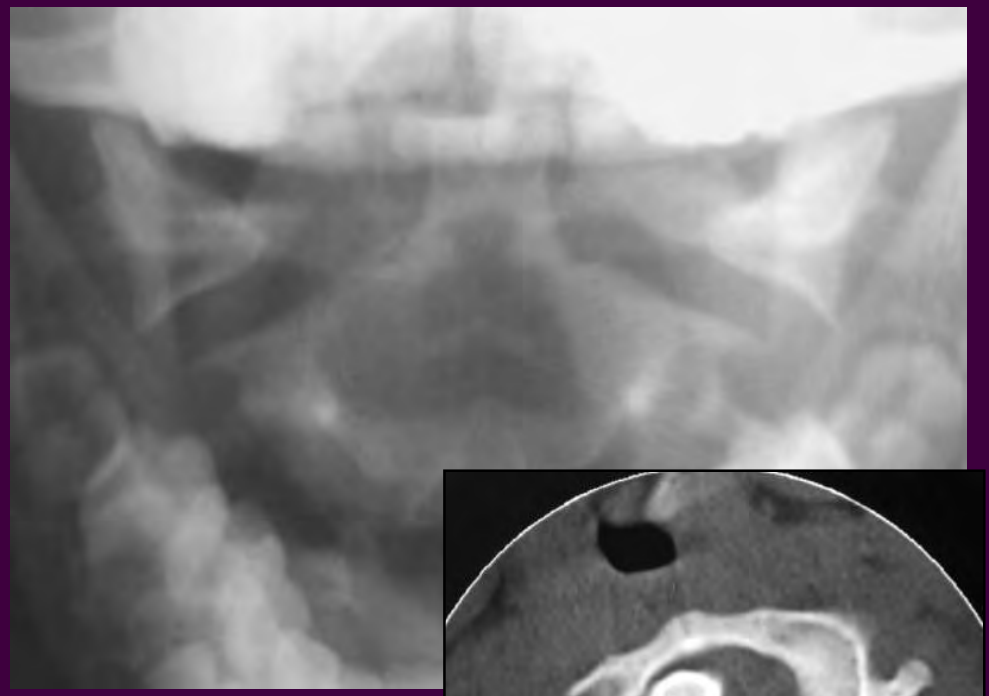
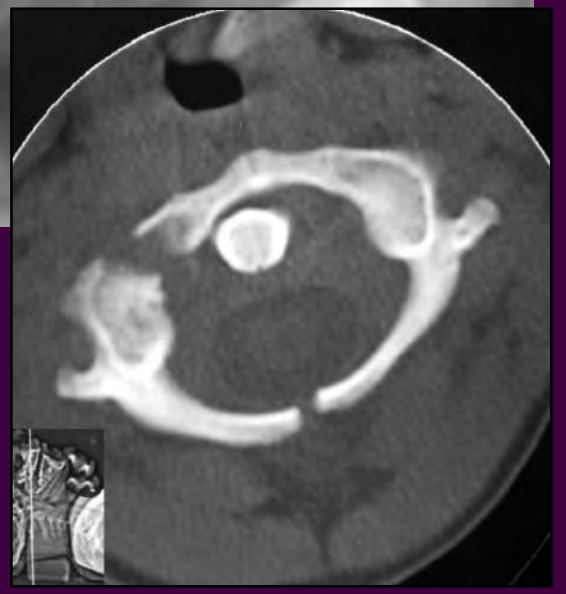
Imaging of Trauma to the Spine

Orthopedic Diplomate Program
University of Bridgeport
College of Chiropractic

Jefferson Fracture





© Yee, LL: The Jefferson Fracture, Radiology Cases in Pediatric Emergency Medicine. Vol 5, Case 4; Kapiolanin Med. Center for Women and Children, Univ of Hawaii, John A. Burns School of Medicine

Thanks to Dr. John Taylor for this slide

Posterior Arch Fracture

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- Most common C1 fracture
- Hyperextension
- Stable
- Usually bilateral
- 80% have other fracture

Thanks to Dr. John Taylor for this slide

Unstable Atlanto-Axial Joint

Odontoid Fracture with increased translation

Hangman's Fracture

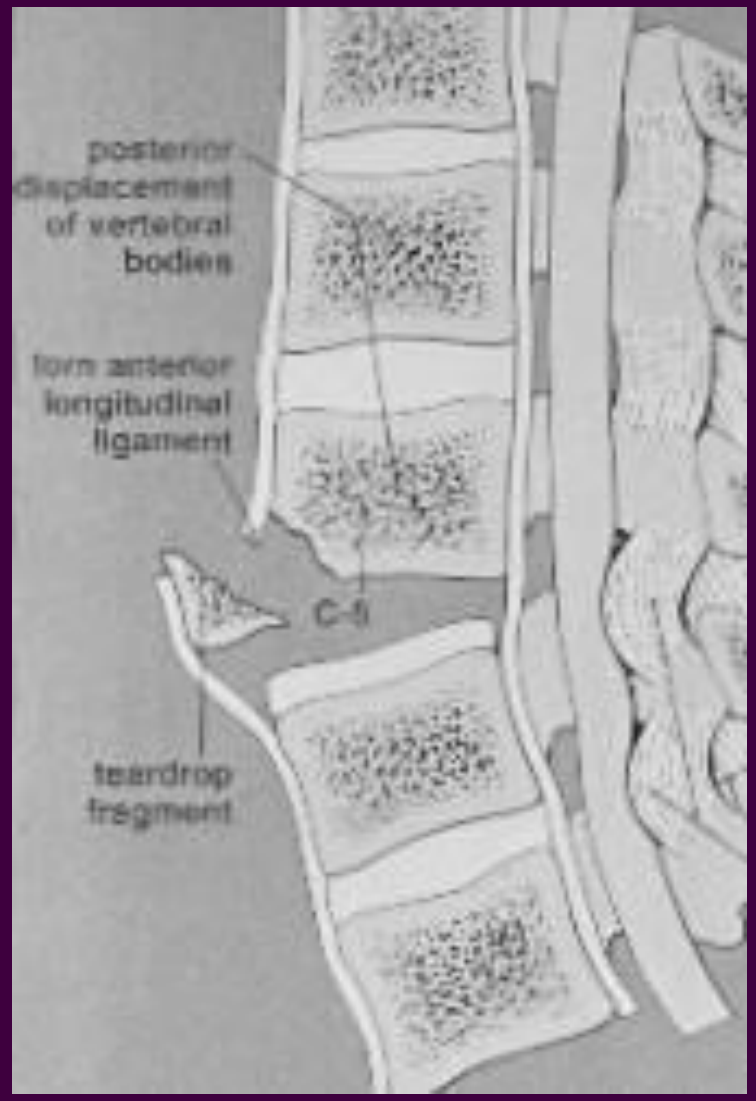
28 y.o. male

- Reportedly fell while chasing a puppy in the street a night after a party
  - Head hit the curb and was forced into hyperextension
  - Significant pain (10/10) in neck & with all attempts at motion

Teardrop Fracture

- ALL rupture
- Hyperextension
- Avulsion of anterior-inferior corner of body
- Severely unstable
- Most common at C2
- Look for other injuries
- Frequent neurologic deficit

