Cervical Spine Injuries

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INTRODUCTION

- Classification and Eponymous fractures of cervical spine
- Early management
- Closed reduction technique
- Halo traction

Anatomy

- 7 cervical vertebrae
- Facet joint articulations permit great degree of movement
- 30 degrees lordosis - energy dissipation
- Axial load on flexed spine – injures discs and body

Common Areas

- Almost always C1-2 or C5-7

  (Jefferson - JBJS 1920)

- C2 and C5 in 75% cases

  (Meyer - Surg Spine trauma 1989)

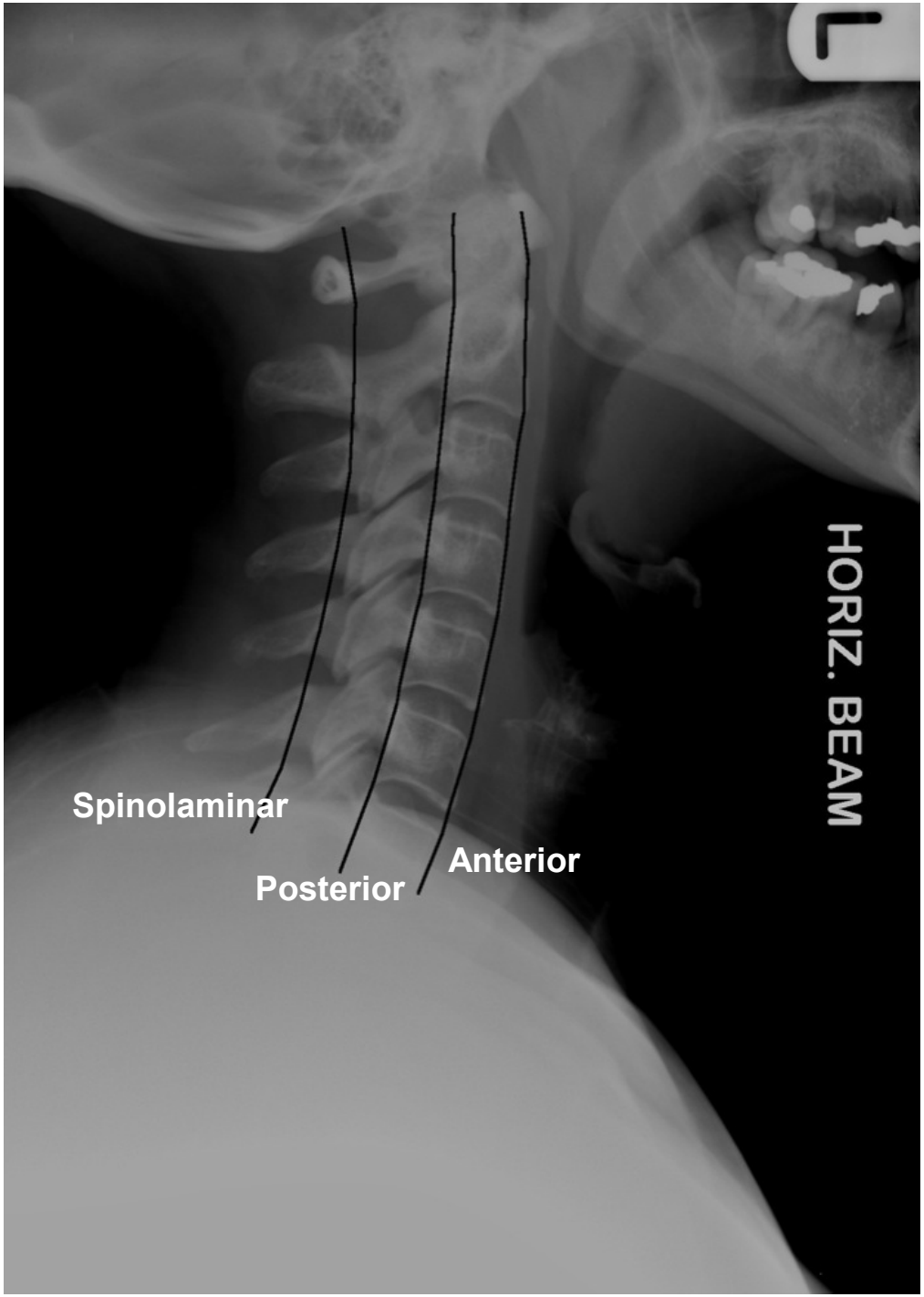
Neuro- Deficit

- 40 % of C- spine injuries ass. with neurological deficit
- 10% cord injuries have radiological evidence of vertebral injury

Neuro- Deficit

- Elderly Spondylitic spine – Hyperextension injury
- Young with congenitally narrow canal

