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Trauma & Emergency Radiology
Boston Medical Center

Imaging

Cervical Spine Trauma

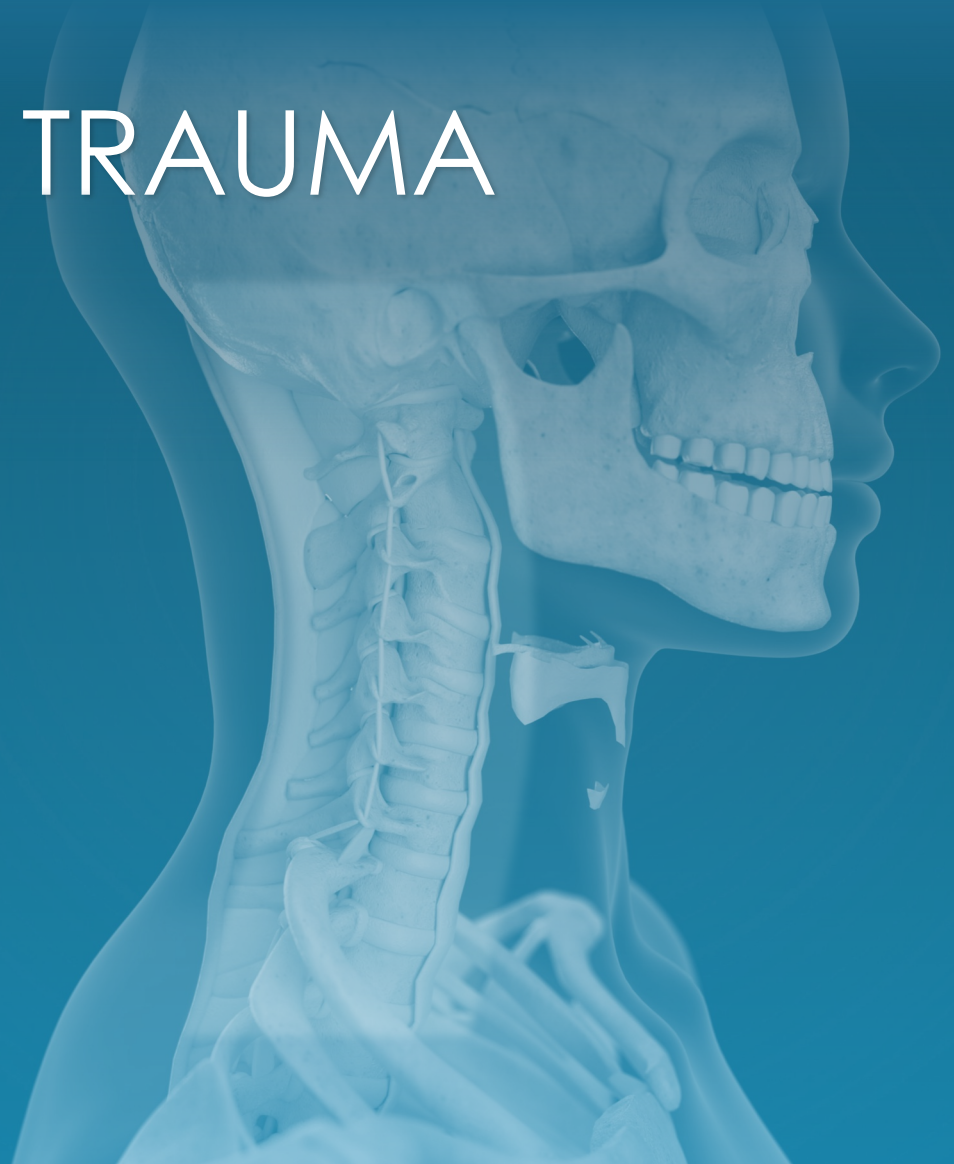
Pearls & Pitfalls



CERVICAL SPINE TRAUMA

Outline

- Screening – *who?*
- Approach – *how?*
- Alignment
- **Hyperflexion Injuries**
- **Hyperextension Injuries**
 - Fused spine



SCREENING

Who To Image?