Teardrop Fracture



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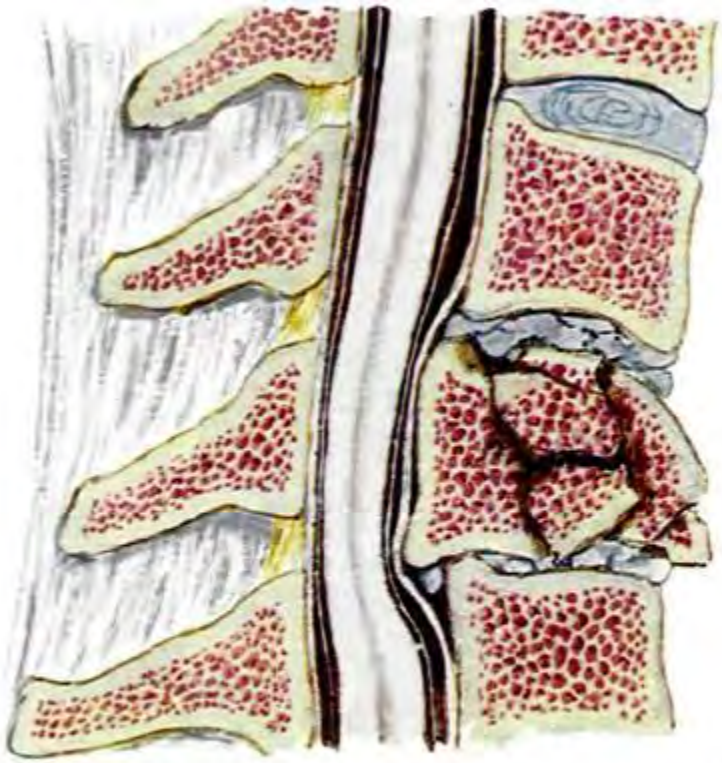
Teardrop Fracture

Burst Fracture

- Vertical compression combined with flexion
- Comminution of body by nucleus pulposus
- Retropulsion
- Kyphosis, spinous fanning, facet dislocation
- 85% neurologic deficit

Burst Fracture



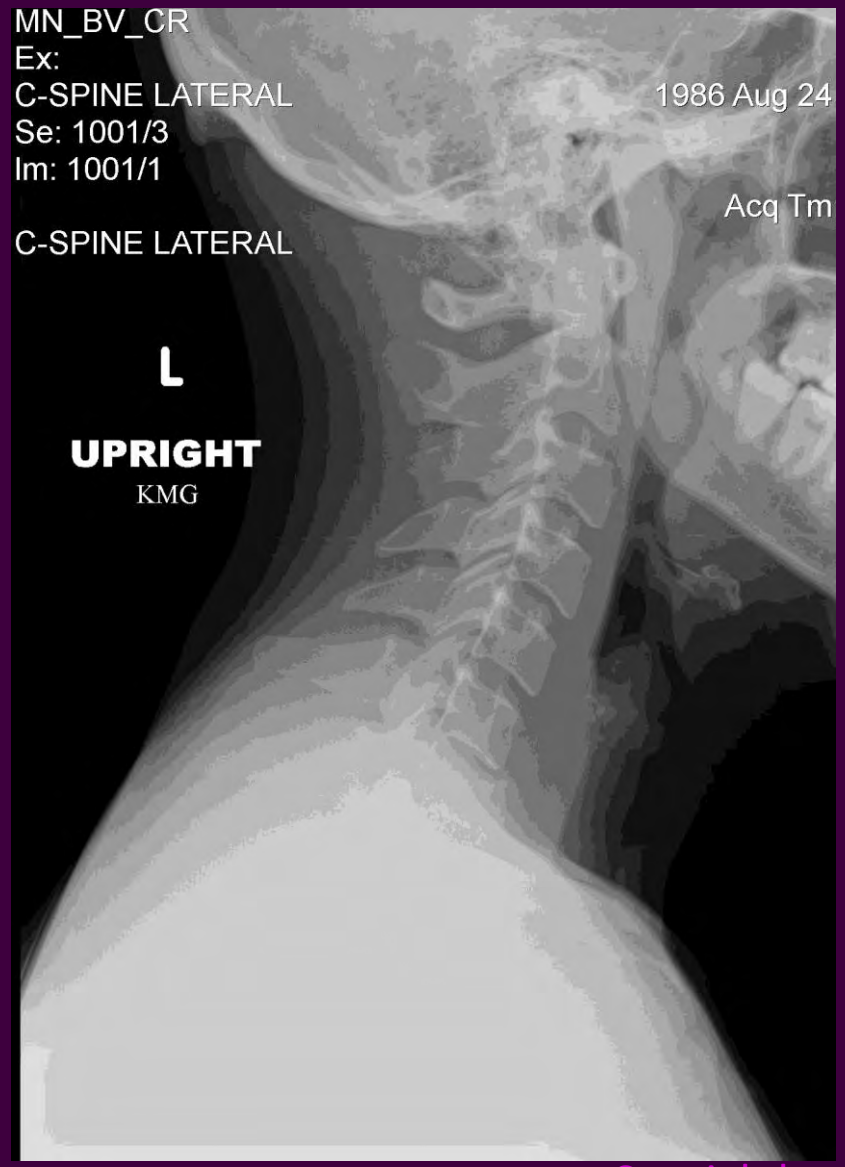
Type III. Fracture through entire vertebral body with fragmentation of its anterior portion. Posterior cortex intact but projects into spinal canal causing damage to cord and/or nerve roots