Radiographs



Radiographs

NORMAL SOFT TISSUE WIDTH

Above C4 < 50% body width

Below C4 upto 100% body width

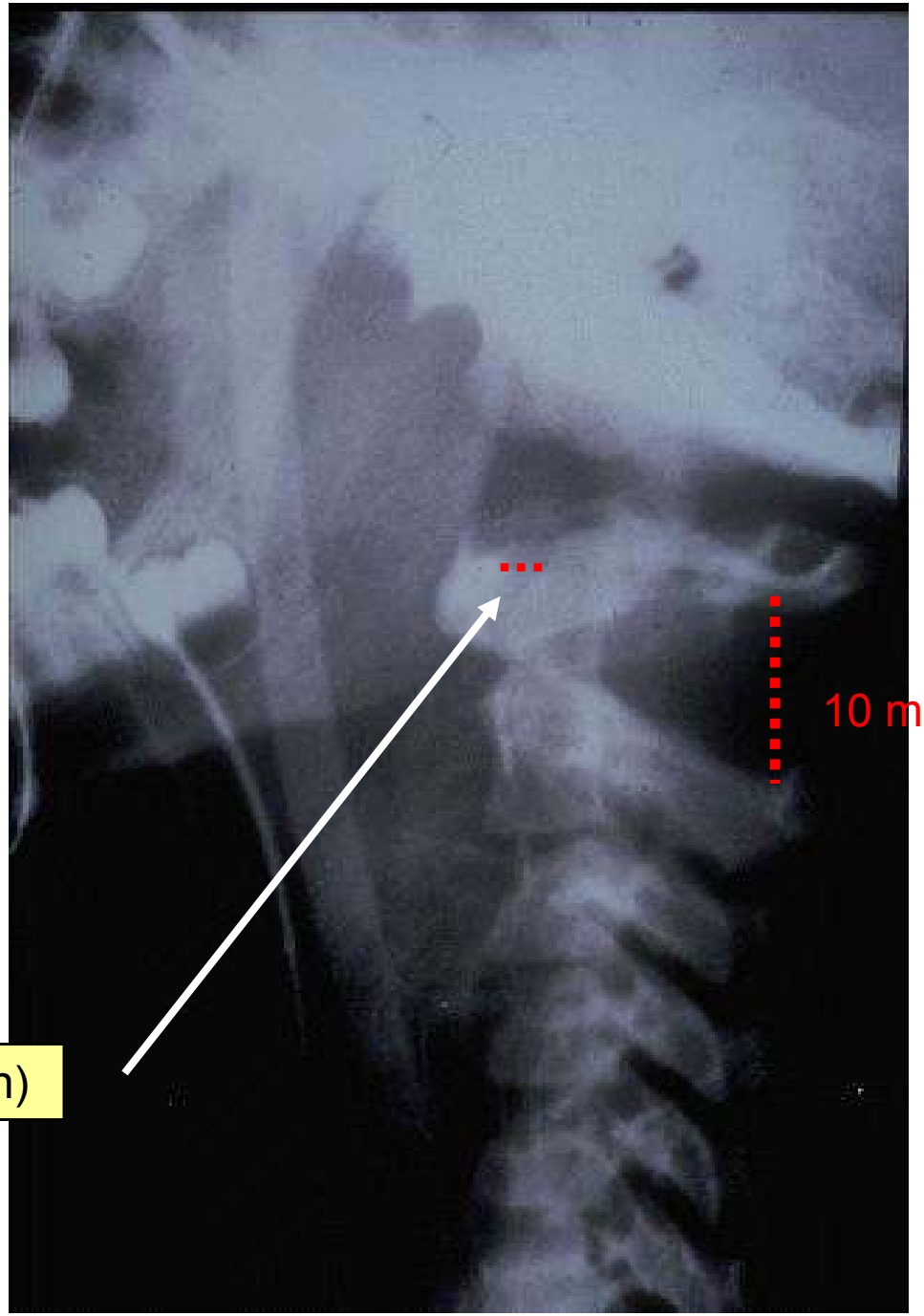
Uni-Facetal
< 50%

Bi-Facetal
> 50%

MRI – traumatic disc herniation

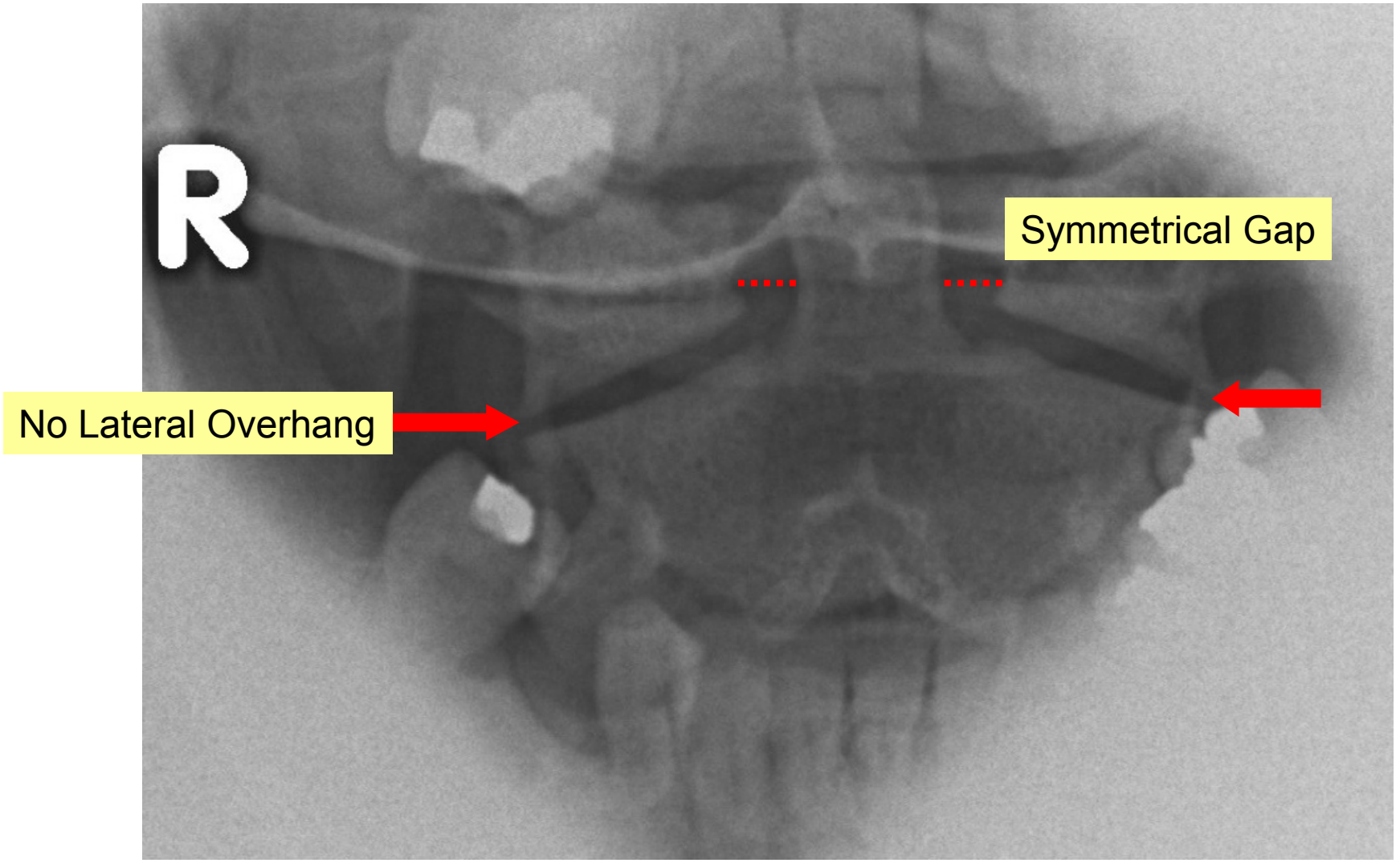
Atlanto-Occipital Articulation

Minimal Soft tissue shadow anteriorly



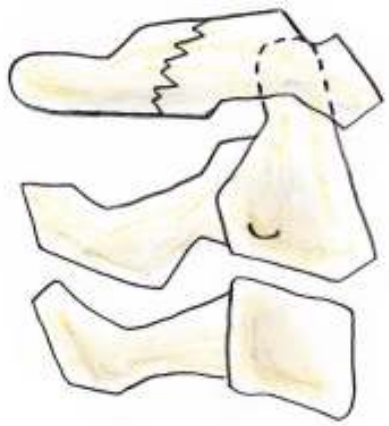
ADI < 3mm (in flexion)