CERVICAL SPINE TRAUMA

*to image or
not to image?*



CERVICAL SPINE TRAUMA

The 5 NO's of NEXUS

physical • NO midline tenderness

history • NO focal neurological deficits

- reliable?* {
- NO normal alertness
 - NO intoxication
 - NO painful distracting injuries

NO MOI

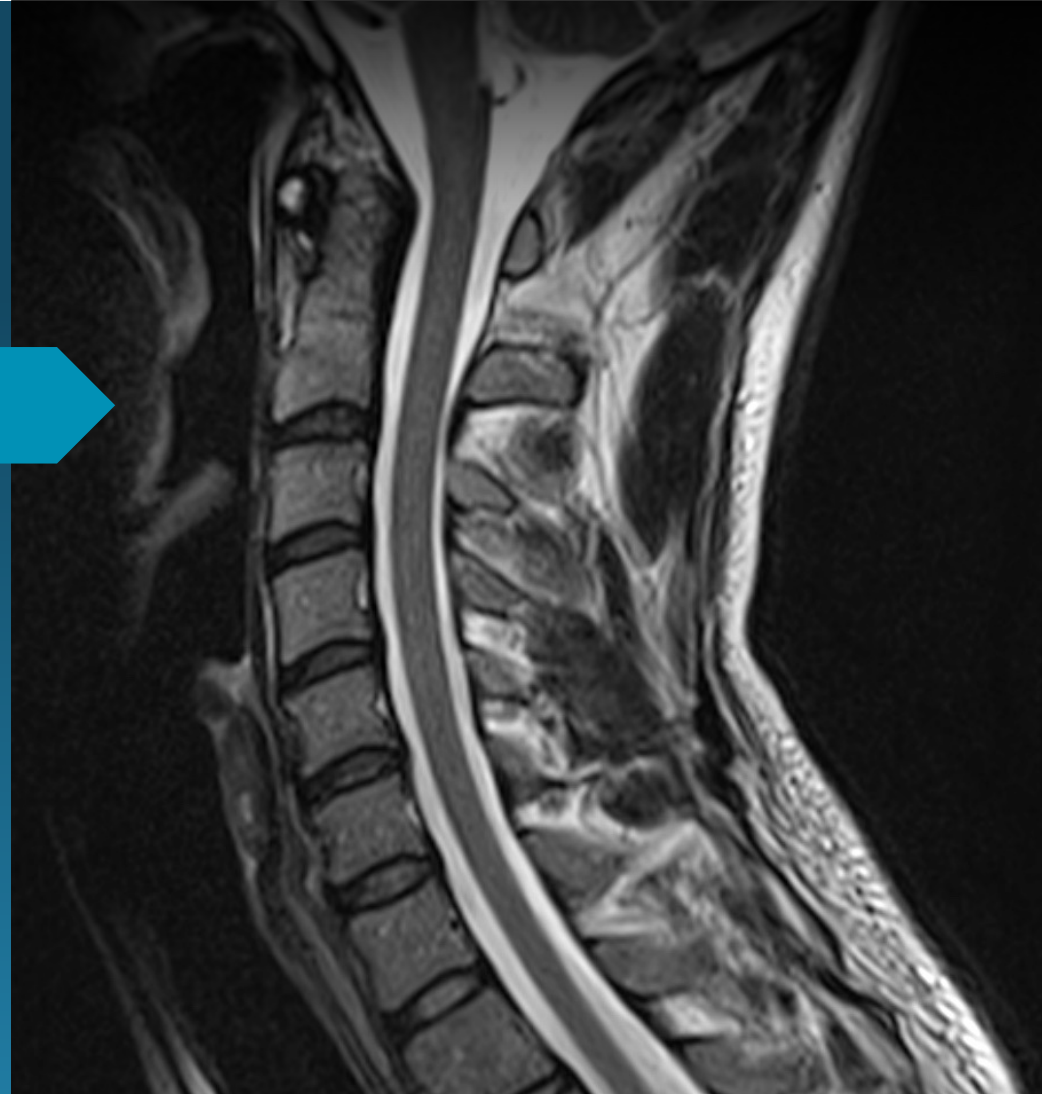
Nat'l Emergency X-ray Utilization Study - very low risk criteria

NEJM 2000; 343: 94-99

SCREENING

The Obtunded Patient

- Unreliable, unexaminable
- Difficult situation!
- *Is MDCT good enough?*
(Yes!)