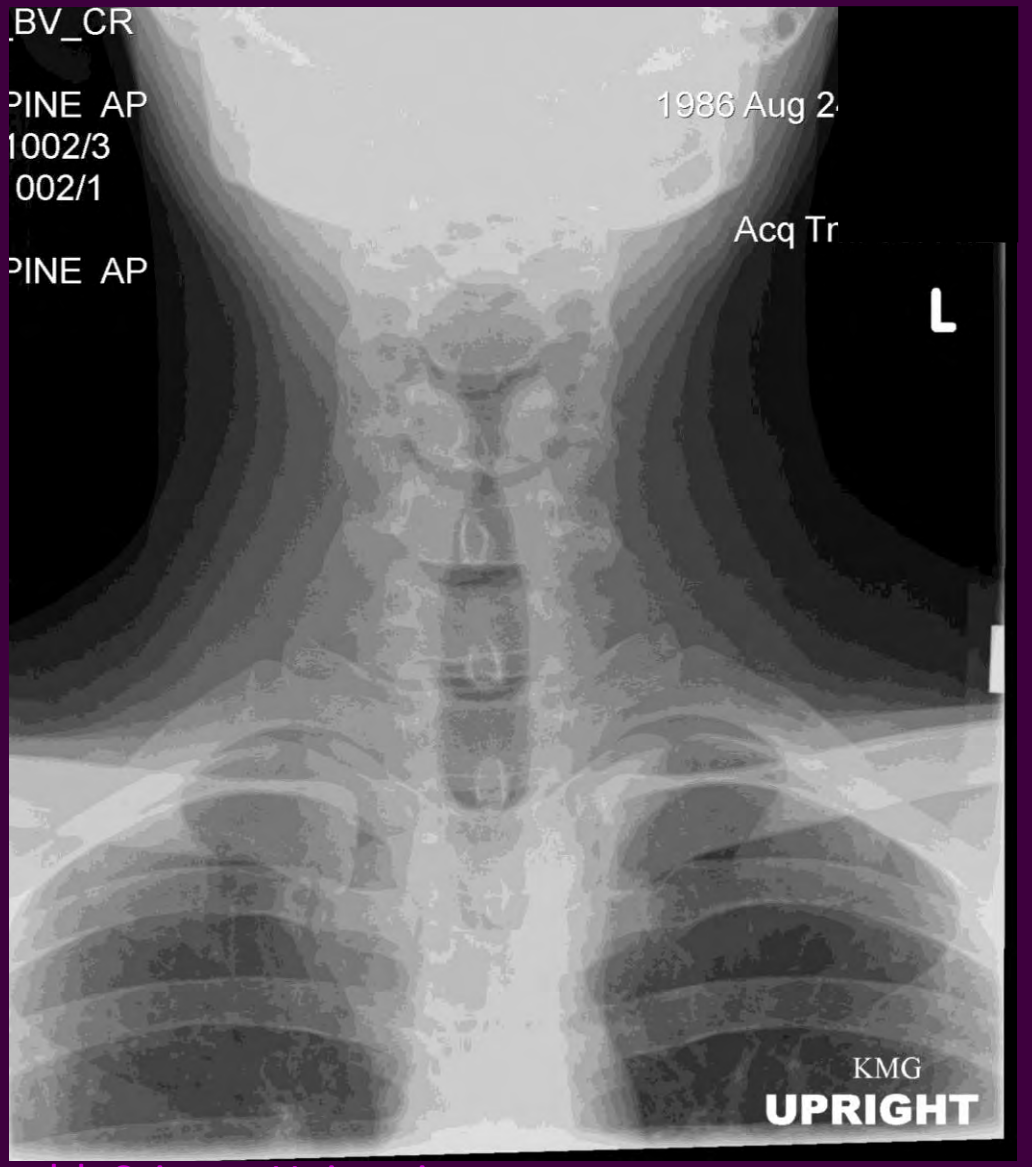
X-ray film: Type III fracture of C5

Ciba ©

Thanks to Dr. John Taylor for this slide

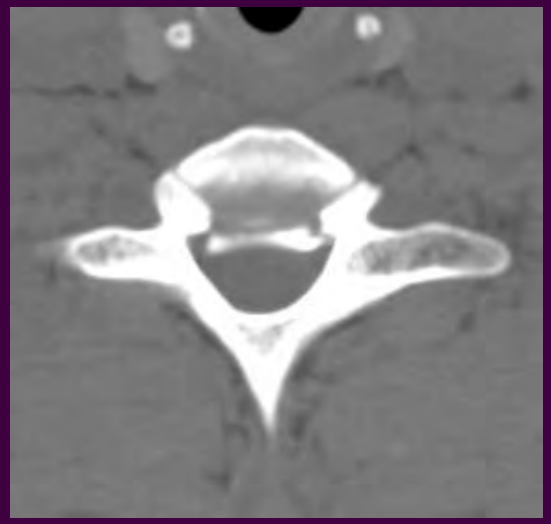
Burst Fracture

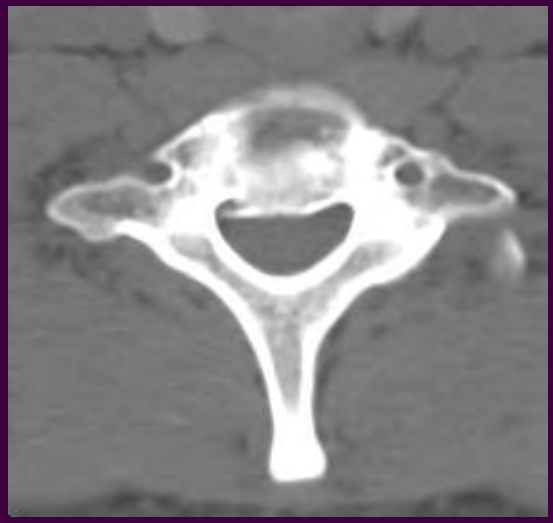
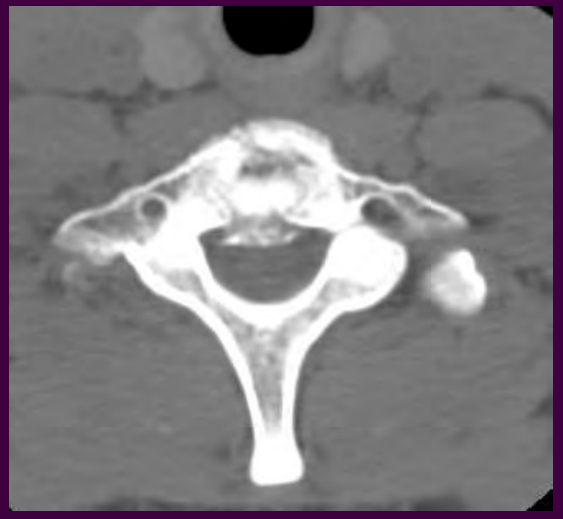
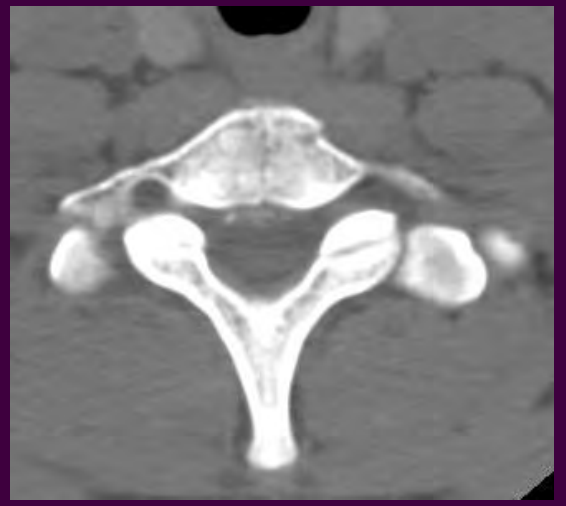




Special thanks to Northwestern Health Science University

Burst Fracture




Special thanks to Northwestern Health Science University for this case

Burst Fractures

CT

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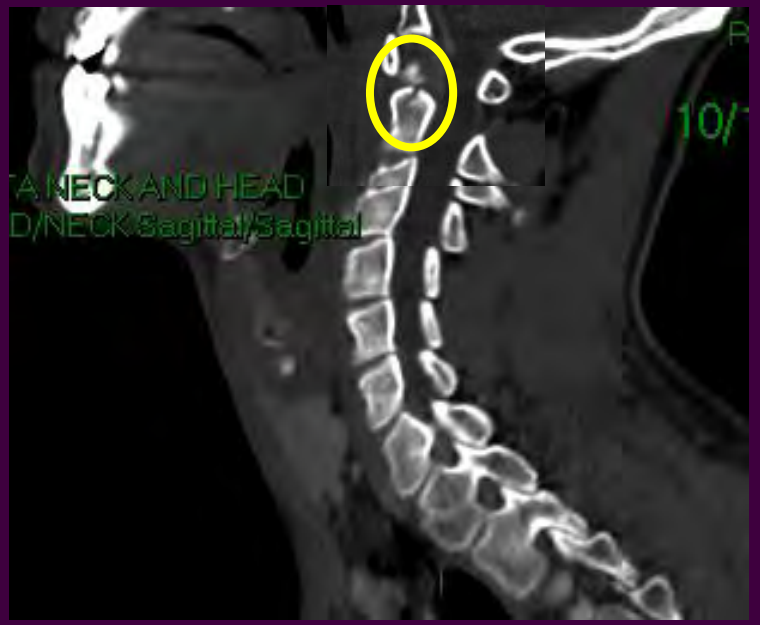
22 y.o Male

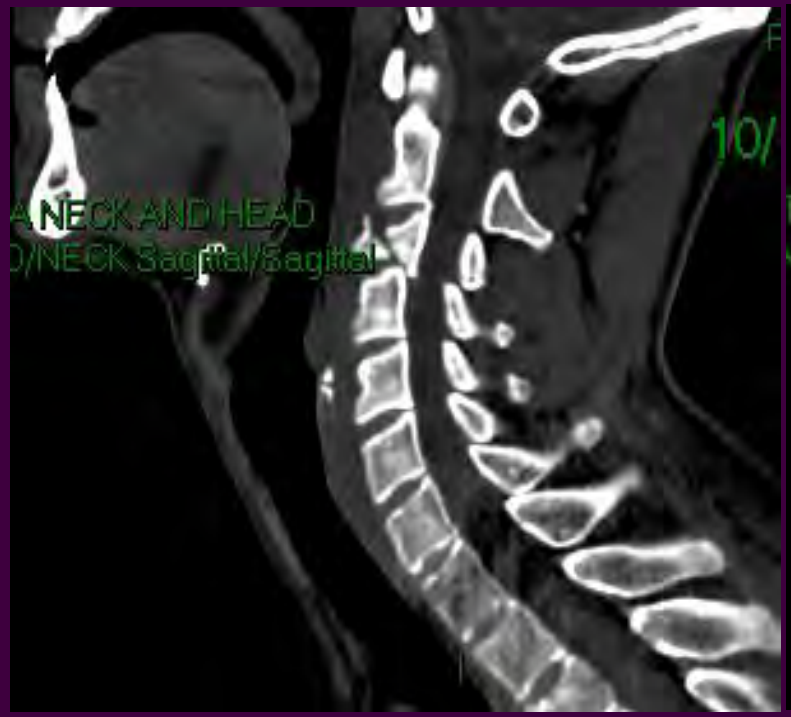
Attempting to ride his bike across the U.S.