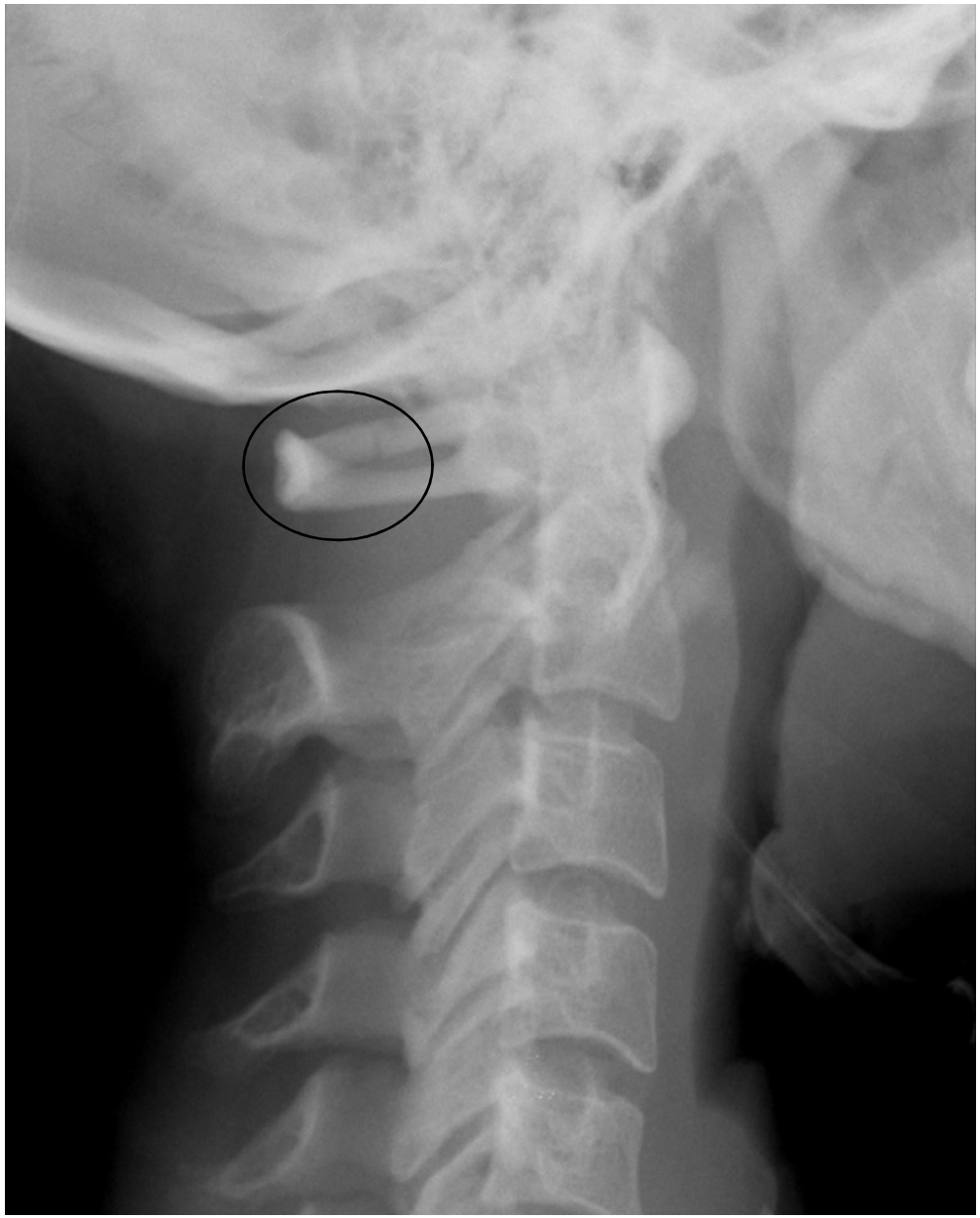
Peg View



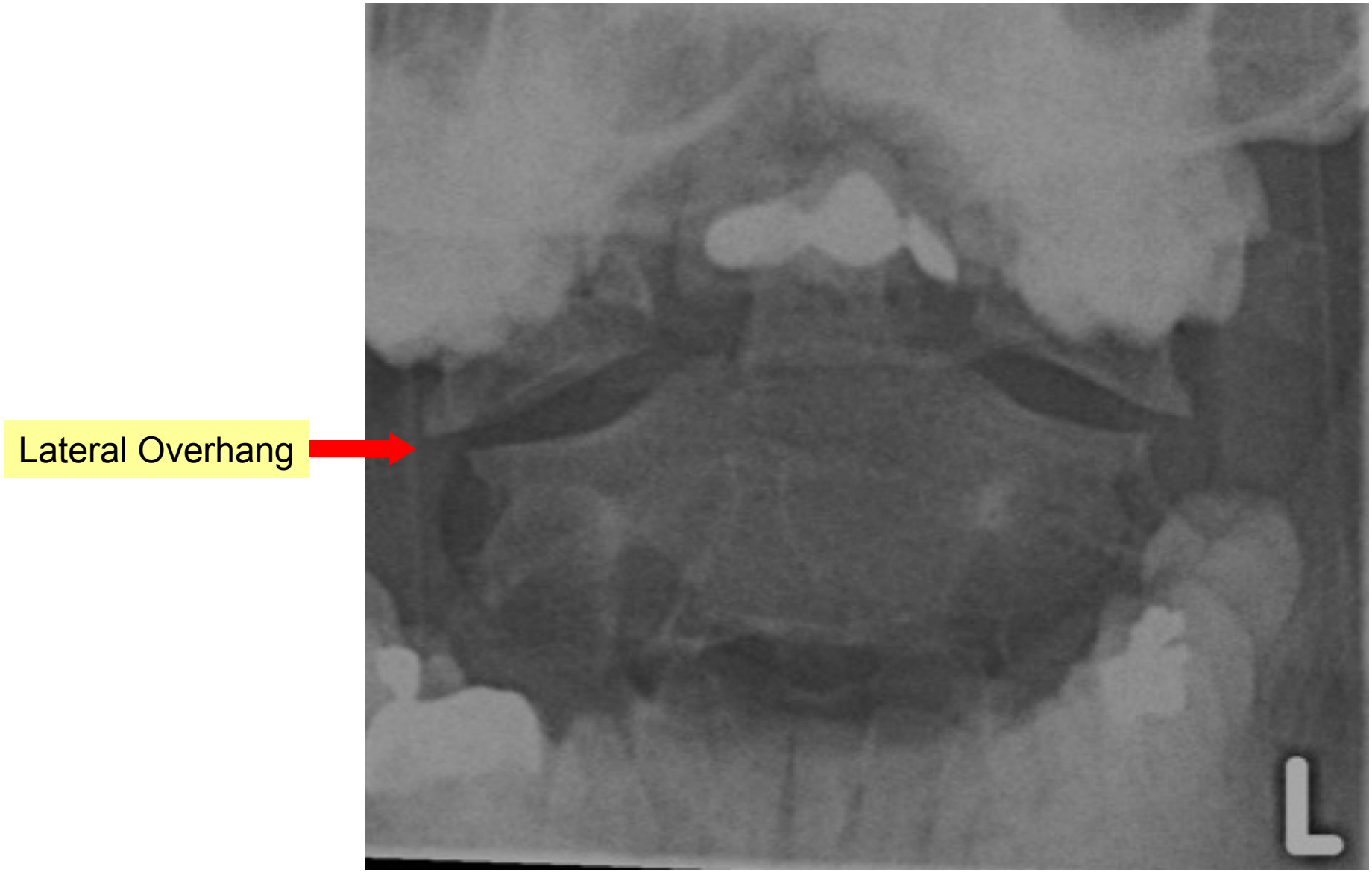
C1- C2 Fractures

C-1 Arch fracture





Jefferson's (Burst) Fracture of C1



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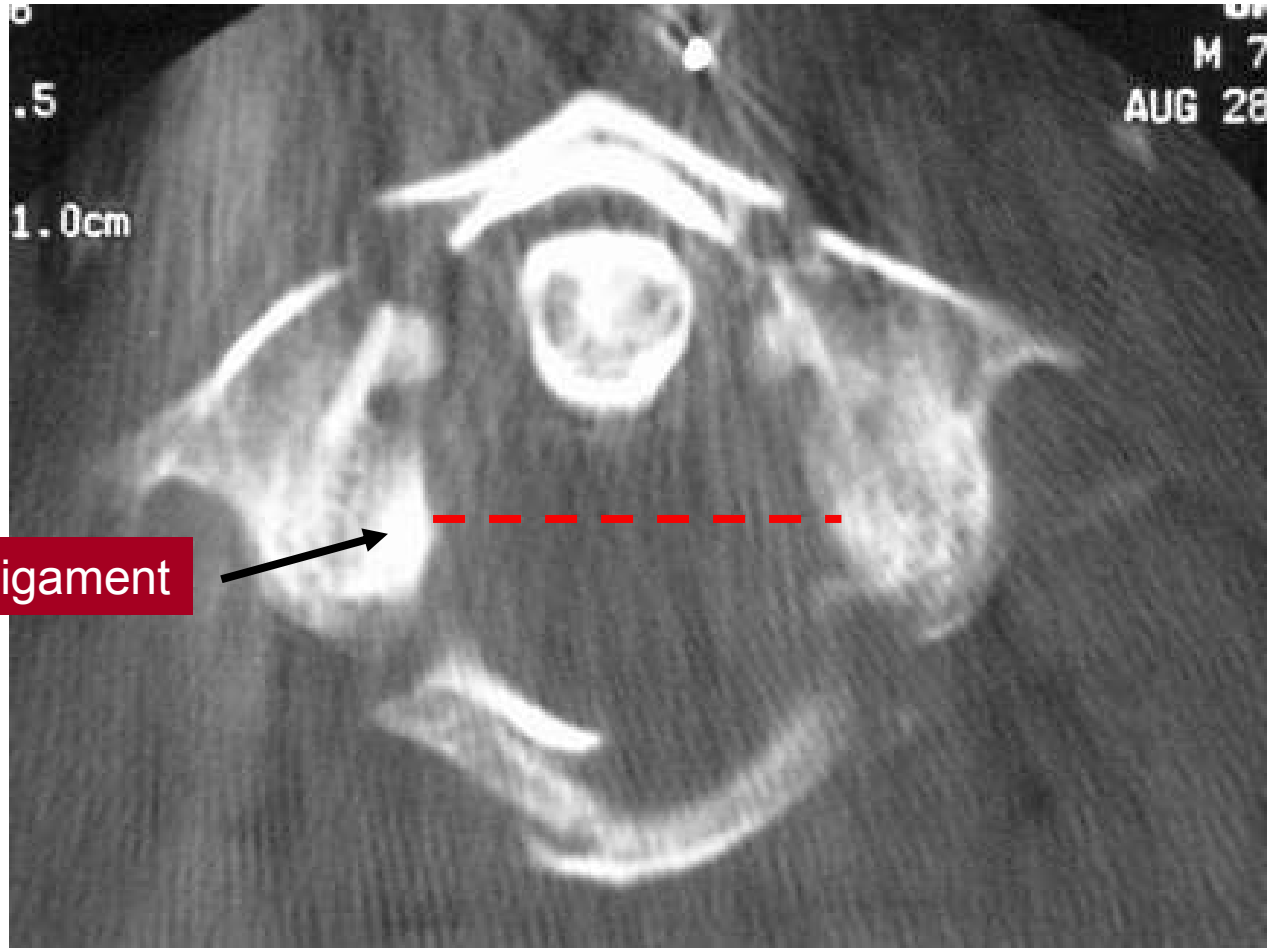
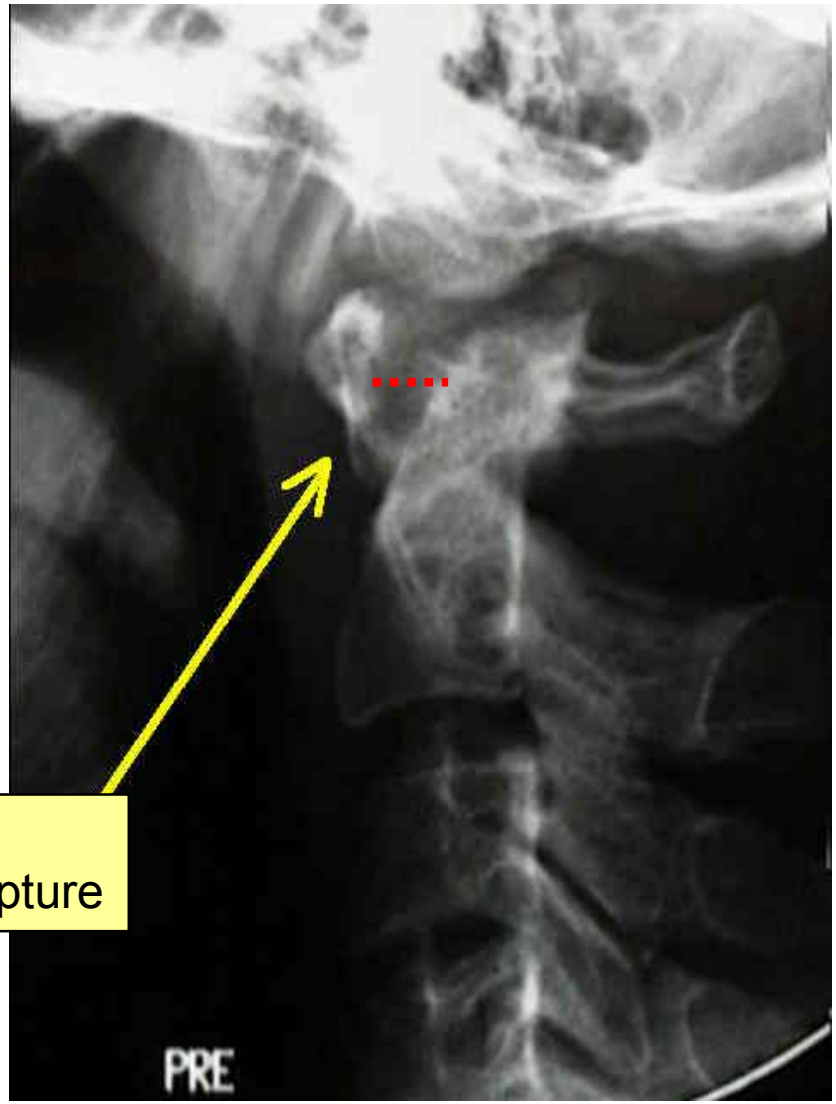