SCREENING

The Obtunded Patient

- EAST recommends C-collar removal after a *"negative high-quality C-spine CT scan result alone."*



east

Cervical spine collar clearance in the obtunded adult blunt trauma patient: A systematic review and practice management guideline from the Eastern Association for the Surgery of Trauma. *J Trauma* 2015, 78(2):430-441

SCREENING

The Obtunded Patient

- Western Trauma Association multi-institutional study, >10,000 patients

✓ "if the CT is adequate and *negative*, the collar may be removed with a low risk of clinically significant injury."

MRI here →

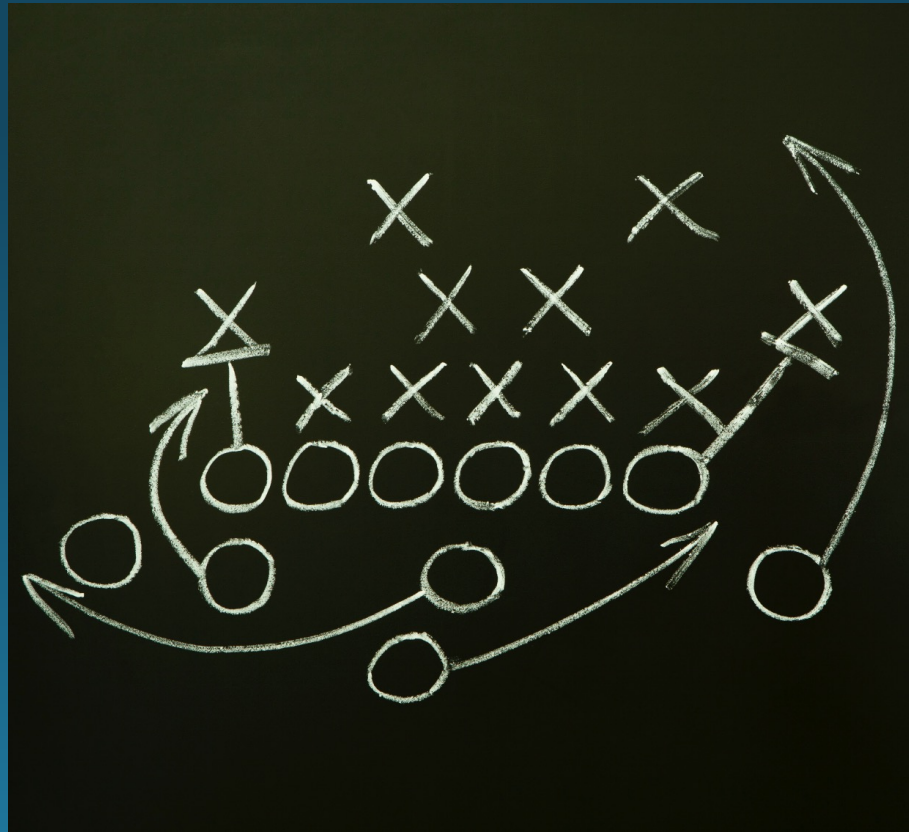
✓ MRI valuable only for "the patient who arrives with motor or sensory *neurologic deficits* or without witnessed movement of all extremities."

Cervical spinal clearance: A prospective Western Trauma Association Multi-institutional Trial.