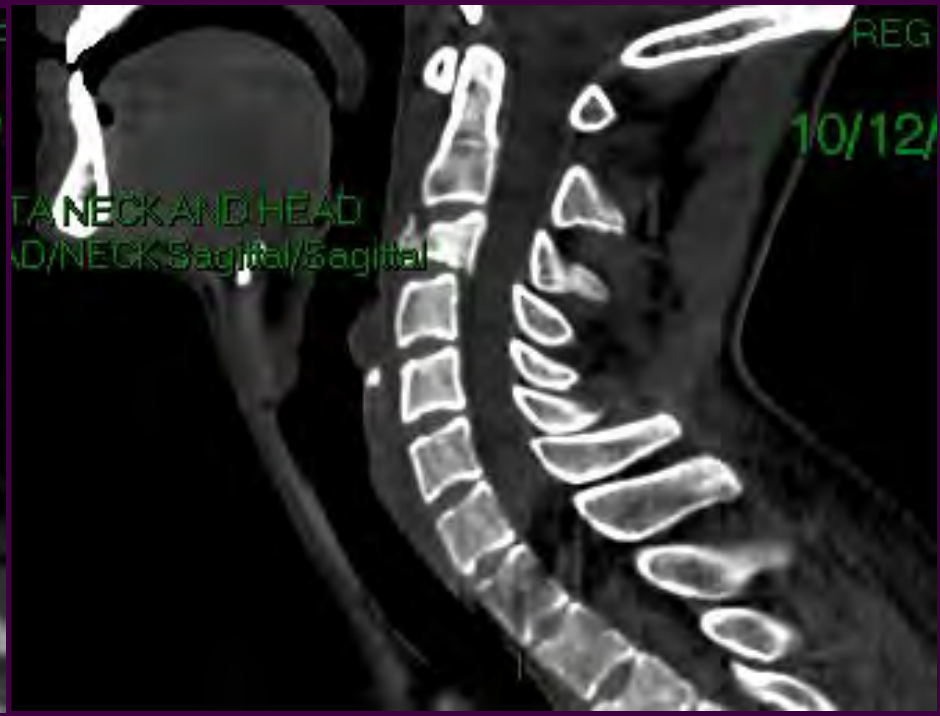
Hit on a straight, flat stretch of road by motorist not paying attention

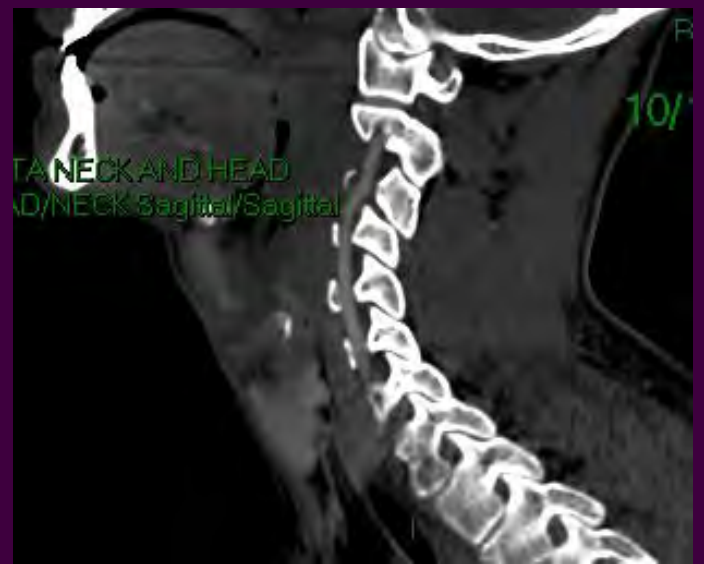
Burst Fracture & ?



Burst Fracture & Odontoid Frx







Cervical Spine Dislocation

- Unilateral facet dislocation
- Bilateral facet dislocation
- Transverse ligament rupture

Unilateral Facet Joint Dislocation

35 y.o. UBCC student

- Involved in MVA while in army approx. 12 yrs ago
  - Neck injury (films?)
  - Has been getting adjusted weekly (2X times a week) by local chiropractor since leaving the service
    - For approx. 7 yrs with great relief
    - The results are what inspired him to attend UBCC
  - Incoming student screening exam referred for cervical films

Chronic Unilateral Facet Joint Dislocation




Acute Compression Fractures

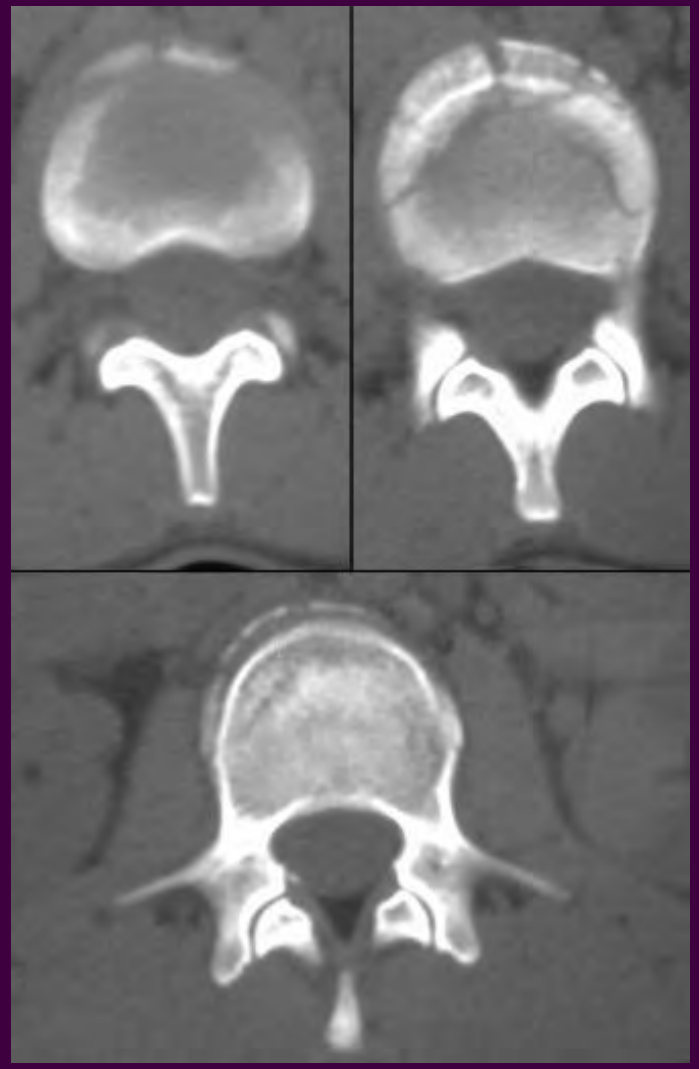
RADIOGRAPHIC FINDINGS:

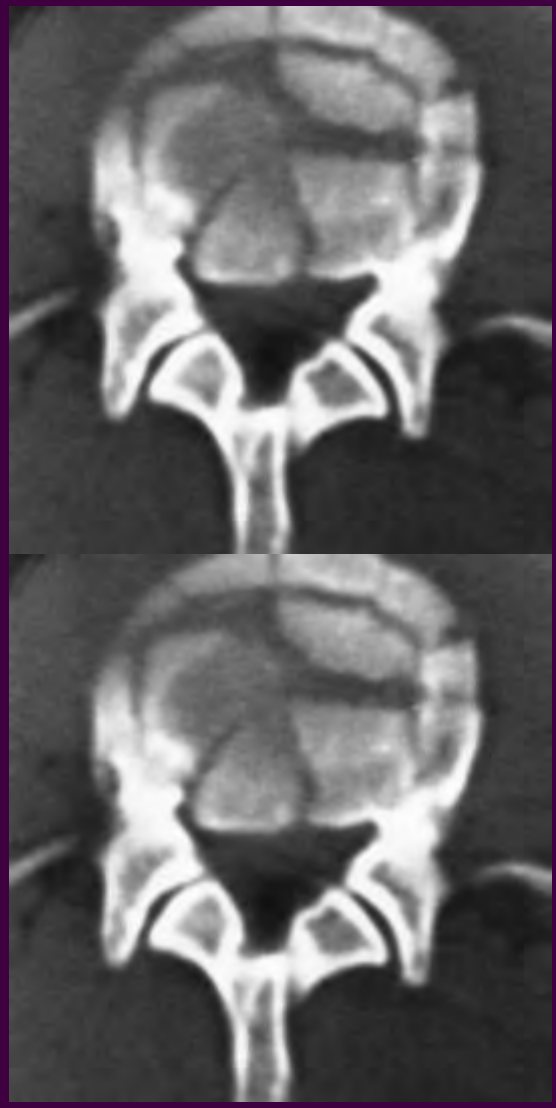
- Wedge deformity
- Zone of impaction
- Step defect
- Paraspinal edema and hemorrhage
- Abdominal ileus—excessive gas

Spinal Trauma

- Compression fractures
  - Axial rotation with fulcrum at about the posterior inferior vertebral corner
    - Causes compression on anterior body

Compression vs Burst fracture





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Hemorrhage on MRI

AGE	BLOOD PRODUCTS	T1 SIGNAL	T2 SIGNAL
Hyperacute (0-1 day)	Oxyhemoglobin/serum	Isointense to cord	Bright
Acute (1-3 days)	Deoxyhemoglobin	Isointense to chord	Dark
Early Subacute (4-7 days)	Intracellular methemoglobin	Bright	Dark
Late Subacute (>7 days)	Extracellular Methemoglobin	Bright	Bright
Chronic (>2 weeks)	Hemosiderin	Dark	Dark

Compression Fracture

T1WI

T2WI

STIR

Fat-saturated Image

Compression Fractures

DETERMINING AGE OF FRACTURES:

	OLD	NEW
Shape	Wedge	Wedge
Step defect	No	Yes
Band of condensation	No	Yes
Degenerative disc	Yes	No
Bone Scan	- /+ (2 yr)	+

