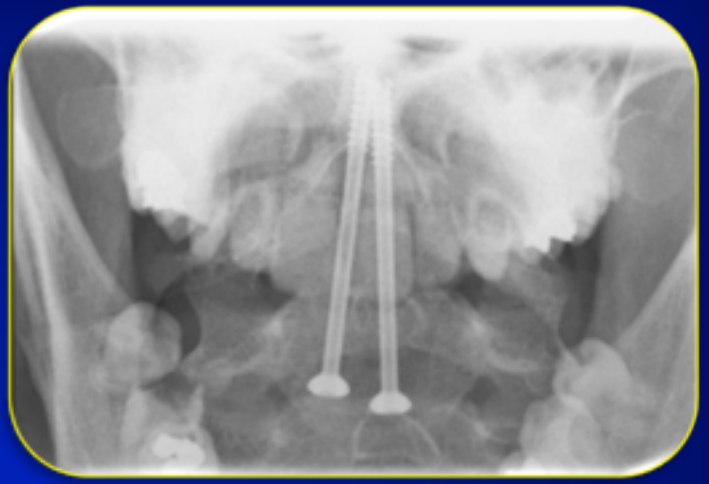
Odontoid fractures

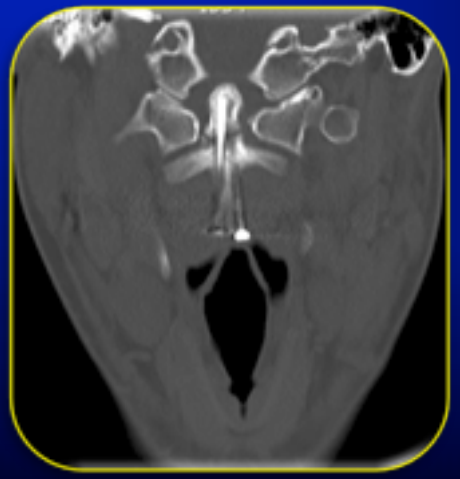
Type II (displaced)

Odontoid fractures

Direct odontoid screw needs two C-arms & full reduction

Odontoid fractures





C2- Fractures Effendi ,Levine , Edwards

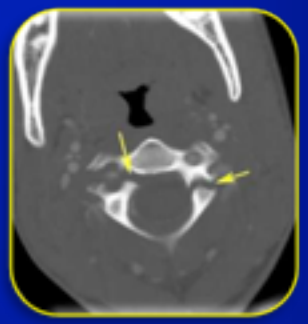
(Hangman's)

Hyperextension / axial loading force

C2

Type I

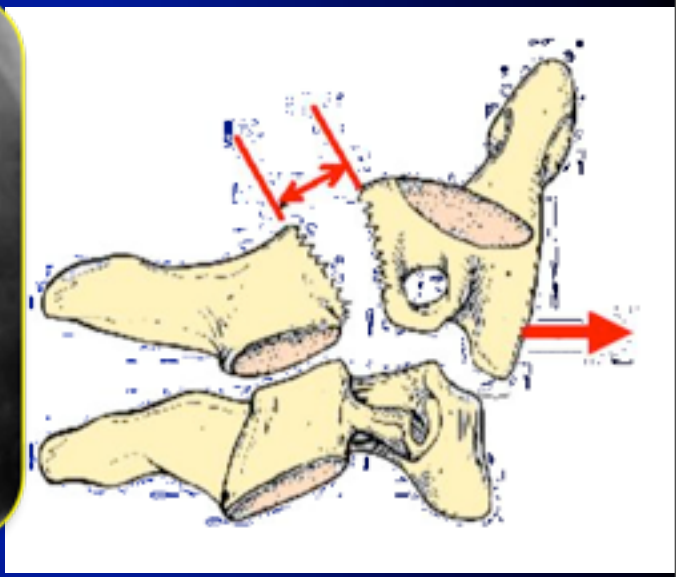
- Minimally displaced
- < 3 mm translation
- C-collar for 3 months