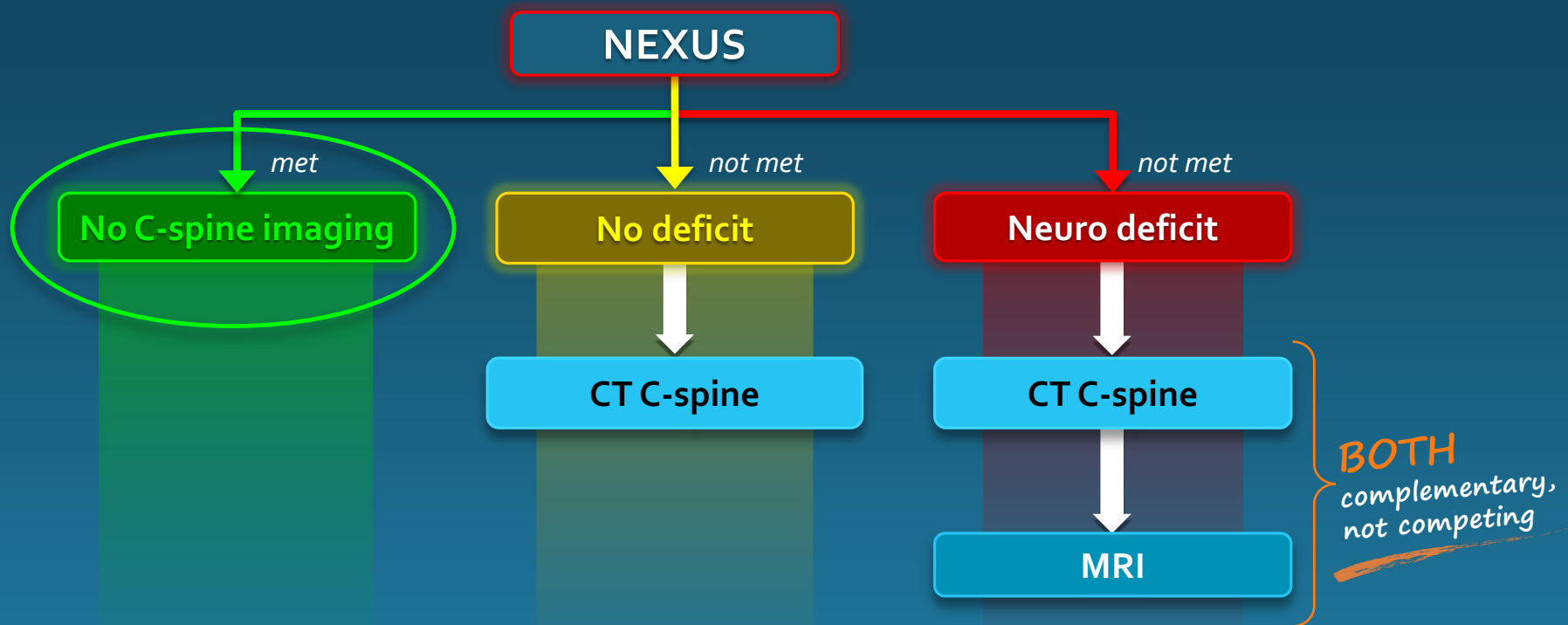
J Trauma 2016, 81(6):1122–1130

APPROACH

How To Image



CERVICAL SPINE TRAUMA