Thanks to Dr. John Taylor for this slide

Yochum & Rowe 2nd ed. 1996, Table 9.11

Compression Fractures

Acute trauma

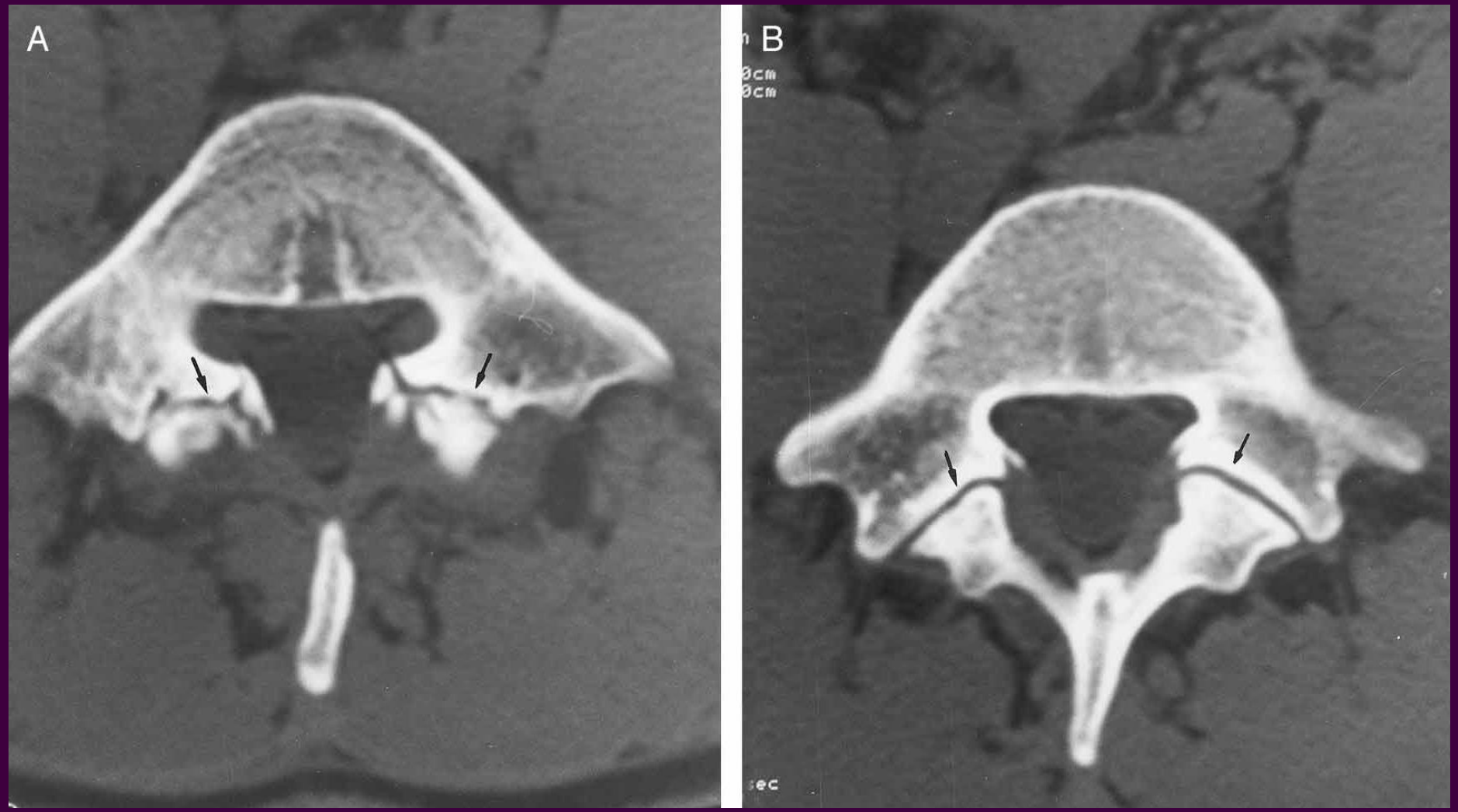
2 yrs after trauma

Pars Interarticulares

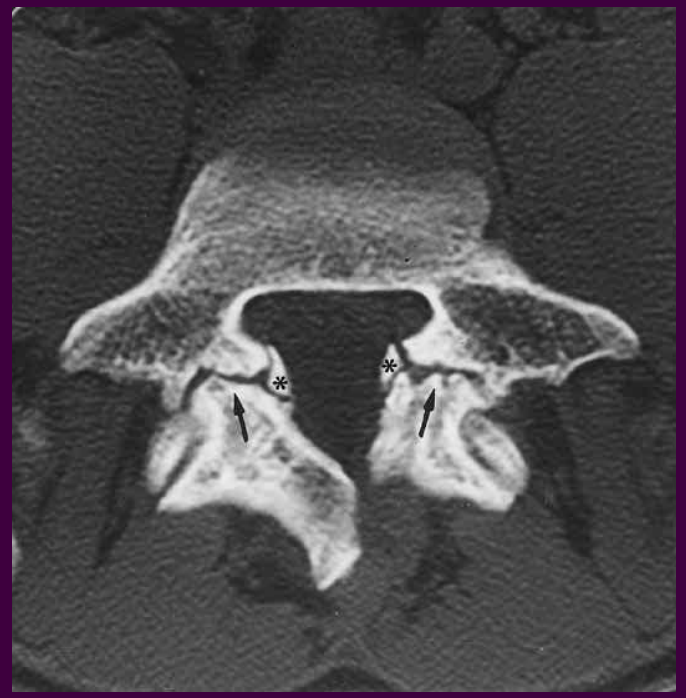
- Younger patients (under 30 yrs old) with low back pain
  - Significant possibility of pars defects
  - Especially in athletes

30 yr old female w/LBP

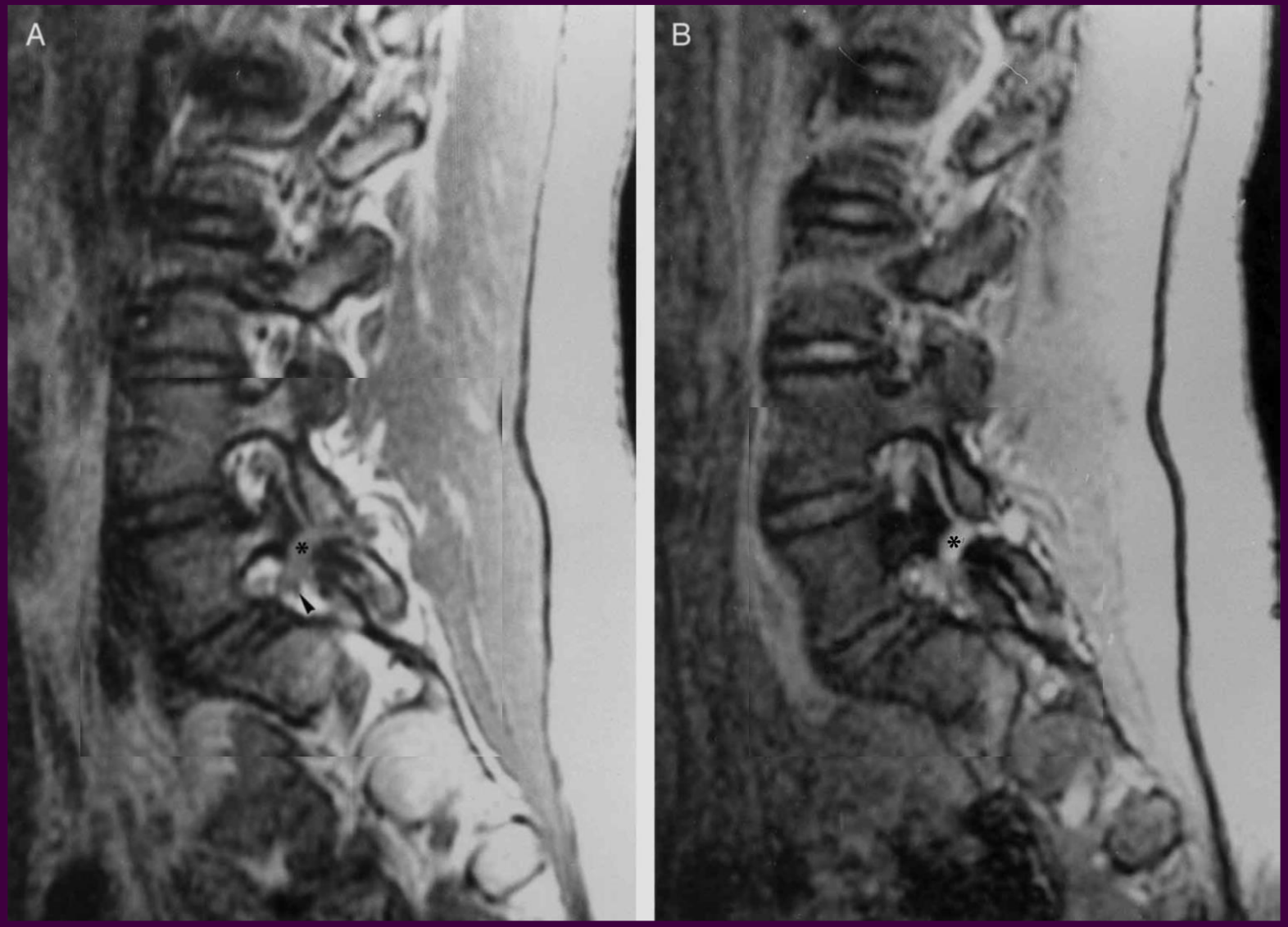
Spondylolysis



Spondylolysis



Spondylolysis



Stability of the Spine

- Typically assumed no more than 3.5 mm. translation in cervical spine
  - Anything more considered excessive/instability
- Lumbar translation

Recumbant vs upright imaging

Lying Down

Upright, Weight-Bearing

Case courtesy of M. Rose, MD, Rose Radiology Centers

Recumbent

Case courtesy of F. W. Smith, MD University of Aberdeen, Scotland

Recumbent

Upright-Flexion

Ligamentous Rupture Associated With Spinal Instability

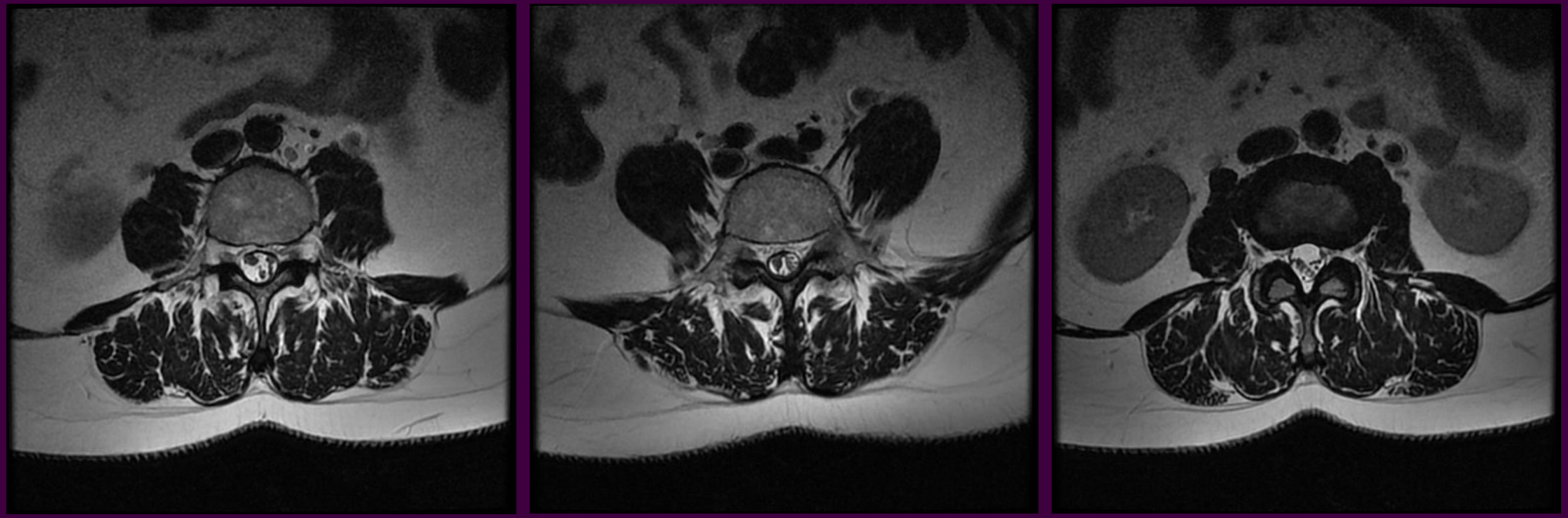
The interspinous ligamentous rupture at the L4/5 level