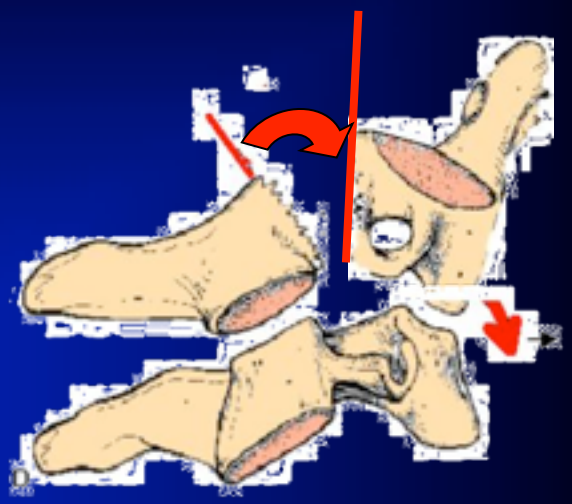
Hangman's fractures

Type II

- Translation > 3 mm
- Minimal angulation
- Halo vest / surgery



Hangman's fractures



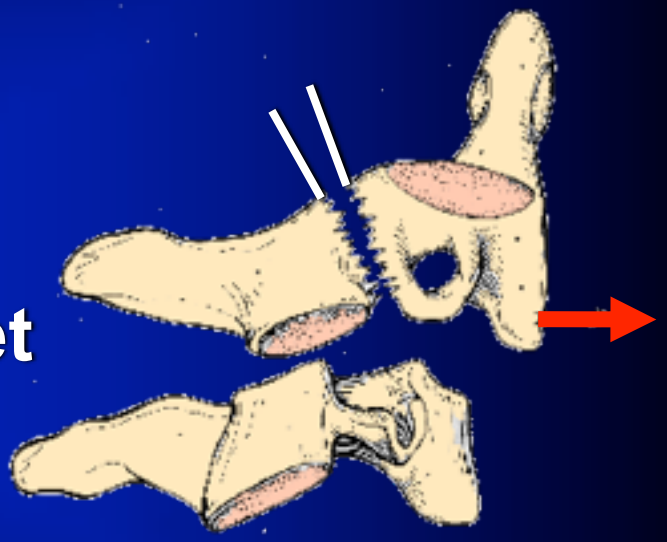
Type IIa

- Minimal translation
- Angulation > 10°
- C2-3 disc disruption
- Halo vest / surgery

Hangman's fractures

TYPE III

- Severe translation
- Unilateral/bilateral C2-C3 facet dislocation
- Open reduction + fixation



