



Cervical Spine Injuries: What Should I Know?

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Cervical Fracture Summary

USUALLY STABLE

- Type 1 and Type 3 Dens*
- Occipital condyle fractures*
- C1 ring fractures**
- Non displaced facet fractures
- Transverse process fractures
- Isolates spinous process fractures
- Isolated osteophyte fractures

SOMETIMES UNSTABLE

- Type 2 Dens
- Type II Hangman's
- Atypical Hangman's
- Floating lateral mass fractures
- Burst fractures

ALWAYS UNSTABLE

- AOD
- Facet dislocations
- Flexion teardrop
- Type III Hangman's
- Flexion distraction
- Displaced facet fractures







Evaluation of the Cervical Spine for the Trauma Surgeon

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Defining Instability

- “the loss of the ability of the spine under **physiologic loads** to maintain its patterns of displacement so there is no initial or additional **neurologic deficit**, no major **deformity**, and no **incapacitating pain**”

-White and Panjabi

Topics

- Initial Evaluation
- Cervical Clearance
- Radiographic Assessment
- Case Example

Initial Evaluation

- ATLS guidelines of the American College of Surgeons
- “all trauma patients should be presumed to have an unstable cervical spine injury” ... until all aspects of the cervical spine have been adequately studied and an injury excluded.”

H & P

- History
 - Mechanism
 - Anticoagulation
 - Numbness/weakness
- Physical Examination
 - Midline tenderness -stepoffs
 - Motor and Sensory Examination
 - Rectal Examination

45 y/o male

- History
 - Fell from skateboard
 - No other injuries
 - Denies Pain/weakness
 - GCS 15
 - Normal state of mind
 - Placed in collar
- Physical Examination
 - No midline TTP
 - Neurointact
 - Normal rectal tone

Physical Exam

STANDARD NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY

MOTOR

KEY MUSCLES

	R	L
C2		
C3		
C4		
C5		
C6		
C7		
C8		
T1		
T2		
T3		
T4		
T5		
T6		
T7		
T8		
T9		
T10		
T11		
T12		
L1		
L2		
L3		
L4		
L5		
S1		
S2		
S3		
S4-5		

Elbow flexors
Wrist extensors
Elbow extensors
Finger flexors (distal phalanx of middle finger)
Finger abductors (little finger)

0 = total paralysis
1 = palpable or visible contraction
2 = active movement, gravity eliminated
3 = active movement, against gravity
4 = active movement, against some resistance
5 = active movement, against full resistance
NT = not testable

Hip flexors
Knee extensors
Ankle dorsiflexors
Long toe extensors
Ankle plantar flexors

☐ Voluntary anal contraction (Yes/No)

TOTALS ☐ + ☐ = ☐ **MOTOR SCORE**
(MAXIMUM) (50) (50) (100)

SENSORY

KEY SENSORY POINTS

	R	L
C2		
C3		
C4		
C5		
C6		
C7		
C8		
T1		
T2		
T3		
T4		
T5		
T6		
T7		
T8		
T9		
T10		
T11		
T12		
L1		
L2		
L3		
L4		
L5		
S1		
S2		
S3		
S4-5		

0 = absent
1 = impaired
2 = normal
NT = not testable

Any anal sensation (Yes/No)

TOTALS ☐ + ☐ = ☐ **PIN PRICK SCORE** (max: 112)
☐ + ☐ = ☐ **LIGHT TOUCH SCORE** (max: 112)
(MAXIMUM) (56) (56) (56) (56)

NEUROLOGICAL LEVEL
The most caudal segment with normal function

SENSORY MOTOR

	R	L
SENSORY		
MOTOR		

COMPLETE OR INCOMPLETE?
Incomplete = presence of any sensory or motor function in lowest sacral segment

ZONE OF PARTIAL PRESERVATION
Partially innervated segments

SENSORY MOTOR

	R	L
SENSORY		
MOTOR		

ASIA IMPAIRMENT SCALE

- ☐ **A = Complete:** No motor or sensory function is preserved in the sacral segments S4-S5.
- ☐ **B = Incomplete:** Sensory but not motor function is preserved below the neurological level and extends through the sacral segments S4-S5.
- ☐ **C = Incomplete:** Motor function is preserved below the neurological level, and the majority of key muscles below the 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.