Case courtesy of F. W. Smith, MD University of Aberdeen, Scotland

Arachnoiditis

- Post-traumatic (post-surgical, *post-pantopaque*)
  - Inflammatory process often d/t components being injected into subarachnoid space (i.e. contrast agents, anesthetics) or intrathecal hemorrhage forming adhesions
    - Clumping of nerve roots instead of gently arching nerve roots
    - May adhere to the dura resulting in empty appearing thecal sac

Arachnoiditis

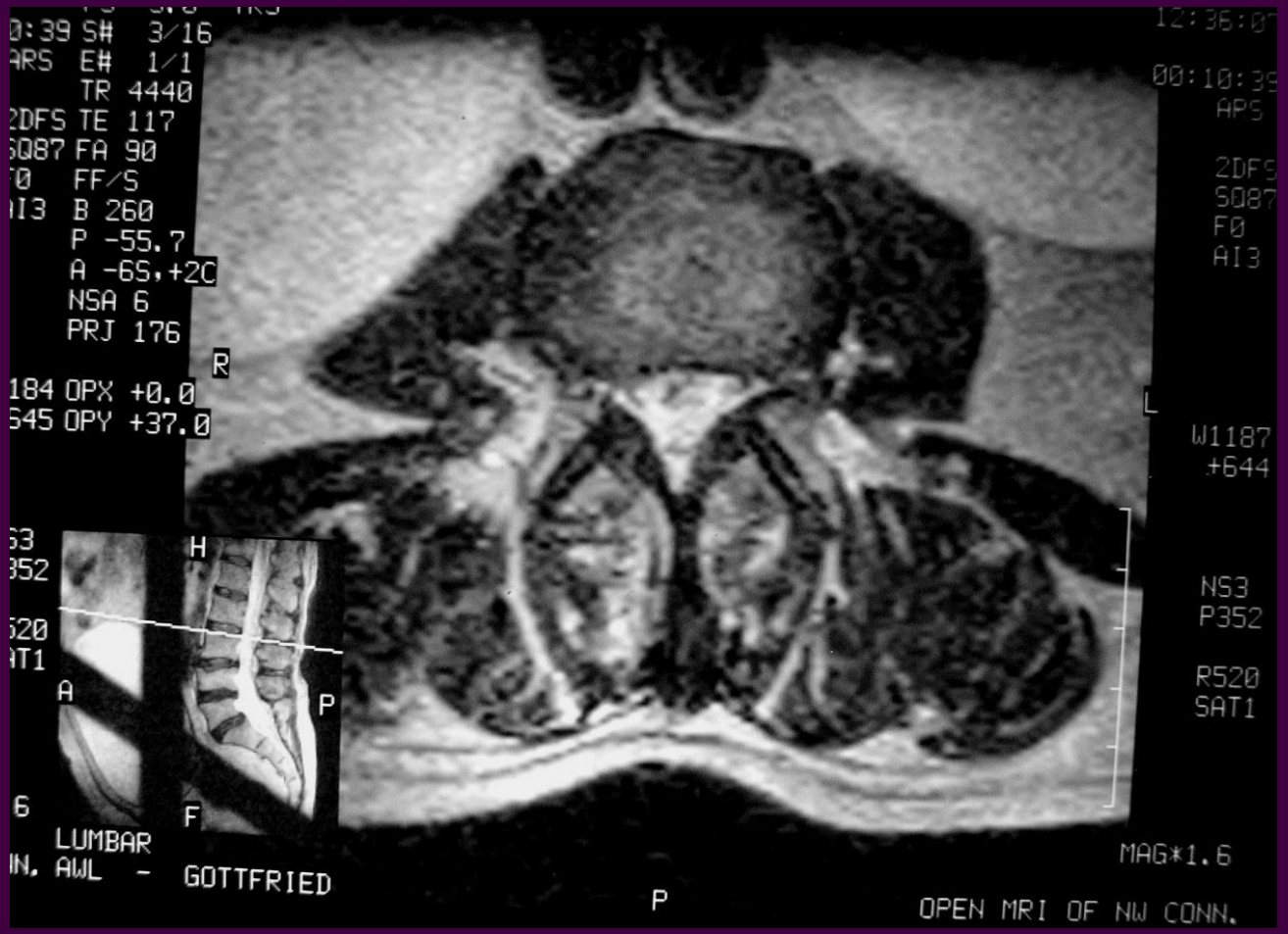


Case courtesy of Dr Marcin Czarniecki, Radiopaedia.org, rID: 26210