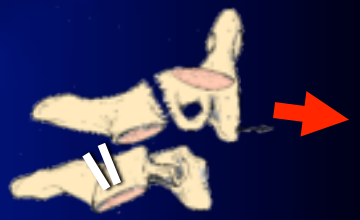
Hangman's fractures

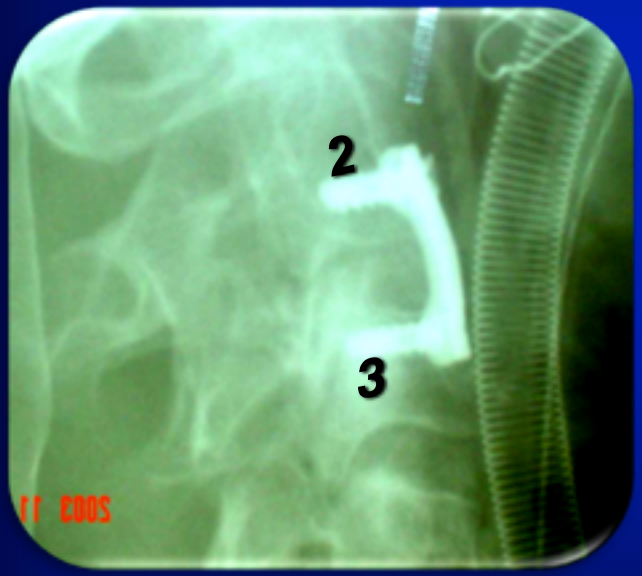
Posterior Approach

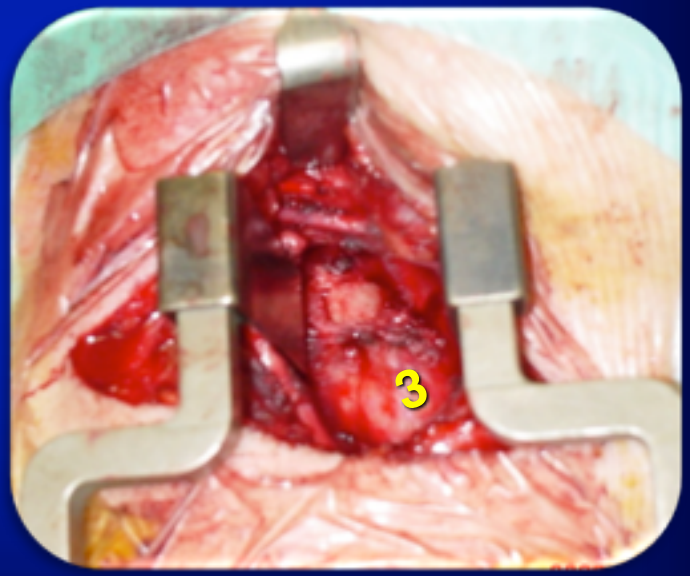
TYPE III

Anterior Approach

Hangman's fractures



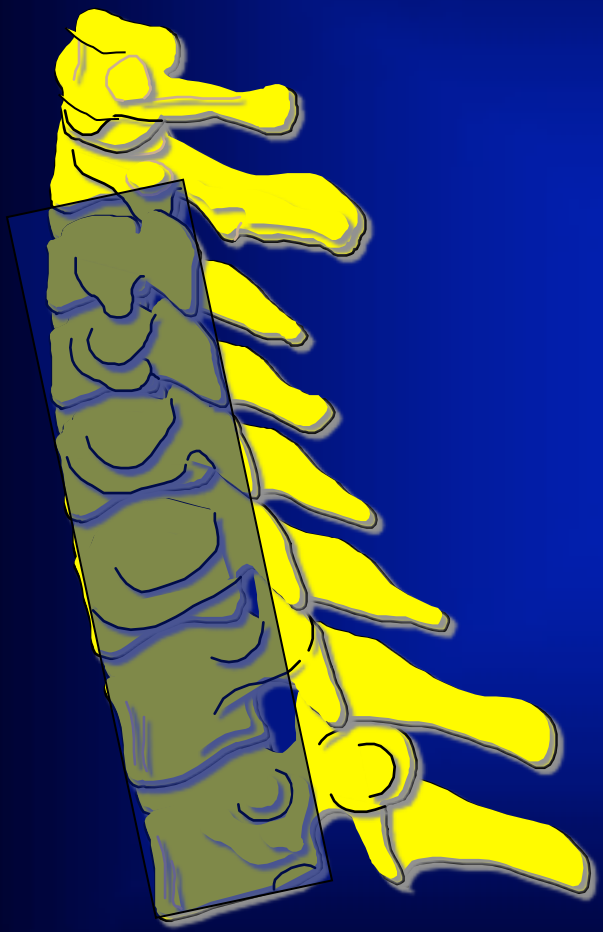


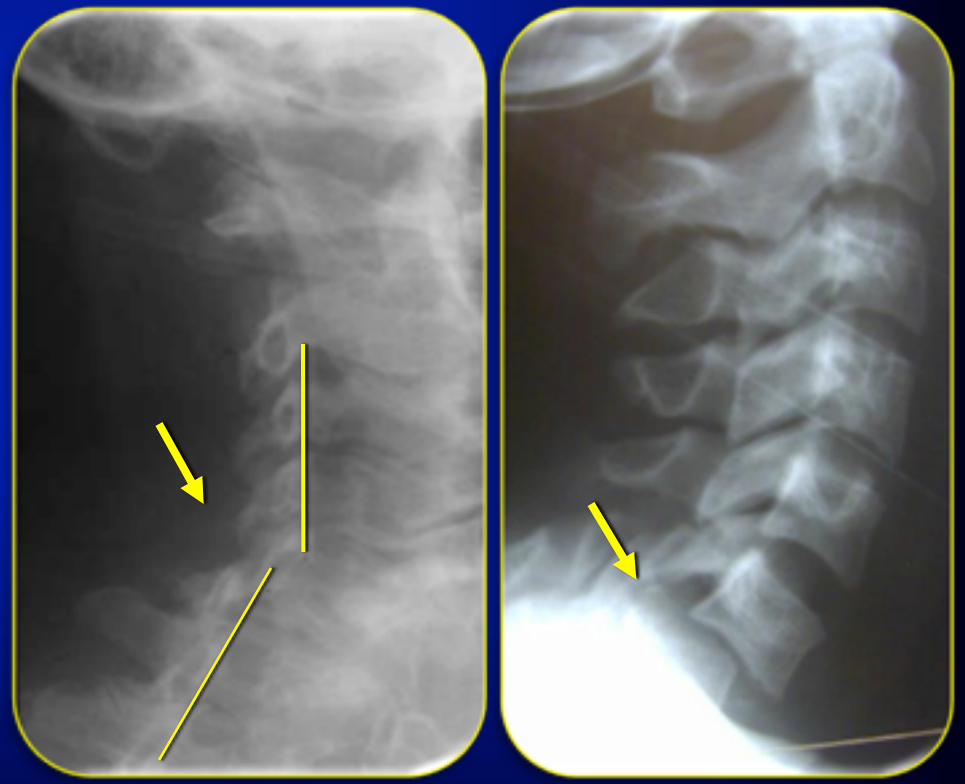


Hypoglossal nerve, Superior laryngeal nerve
(int & ext branches), Lingual, facial, superior thyroid artery