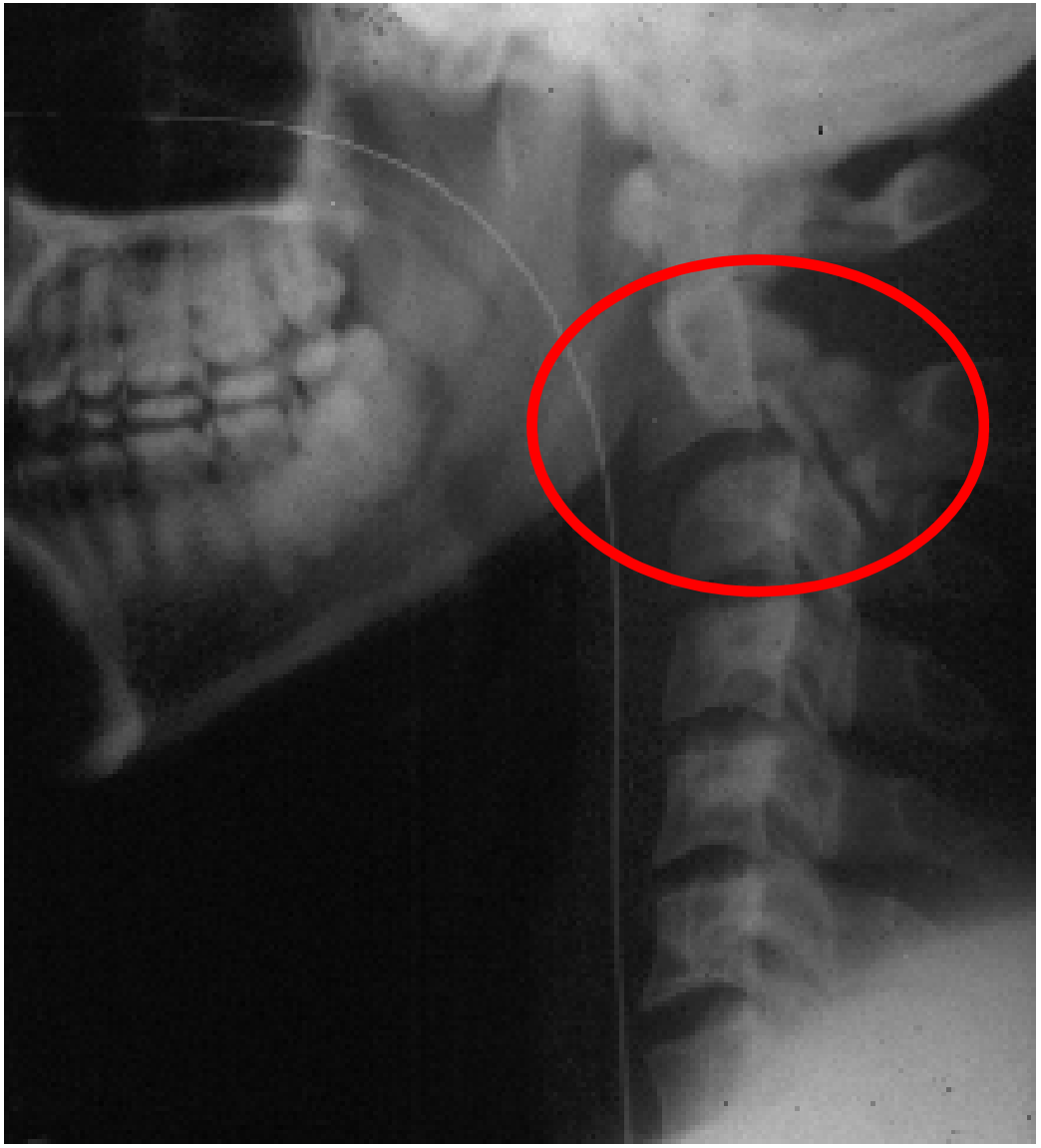
Unstable Jefferson's Fracture of C1

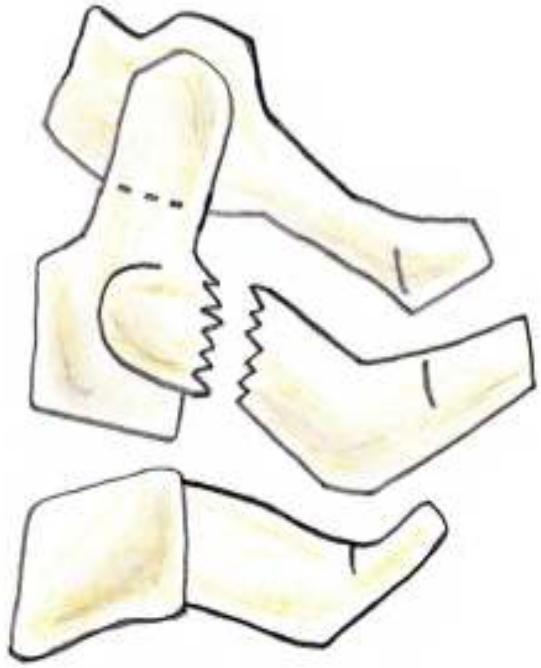


ADI > 3mm (in flexion)
= Transverse Ligament rupture

Hangman's Fracture

(*Traumatic C2-3 Spondylolisthesis*)