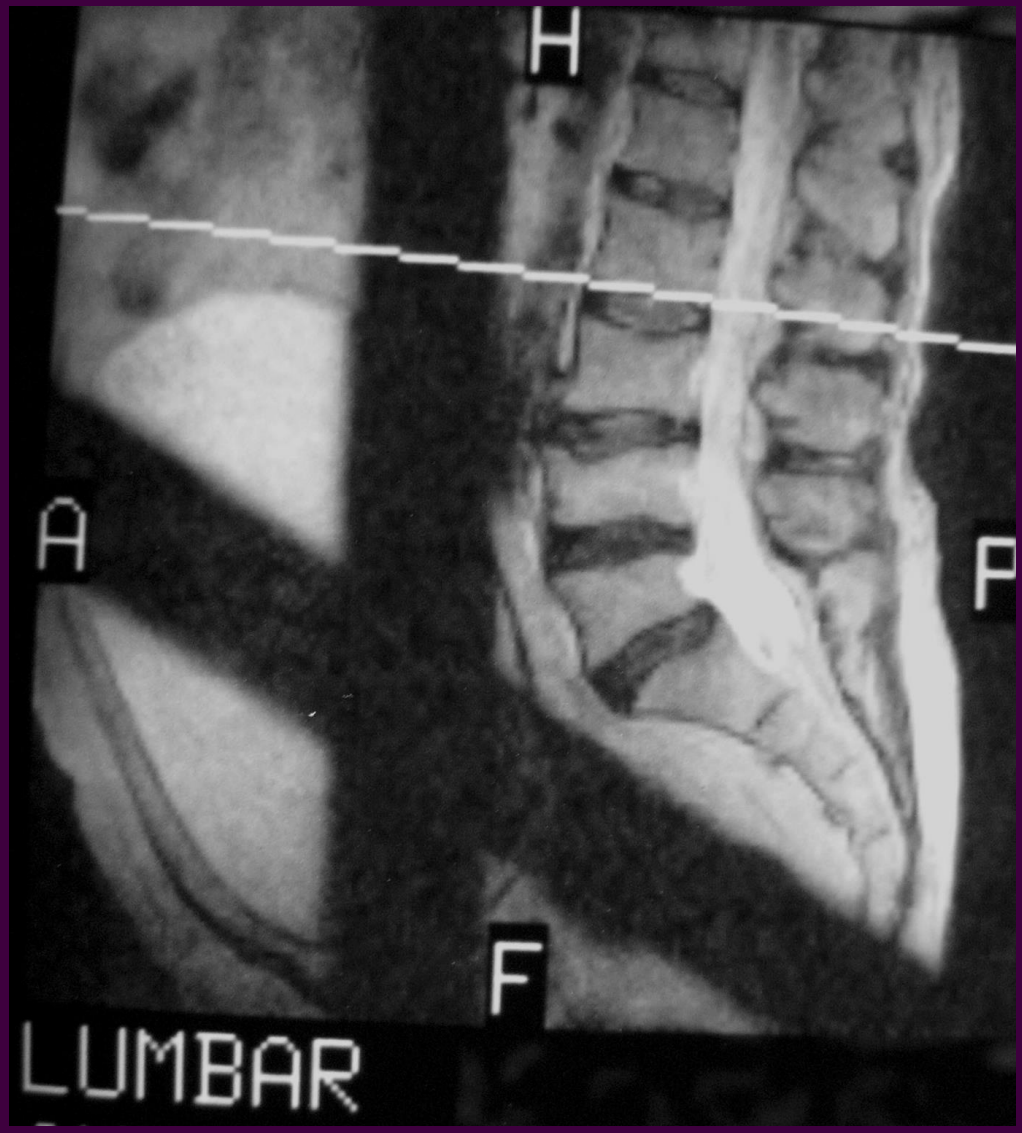
Case 5: 75 yr old male

- Radicular symptoms along L4/L5 nerve root dermatome
  - Mild low back pain
  - History of fall 2 yrs previous no films or follow-up
  - History of psoriatic arthritis

Case 5: 75 yr old male



Case 5: 75 yr old male

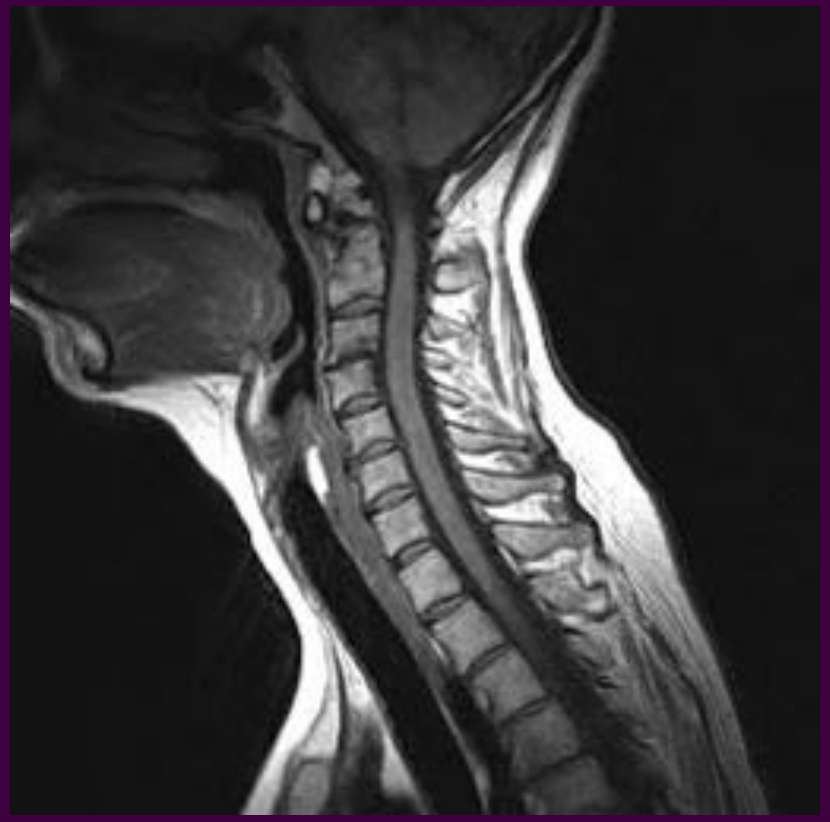


Case 5: 75 yr old male

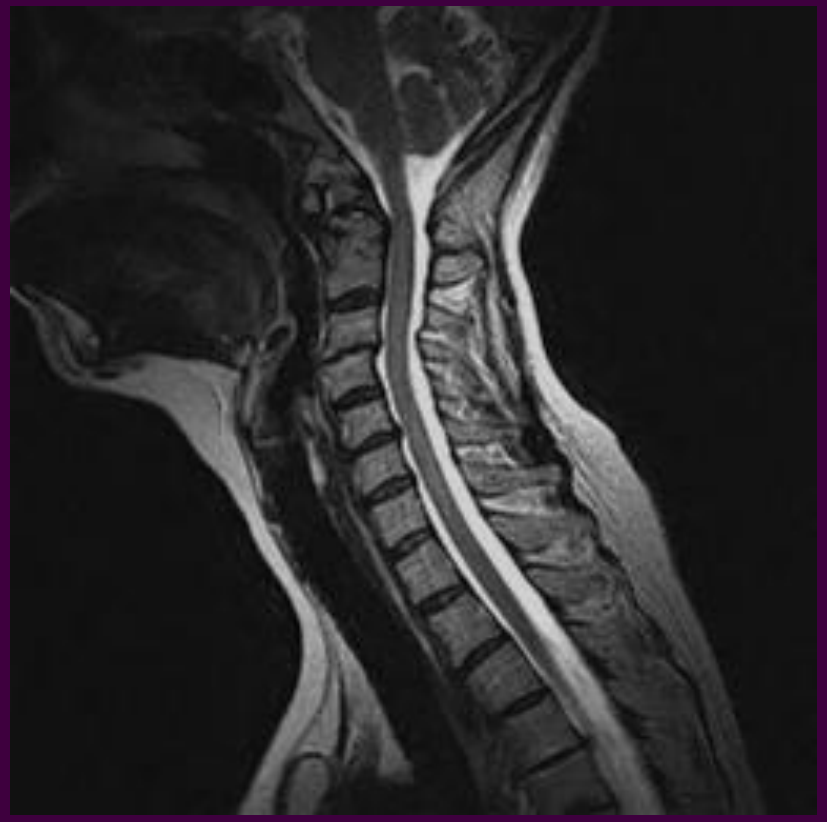
Case #6: 39 y.o. female

Case #6: 39 y.o. female

Case #7



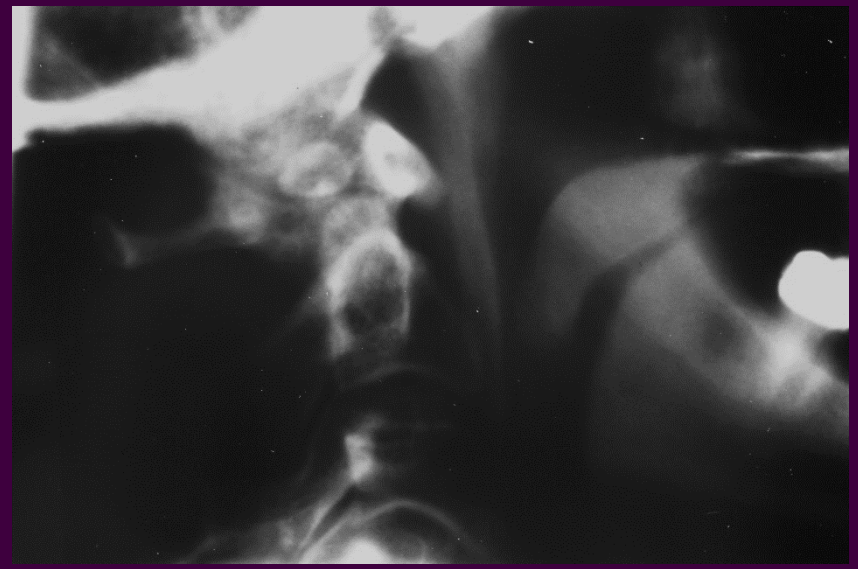
T1 Neutral



T2 Neutral

T2 Flexion

Case #7: Os Odontoideum



End of Spinal Trauma Section