Sub-Axial Injuries

Missed injuries are common in sub-axial cervical spine





Avulsion fractures

- Sudden severe flexion force
- Spinous process
- C-collar

Compression fractures

- Loss of anterior body height
- Ant compression < 25% C-collar
- Ant compression > 50%
  (ant/post reconstruction)

Facet Joint Injuries

(Flexion + rotation/axial)

- Posterior ligamentous complex disruption
- Facet joint subluxation or dislocation (unilateral/bilateral)
- Can be associated with or without neurological injury

Judo

Unilateral Facet Dislocation

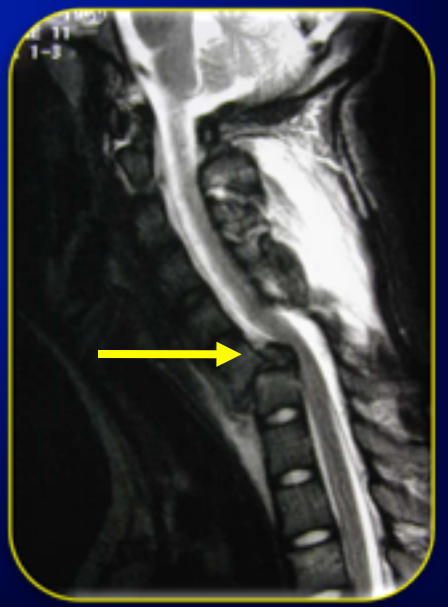
Facet Joint Injuries

(Flexion + rotation/axial)

Unilateral Facet Dislocation

Bilateral facet dislocation

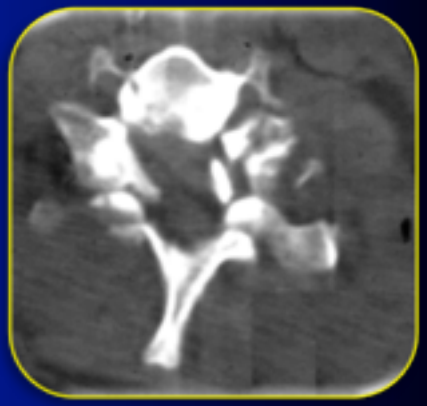
- Rapid reduction with traction, when reduction is achieved then post fusion /inst is recommended
- MRI , exclude disc prolapse

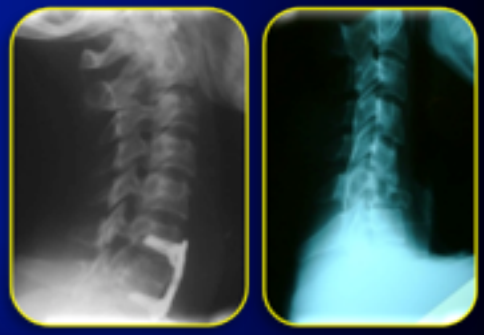


Vertebral Burst Fractures

(Severe axial loading + hyperflexion)

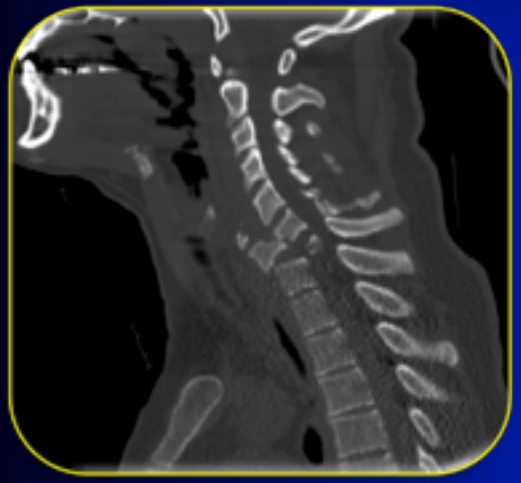
- Comminuted fracture of ant/mid Columns
- Cord injury is present (retropulsion)
- Canal compromise , anterior surgery
- Unstable fracture ant + posterior surgery