MOBITE


44Y/F
Sagittal 18
SU/HF/
INTERP-3/FC30/ORG//R
SUNDERLAND ROYAL HOSPITAL
120kV/ 150mAs
44Y/F
Sagittal 22
SU/HF/
INTERP-3/FC30/ORG//R
SUNDERLAND ROYAL HOSPITAL
WL=415
WW=1781
Asteion F
AE084509/04
S 99 4mm
11153 2 23
66 00mm
6 0mm 1111
0 0D
(256,252)
44Y/F
Sagittal 19
SU/HF/
INTERP-3/FC30/ORG//R
SUNDERLAND ROYAL HOSPITAL
120kV/ 150mAs
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AE084509/04
S 99 4mm
11153 2 24
69 00mm
6 0mm 1111
0 0D
(256,252)
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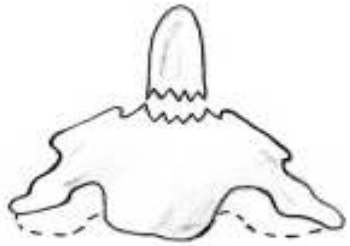
Anderson & D'Alonzo's classification of Odontoid Fractures

A

Type 1

B



Type 2

C

Type 3

Subaxial Fractures (C3-C7)

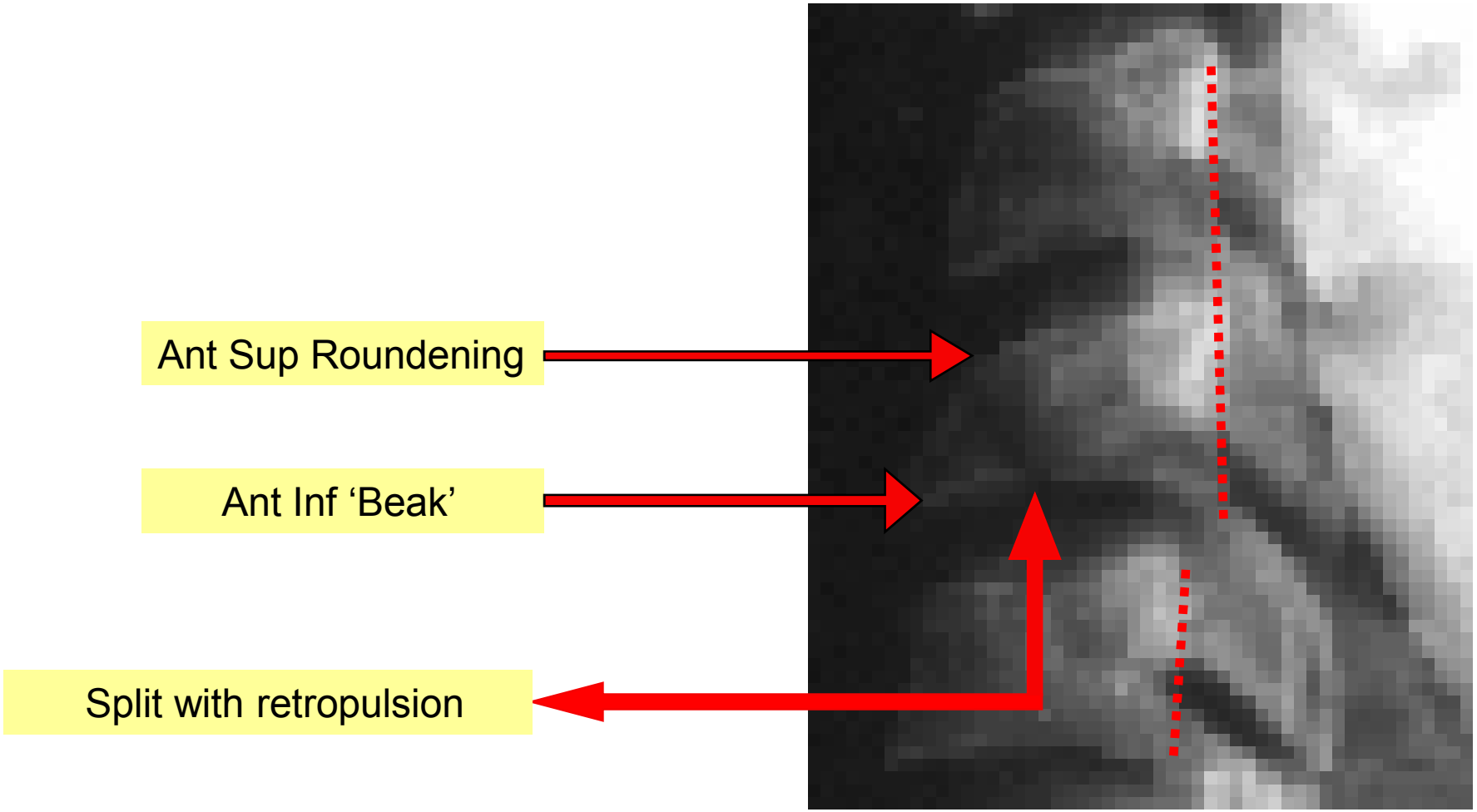
Allen's Subaxial C-Spine Injury Classification

(Based on Mechanism of Injury)