CLINICAL SYNDROMES

- ☐ Central Cord
- ☐ Brown-Sequard
- ☐ Anterior Cord
- ☐ Conus Medullaris
- ☐ Cauda Equina

Imaging?

NEXUS Criteria: who doesn't need imaging?

- Normal level of alertness (GCS 15)
- No evidence of intoxication
- Absence of tenderness in the posterior midline
- Absence of a neurological deficit
- No distracting pain elsewhere

Clear Spine?

Cervical Clearance

Alert patient with normal cervical spine exam

- C-Spine can be cleared on clinical basis
- NEXUS + Active ROM

The Canadian C-Spine (cervical-spine) Rule (CCR) and the National Emergency X-Radiography Utilization Study (NEXUS) Low-Risk Criteria (NLC) are decision rules to guide the use of cervical-spine radiography in patients with trauma.

Imaging

- X-rays
- CT scan
- MRI

X-Ray



Landmarks and Lines

Lateral X-Ray:

Adequate Image?

- Visualize O-C
- Visualize T1
- Swimmer's view?

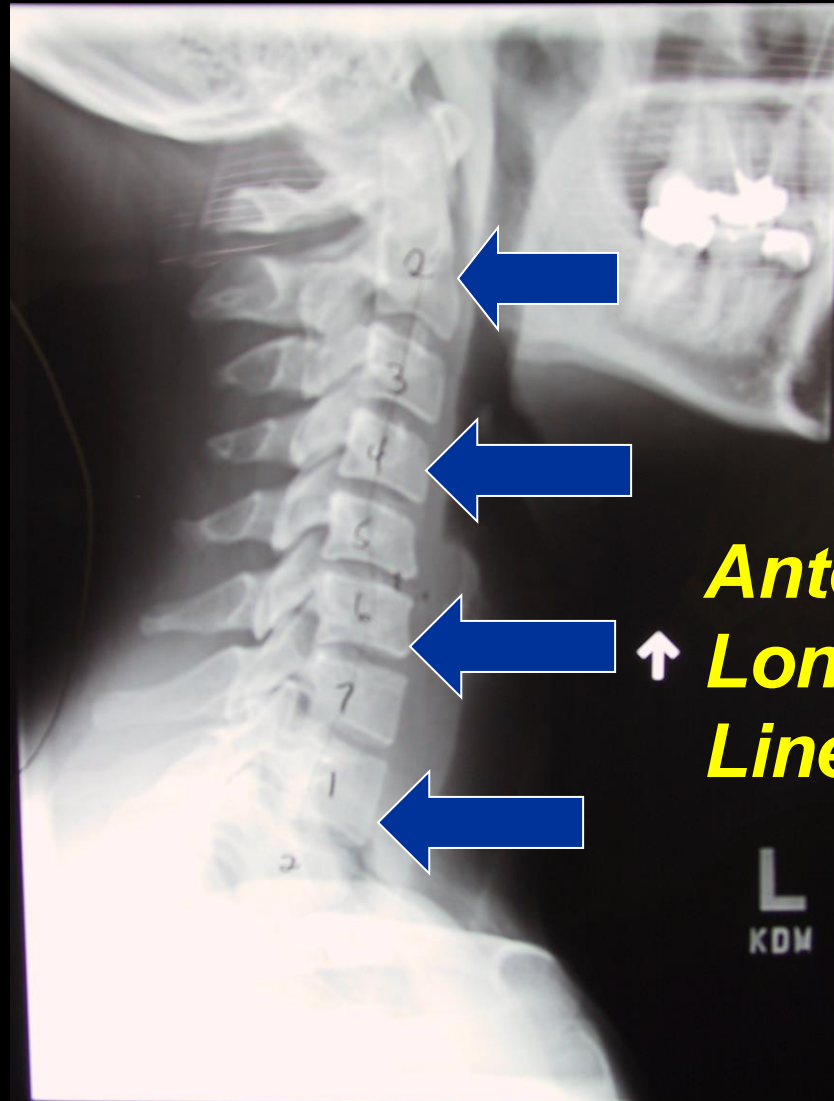
Assess:

- Alignment
- Disc Spaces
- Soft Tissues



Landmarks and Lines

Lateral X-Ray:

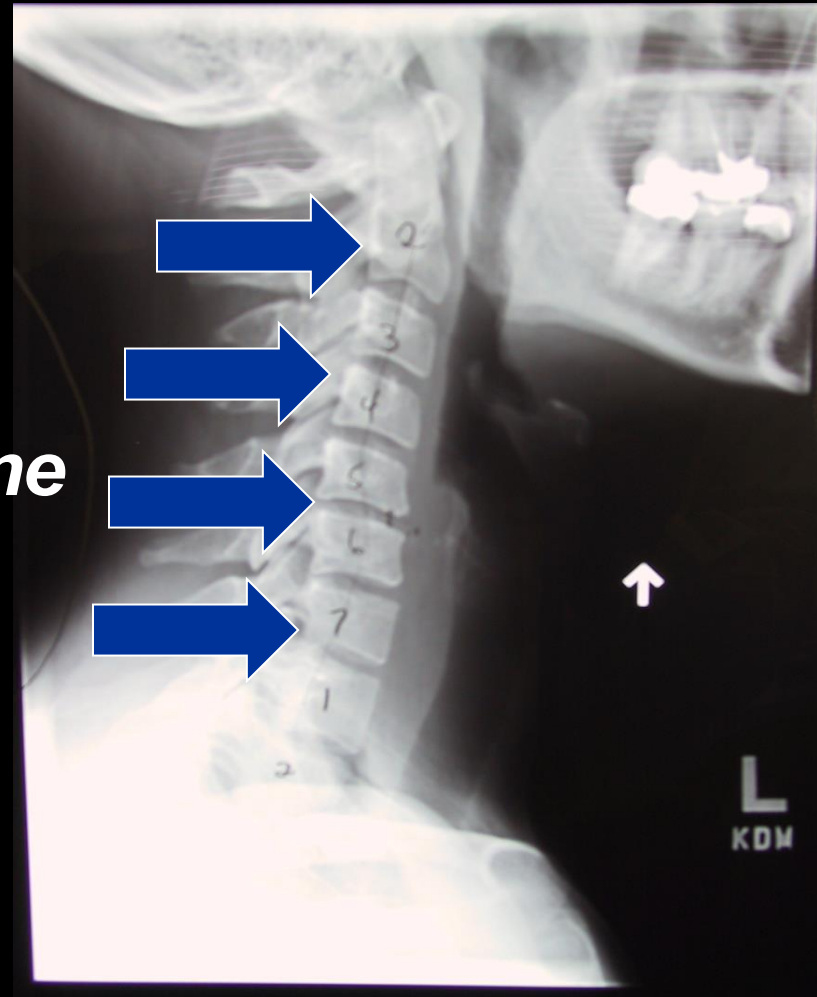


***Anterior
Longitudinal
Line (ALL)***

Landmarks and Lines

Lateral X-Ray:

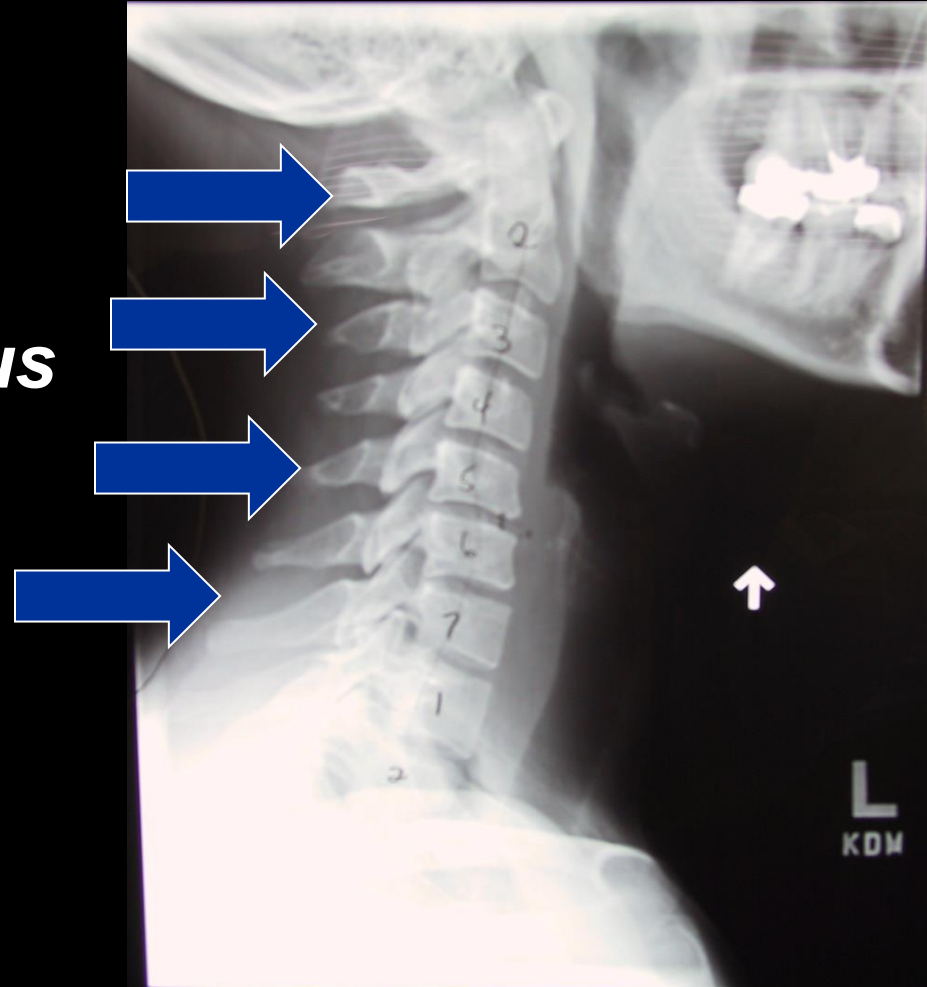
***Posterior
Longitudinal Line
(PLL)***



Landmarks and Lines

Lateral X-Ray:

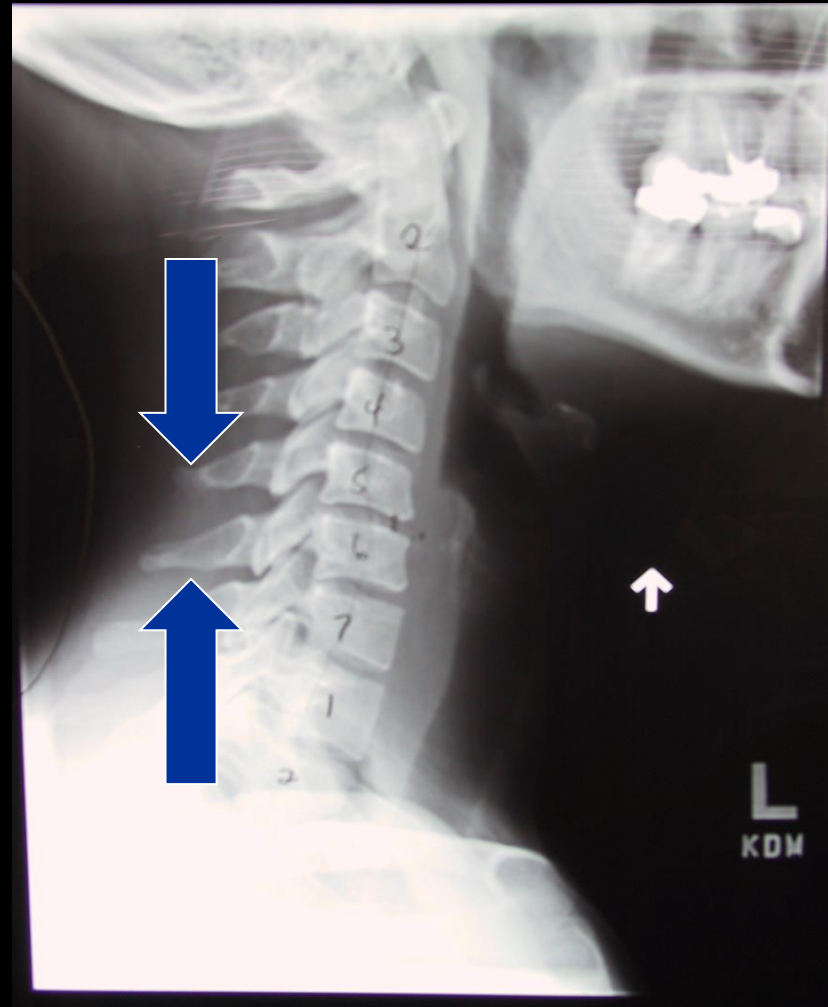
Alignment of Spinous Processes



Landmarks and Lines

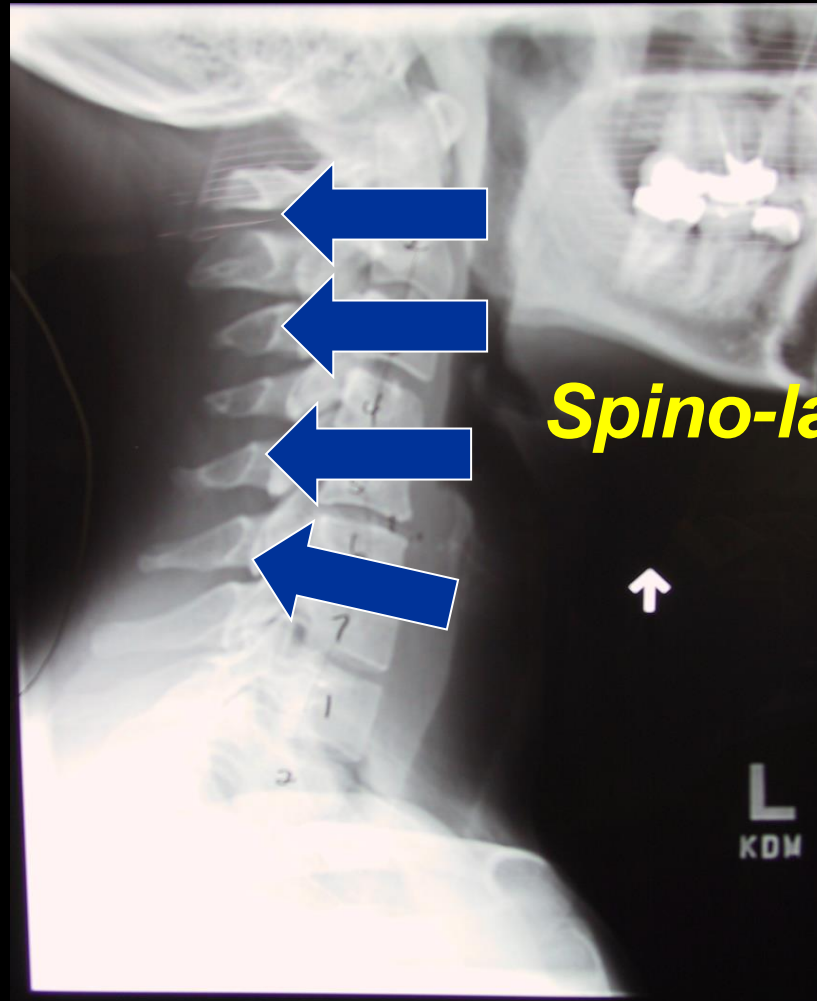
Lateral X-Ray:

Inter-spinous Distance



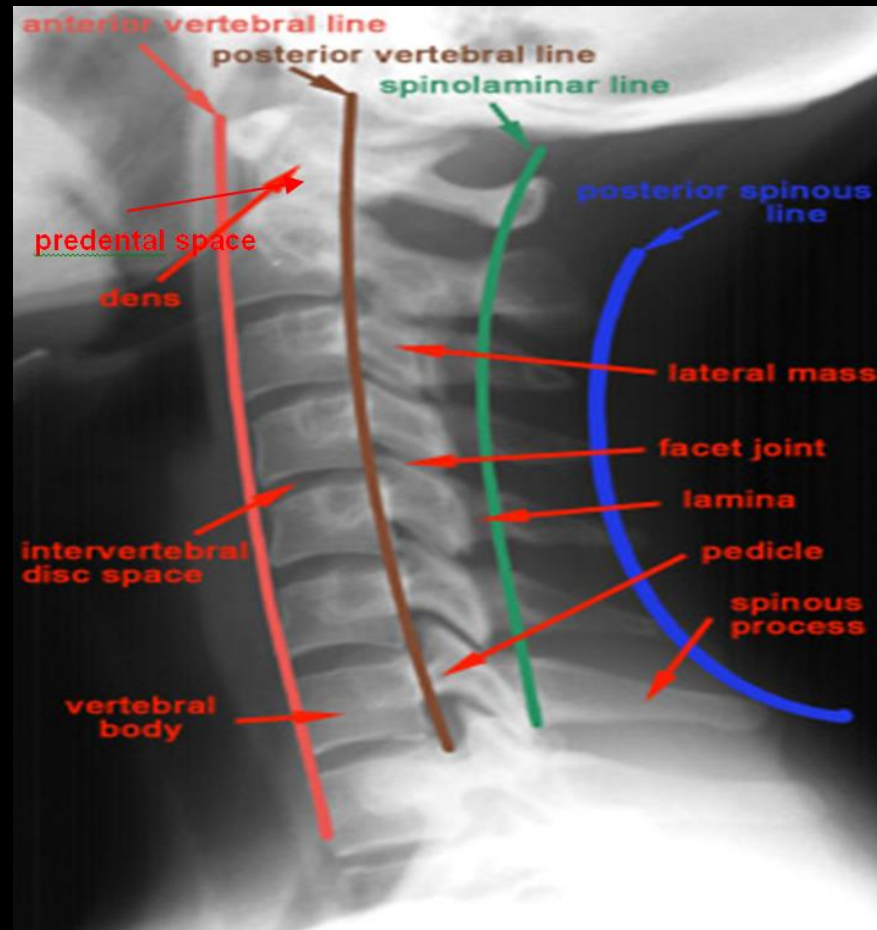
Landmarks and Lines

Lateral X-Ray:

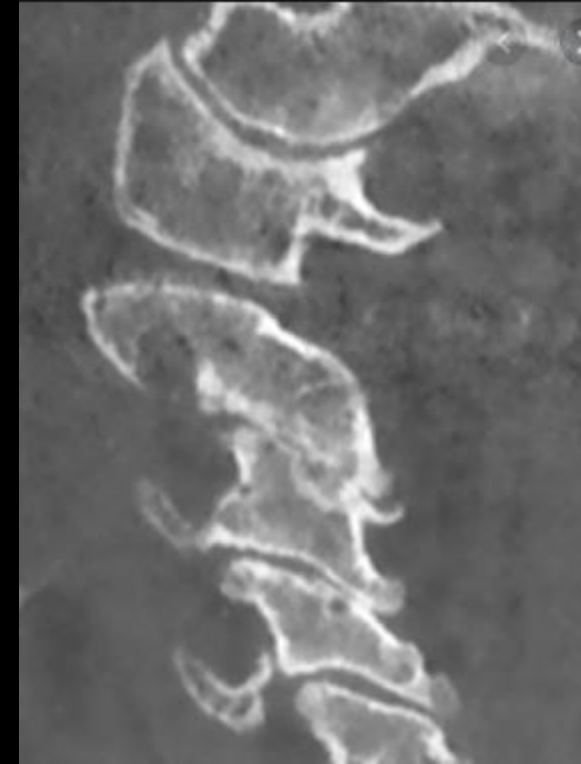


Spino-laminar Line

Landmarks and Lines



Landmarks and Lines

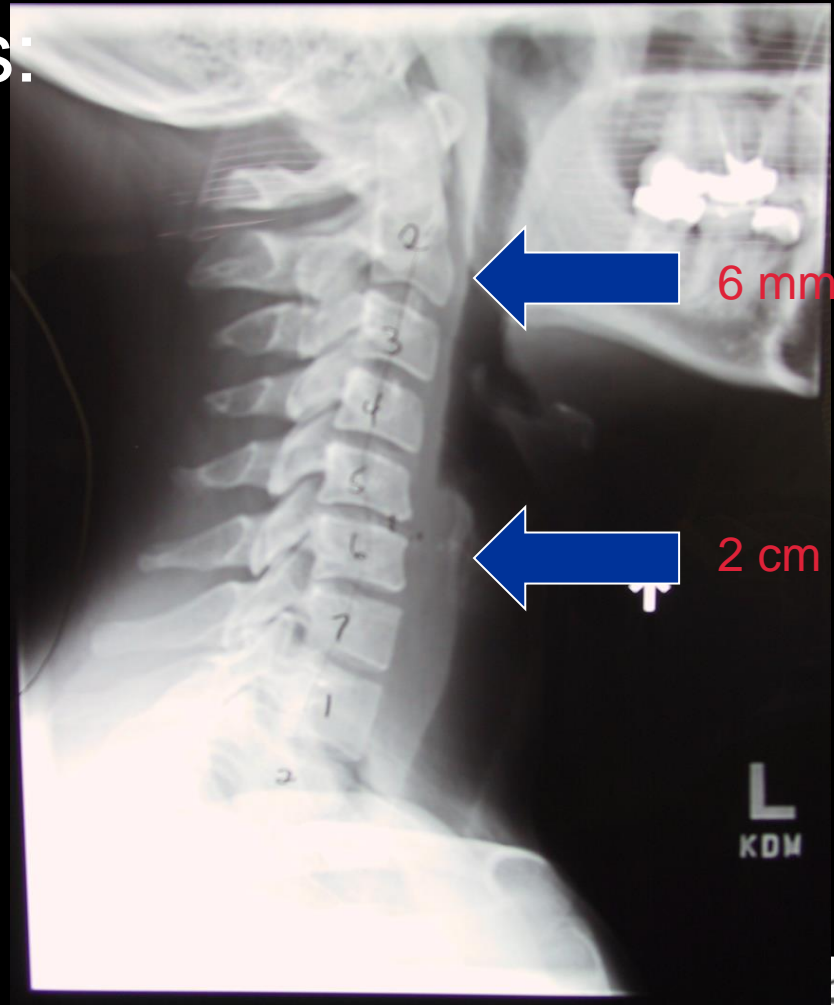


Anterior soft tissue swelling

Soft Tissue Shadows:

6mm @ C2

2 cm @ C6



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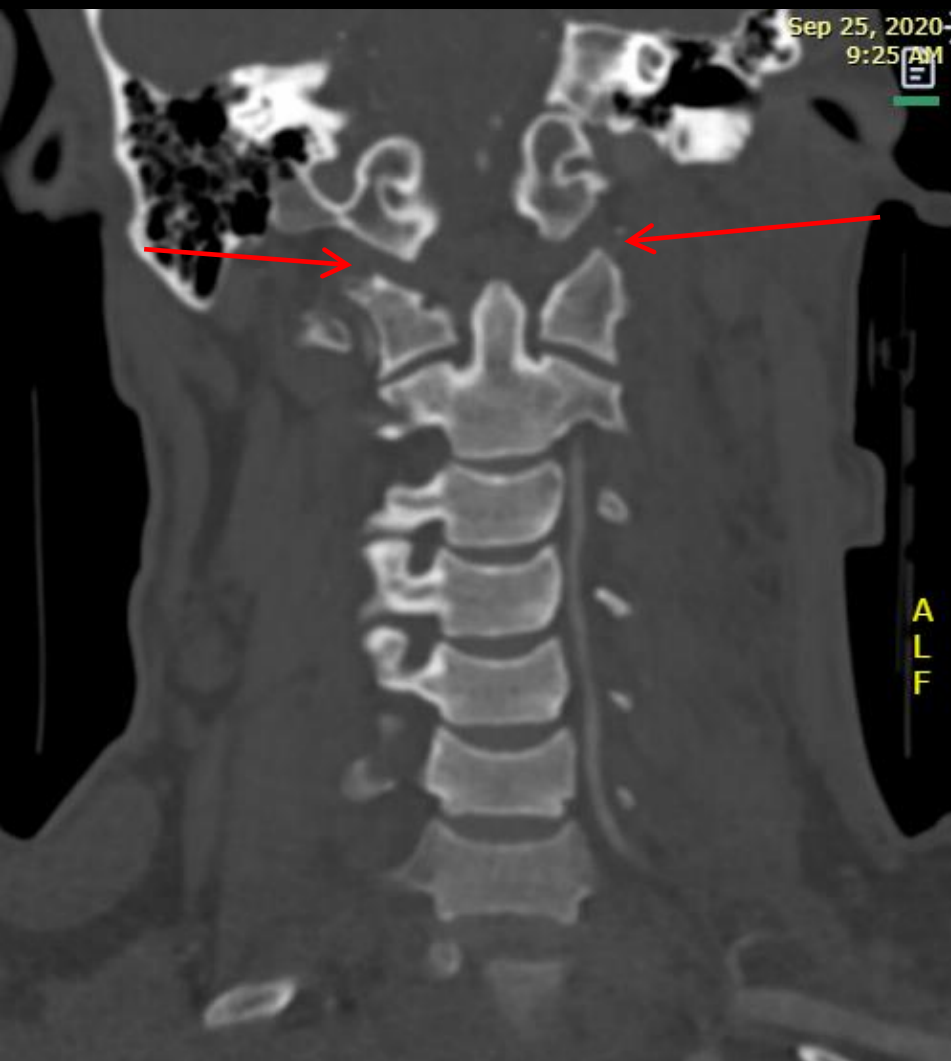
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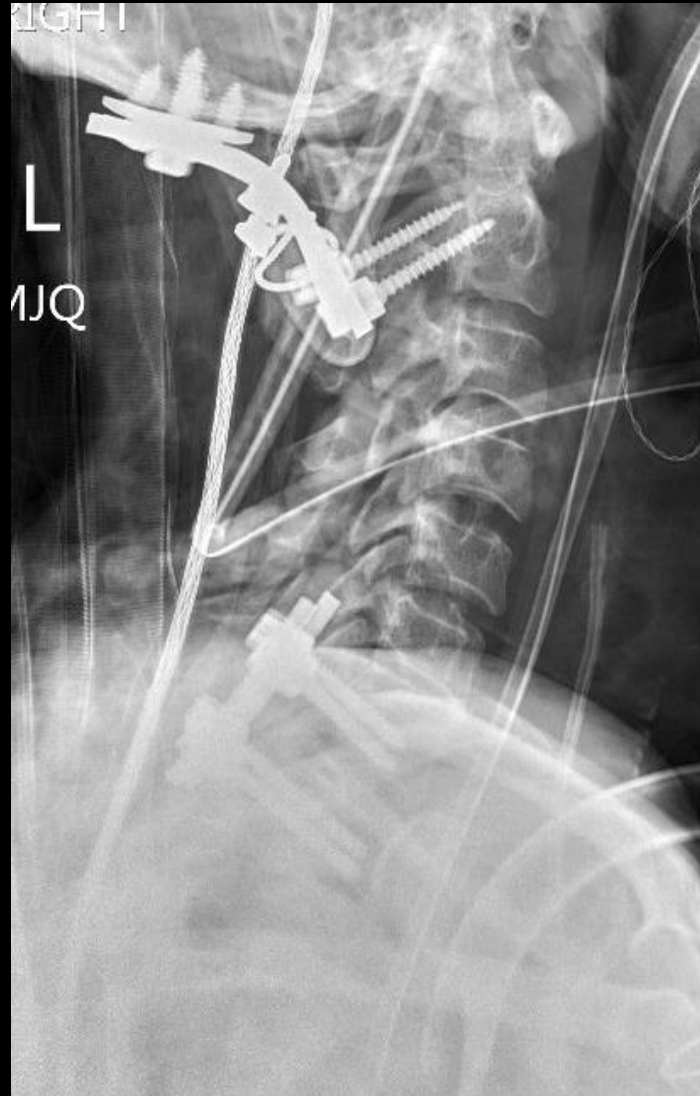
09/2020: 40 yo high speed autoped. Intubated at scene. TBI



09/2020: 40 yo high speed autoped



09/2020: 40 yo high speed autoped



1. Occiput to C2 PSIF

2. C7-T1 PSIF

Take Home Points

- Assume spinal injury until proven otherwise
- Thorough evaluation is critical
- Spine could be cleared with negative NEXUS criteria and painless range of motion
- On imaging evaluate lines and landmarks
- Pay attention to asymmetries on imaging

Thank You!