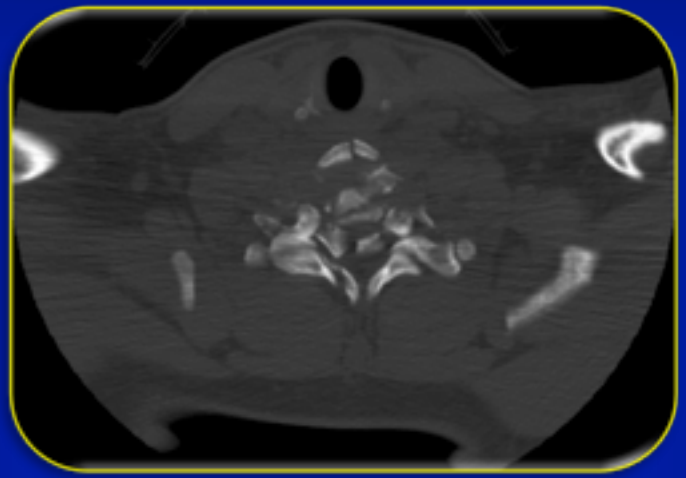




Vertebral Burst Fractures

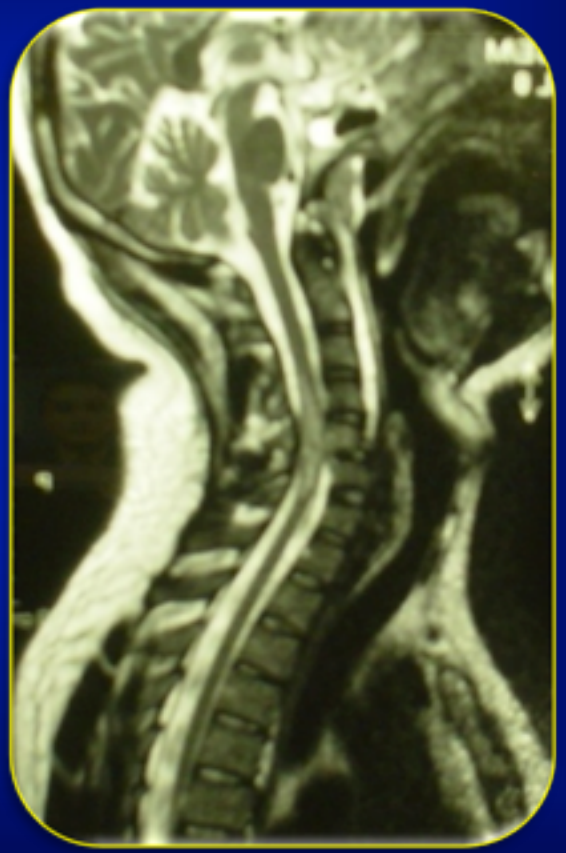
(Severe axial loading + hyperflexion)





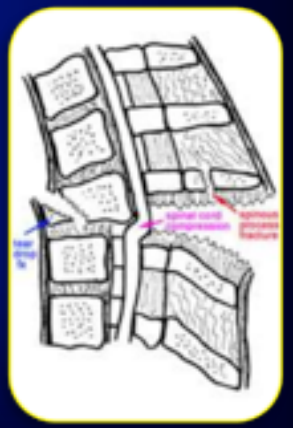
Tear drop Fracture

(Severe flexion - axial loading)



Tear drop Fracture

- 3 column injury and associated with neurological- injury
- Displaced fracture of the ant-inferior corner of VB
- Post ligament and segmental disc disruption
- Diagnosis and treatment are the same as for burst fractures



Cervical Spine Injuries in Sport

- Over 450 catastrophic injuries were reported in sports between 1994-2010. 75% of these were cervical injuries

Non contact Sports

- Diving
- Skiing
- Track & field
- Surfing

Contact Sports

- American football
- Rugby
- Hockey
- Wrestling

CERVICAL SPINE INJURIES IN SPORTS

- Spearing occurs when a player, uses the head as the first point of contact with another player
- Spearing is a significant cause of C-spine injuries and quadriplegia in American football and rugby

CERVICAL SPINAL STENOSIS

Epstein 1972

- The diminution of the antero-posterior diameter of the spinal canal is serious risk factor for neurological injury in contact sports
- Normal range is 14.2mm, less than 13mm is considered stenosis

Torg/Pavlov Ratio
Less than 0.8=stenosis

CERVICAL SPINAL STENOSIS

Epstein 1972

- Any athlete with cervical stenosis has increased risk for quadriplegia following injury and therefore should be prohibited from contact sports

CONCLUSION

The incidence of catastrophic cervical injuries in sports has significantly decreased over the last 30 years.
this decrease is the result of rule changes , better coaching on contact and tackling techniques, the presence and instruction of the athletic trainers and improvement in protective gear including helmet and shoulder pads

CONCLUSION

The team physician plays a crucial role in the medical assessment on the playing field, immobilization and transportation to a qualified facility for evaluation and treatment

Decision making regarding return to play following an injury should be discussed with the athlete and the athlete's parents, coaches, trainers and agents. The ultimate decision should be made in the best interest of the patient.

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