1.Compressive Flexion

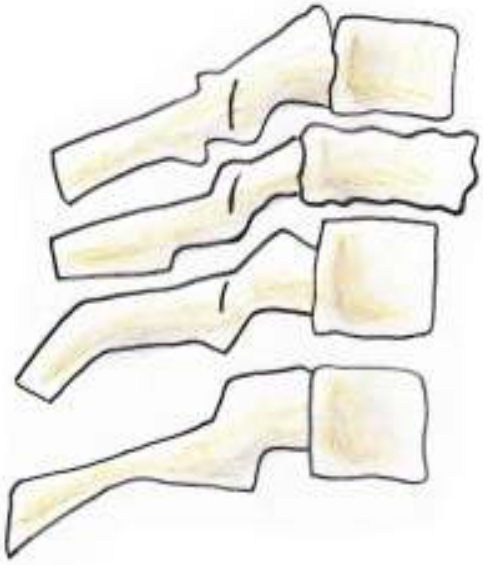
SPINE J 1982

1. Compressive Flexion

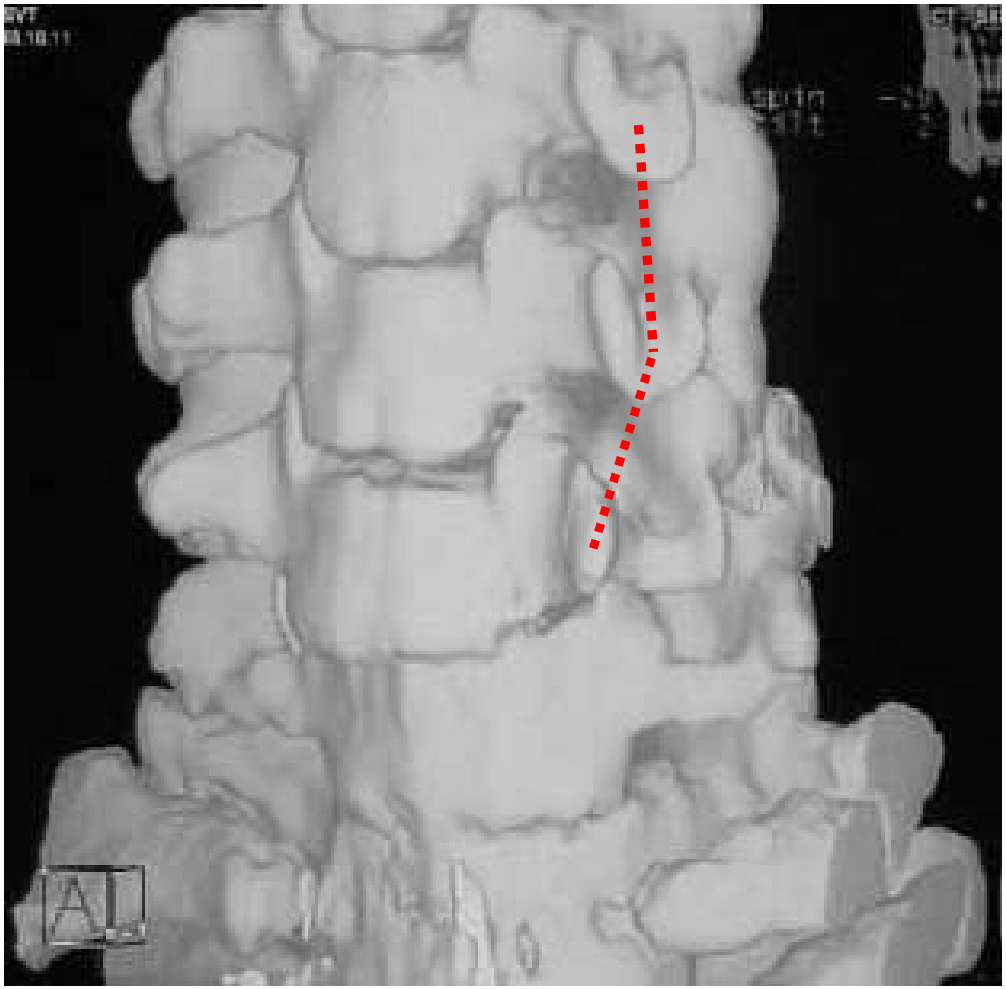


2. Vertical Compression

Pure compression with spine in neutral position – cupping of endplates



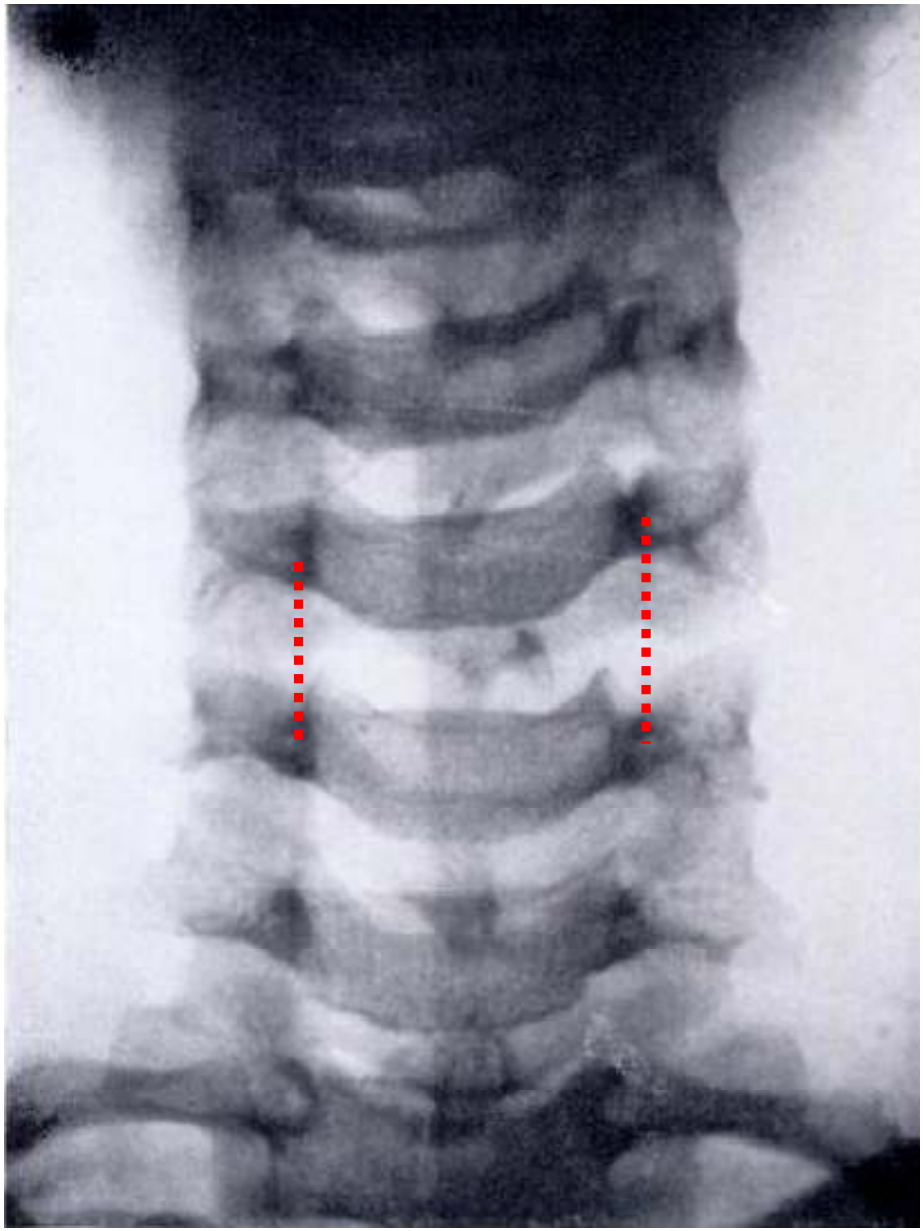
3. Compressive Extension



Arch # with rotatory displacement

4.Lateral Flexion

Asymmetrical compression # with contralateral ligamentous failure



5. Distractive Flexion

Posterior complex failure with uni-, bi- or total vertebral body displacement

Caution in applying traction in DF

6.Distraction Extension

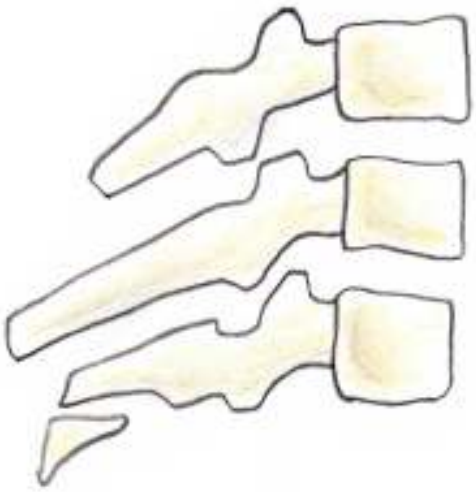
1. Failure of anterior ligamentous complex
2. Retrolisthesis
3. Slight widening of disc space

Caution while applying traction in DE Fractures

Clay Shoveler's Fracture

Avulsion fracture
of base of spinous
process – flexion injury.

C7 - common



Initial Management of Cervical Spine Injuries

Preadmission Immobilization

- Hard cervical collar
- Supportive blocks and tape
- Back board and straps

Initial Management - ATLS

- Airway (with Spine Precautions)
- Breathing
- Circulatory
- Disability (Neurologic Exam)
- Exposure

Motor Examination of the Upper Extremity

- C5- elbow flexion
- C6- wrist extension
- C7- wrist flexion/ finger extension
- C8- finger flexion
- T1- Finger abduction

Motor Examination of the Lower Extremity

- L2- hip flexion
- L3- knee extension
- L4- foot dorsiflexion
- L5- EHL
- S1- FHL

Sensory Examination

- Check + document pain, temperature, proprioception and vibration

- Acutely, sensory sparing to pin prick in a motor segment w/ grade 0 power indicates an *85% chance of motor recovery* to at least grade 3. ***(AR Poyton et al. JBJS 1997)***

Reflex Examination

Spinal Shock - cord concussion (24-72 hour) - period of **paralysis**, **hypotonia**, & **areflexia.**

(Usually, if no recovery in 4 hours then unlikely to recover completely)

End of Shock

- hyperreflexia, hypertonicity, and clonus.
- The return of reflex activity below level of injury (such as bulbocavernosus reflex)

Reflex Examination

Bulbocavernosus Reflex

- Anal sphincter contraction in response to squeezing the glans penis, clitoris or tugging on the Foley.
- **S 1- 3**
- Absence - continuation of spinal shock

American Spine Injury Association (ASIA) Impairment Scale

- **A = Complete**
- **B = Incomplete**: sensory preserved; no motor
- **C = Incomplete**: motor preserved; but < grade 3
- **D = Incomplete**: motor preserved; > grade 3
- **E = Normal**

- *Incomplete SCI - any spared motor or sensory function below level of injury = good recovery potential.*

Early Management of Acute Cervical Spinal Cord Injury

- **AVOID HYPOTENSION!**

  ** (Hypotension is always due to Hypovolaemic Shock and Spinal Shock is a diagnosis of exclusion)*

- MAP at 85-90 mm Hg for the first week.

- Keep 100% O2 saturation via nasal cannula.

- Early closed/open reduction and decompression if necessary.

Steroids in Acute SCI

- **CONTROVERSIAL**

- **NASCIS 3 RCT (1997) findings –**

  - **48 hr MPSS ~ to 24 hr MPSS ~ Tirilazad(lipid preoxidation inhibitor) if started before 3 hrs**

  - **48 hr MPSS recovered more motor function if started 3-8 hrs after**

  - **Pneumonia and Sepsis was highest with 48 hr MPSS.**

* ACS, Canadian Ass. Of Emergency Practitioners, Congress of Neurological surgeons – challenged the findings.

CURRENT RECOMMENDATION –

Follow Local or regional protocols – if steroids administered do so before 8 hours.