NYU/Bellevue C-Spine Trauma Imaging Guidelines

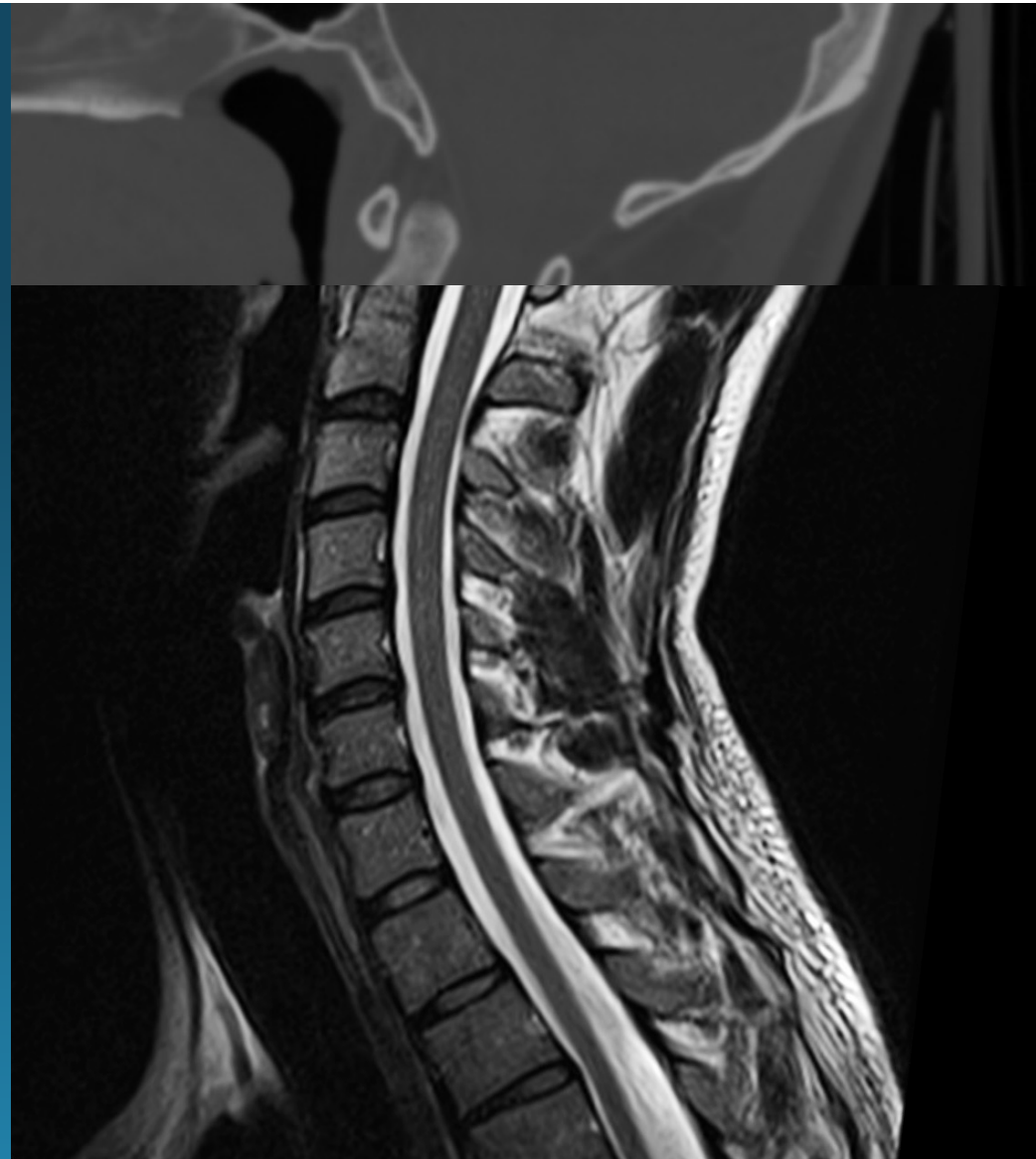
IMAGING

Standard of Care

- ✓ Screening Trauma = CT with MPRs