Goals in C-Spine Injuries

- Treat concomitant injuries
- Preserve neurologic function
- Enhance neurologic recovery
- Maximize functional recovery

- **Clinical instability** is the inability of the spine to protect the spinal cord or nerve roots from initial or subsequent damage and prevent the development of incapacitating deformity or severe pain under physiological loads.

  (White & Panjabi 1990)

Indications For Spinal Stabilisation

- Anterior elements destroyed (2 Points)
- Posterior elements destroyed (2 Points)
- Positive stretch test (2 Points)

White and Panjabi

Indications For Spinal Stabilisation

Resting radiographs

Sagittal plane displacement

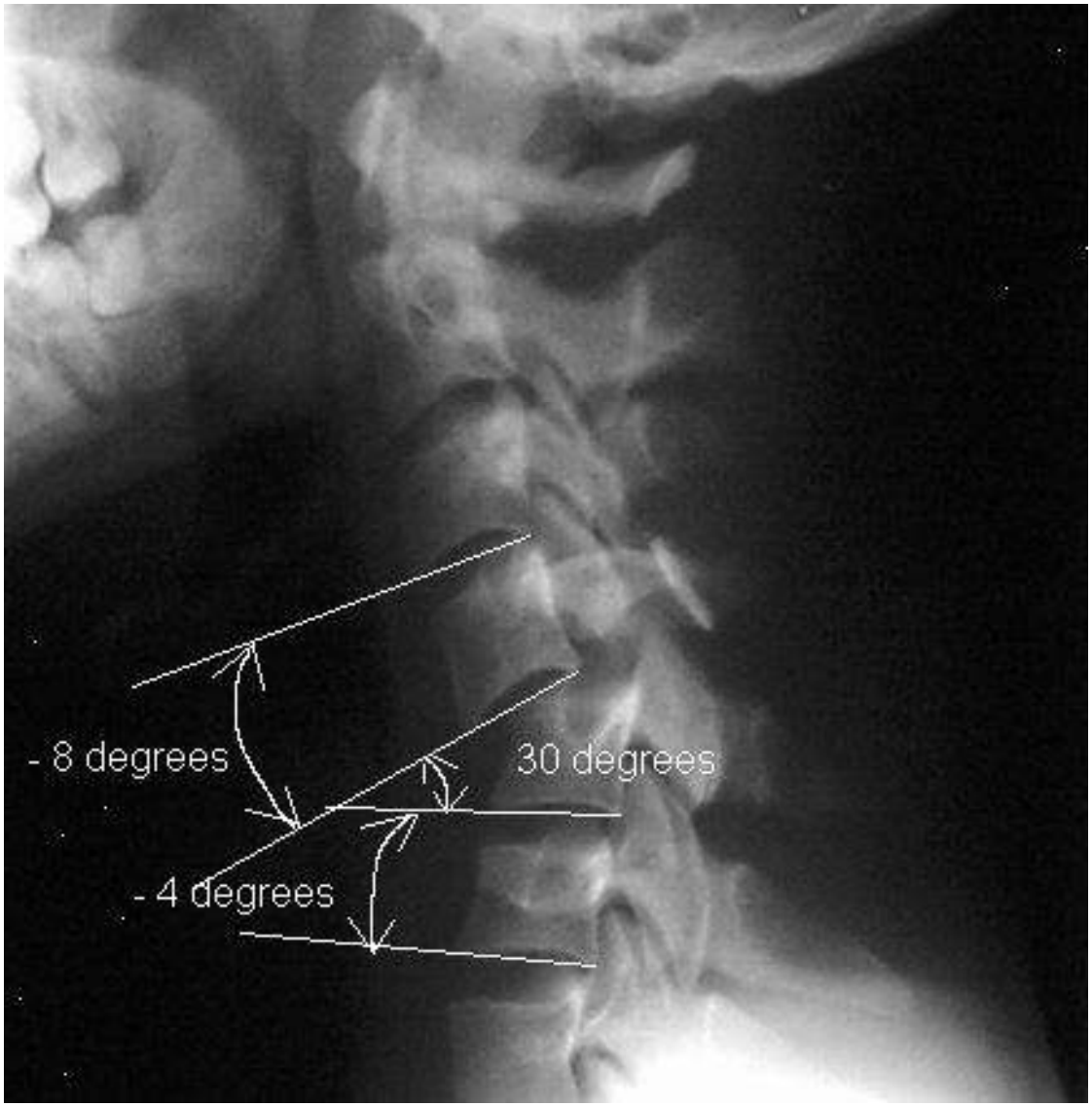
(a) > 3.5mm or

(a/b) > 20% (1 point)

White and Panjabi

Resting Radiographs

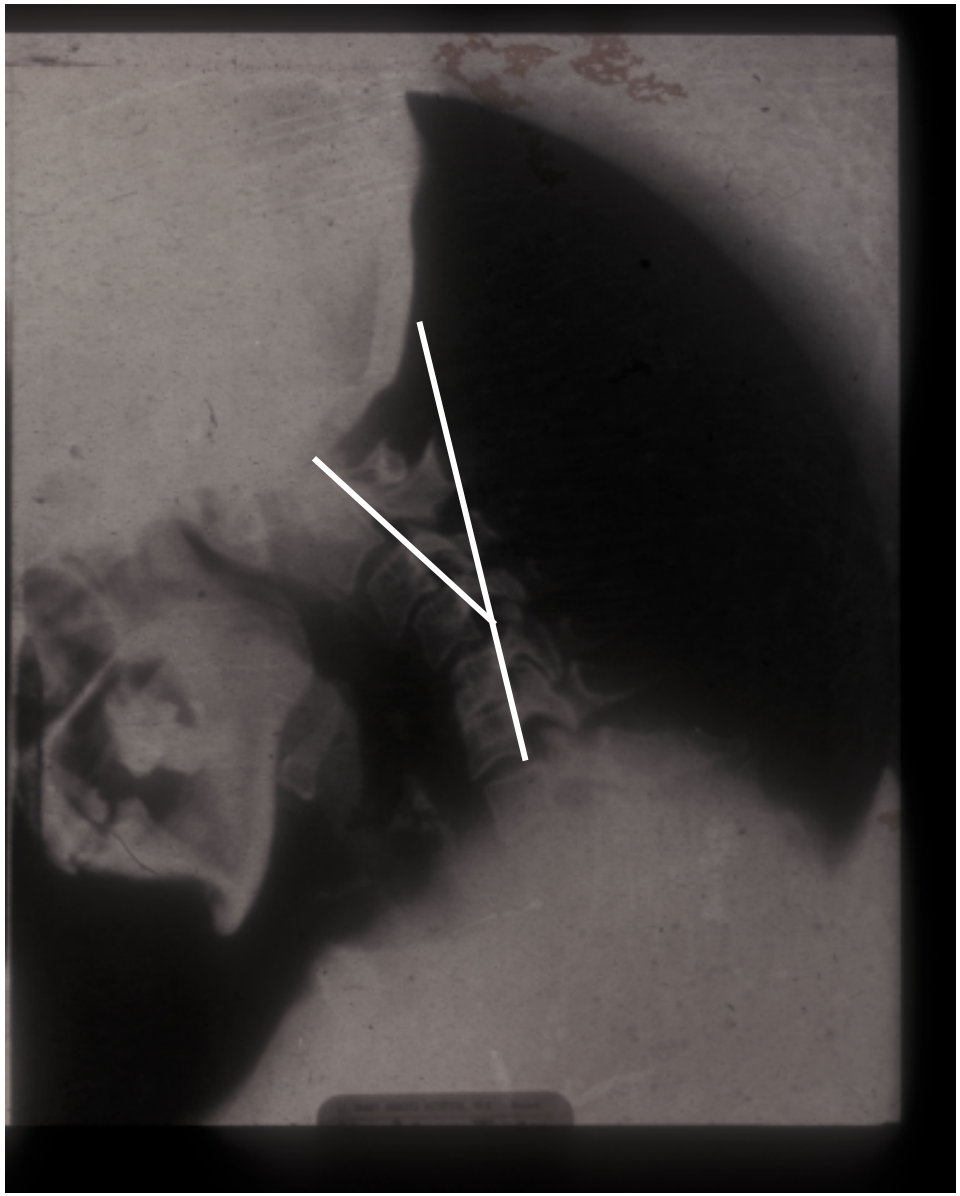
Relative sagittal plane angulation **> 11 degrees** (1 point)



White and Panjabi

Flexion-extension radiographs

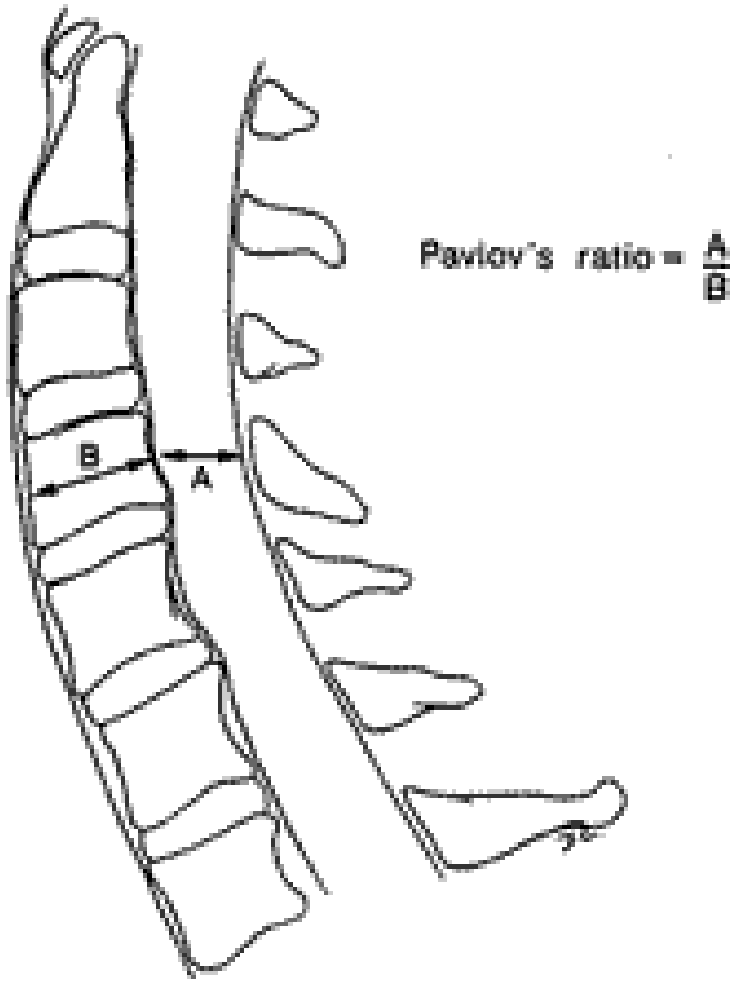
- Sagittal plane translation > **3.5mm** or 20% (1 point)
- Sagittal plane rotation **> 20 degrees** (1 point)



White and Panjabi

Developmentally narrow spinal canal

- Sagittal diameter **< 13mm** (1 point)
- Pavlov ratio **< 0.8** (1 point)



White and Panjabi

- **Abnormal disc narrowing** (1 point)
- **Spinal cord damage** (2 points)
- **Nerve root damage** (1 point)
- **Dangerous loading anticipated** (1 point)

Sum Total > 5 Points = Unstable

White and Panjabi

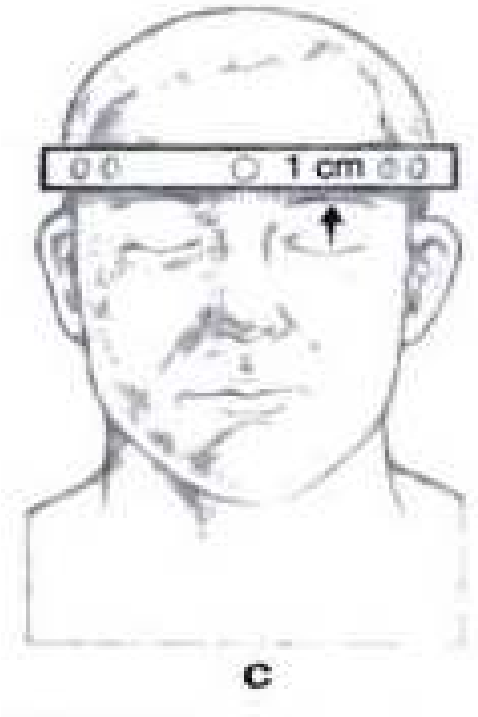
Halo Application

- To control C1-2 articulation
- Contraindicated in skull # and skin trauma
- Spine board – axial traction, occipital support
- Size the halo
- 4 holes – 2 anterior and 2 posterior

Halo Application

Anterior Pins

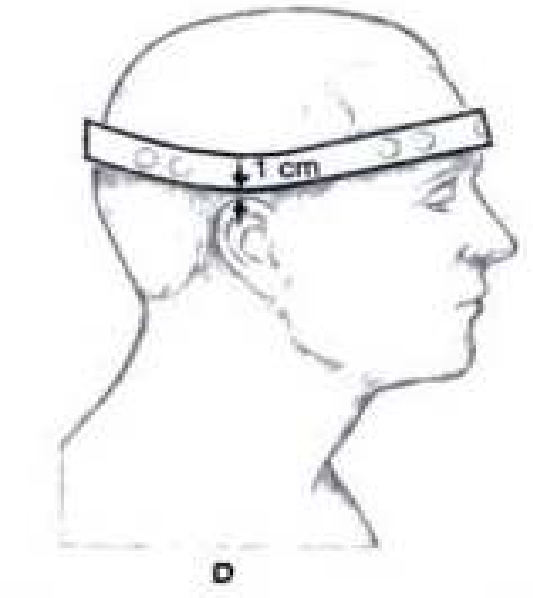
- Between Supraciliary ridge and frontal prominence
- Superior to outer half of eyebrow – avoid Supraorbital NV
- Med – Frontal sinus
- Inf - orbit

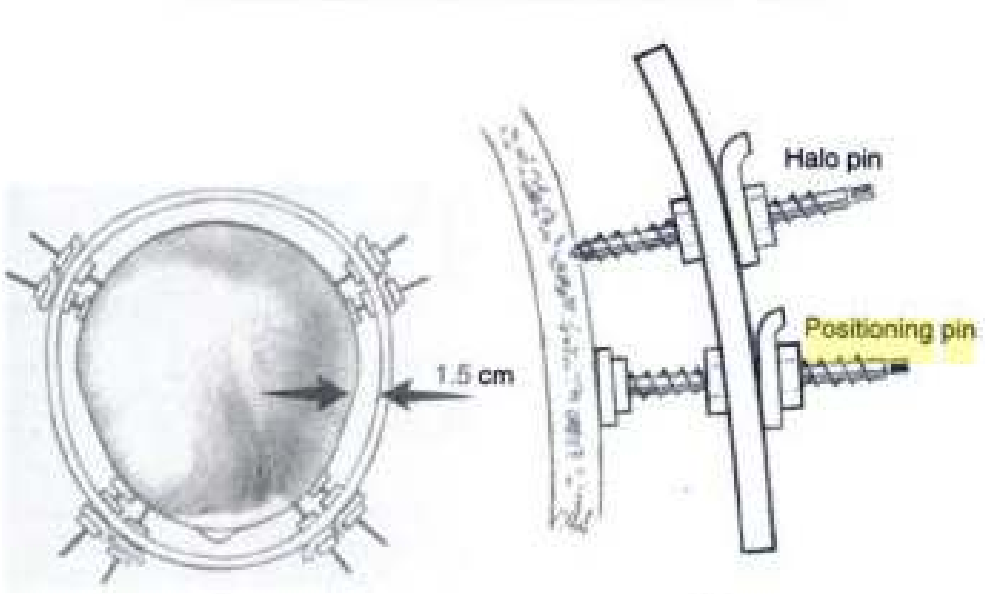


POSTERIOR PINS

- 1cm above ear

- Diagonally opposite to anterior pin





Technique

- Stab incision
- Tighten diagonally opposite pins
- 6-8 pounds torque screw driver
- check daily

Role Of Skull Traction

Used for '**Reduction of facet dislocations**'

TECHNIQUE

- **Crutchfield's rule** – Start with 10 lbs for head and 5 lbs for each level, max. 30-40 lbs.
- Weights are serially added, neck in flexion.
- After each 2.5kg weight - lateral X ray + neurology
- 20 kg. traction maximum for a few hours only.
- After reduction the neck is placed in extension and reduce weights

Summary

- Eponymous fractures – Jefferson's #, Hangman's #
- Allen's classification of sub-axial #s
- Early management
- Halo application technique
- Technique of closed reduction

Thank You