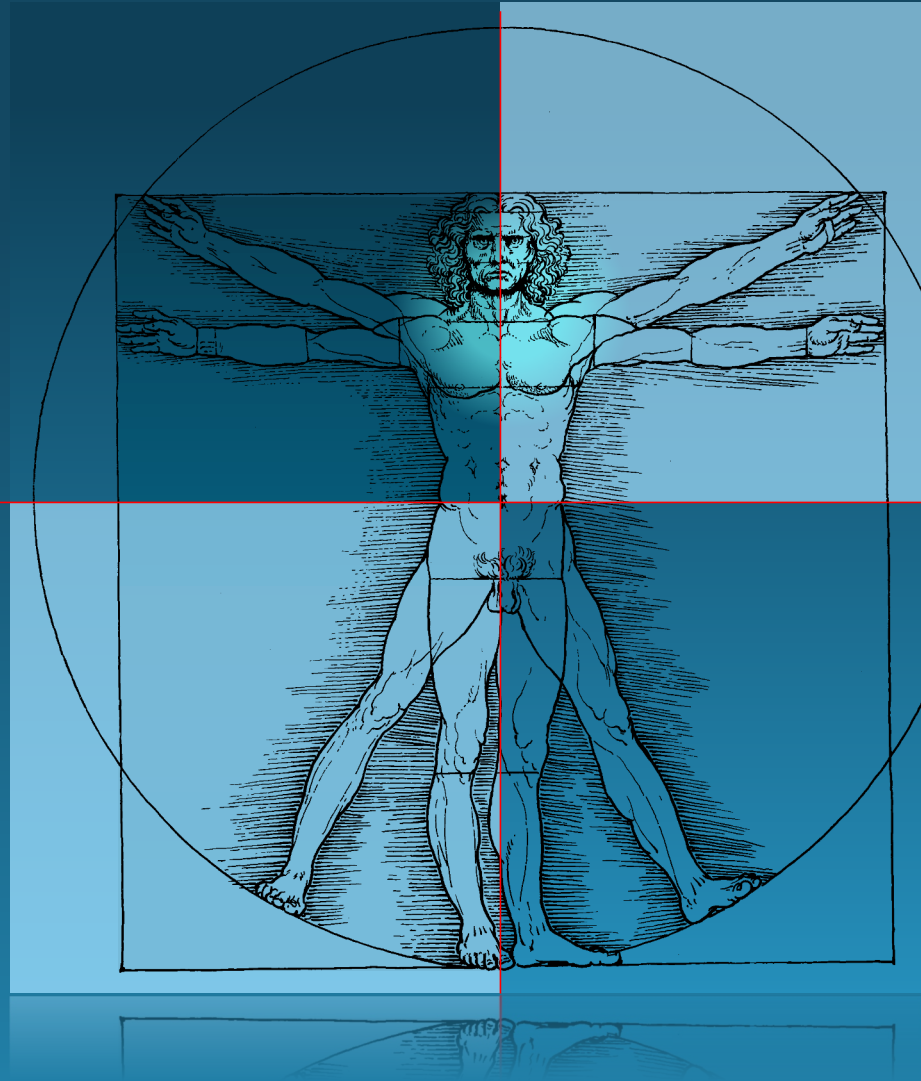
MRI Indications

- Neurological deficit
- Unstable injury

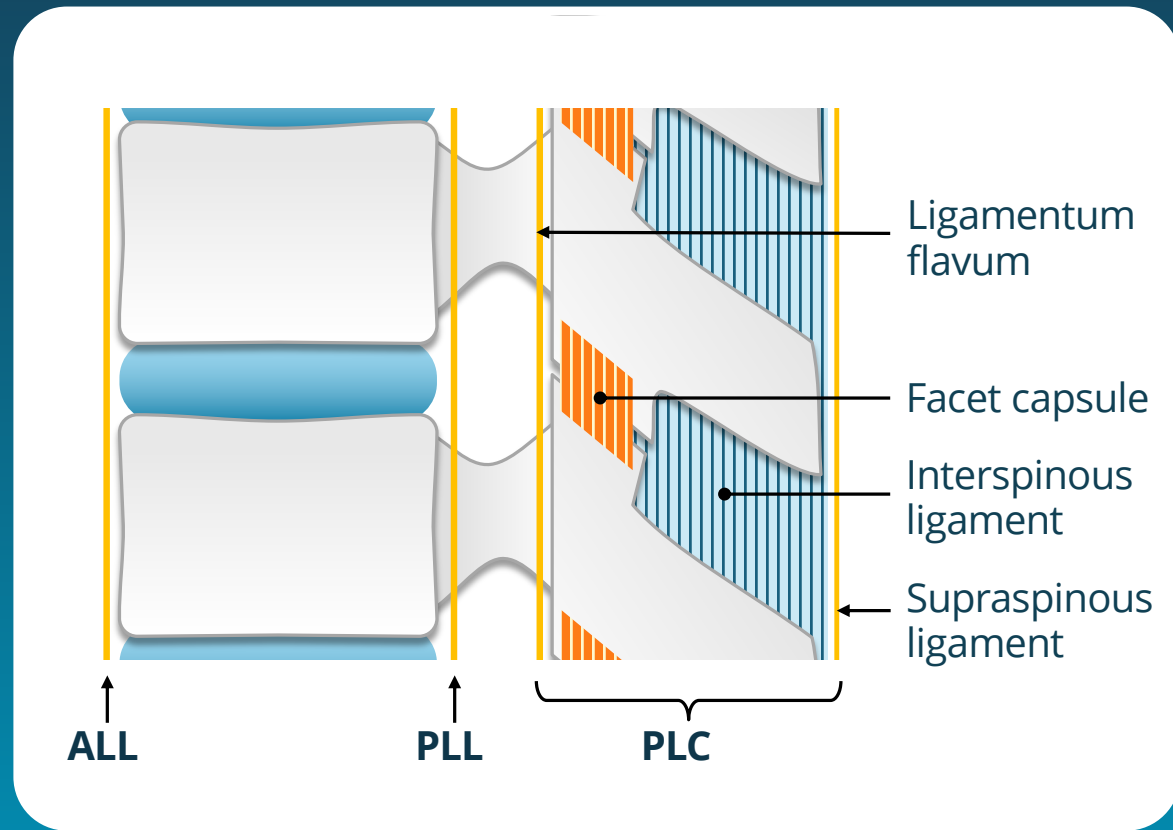


ALIGNMENT

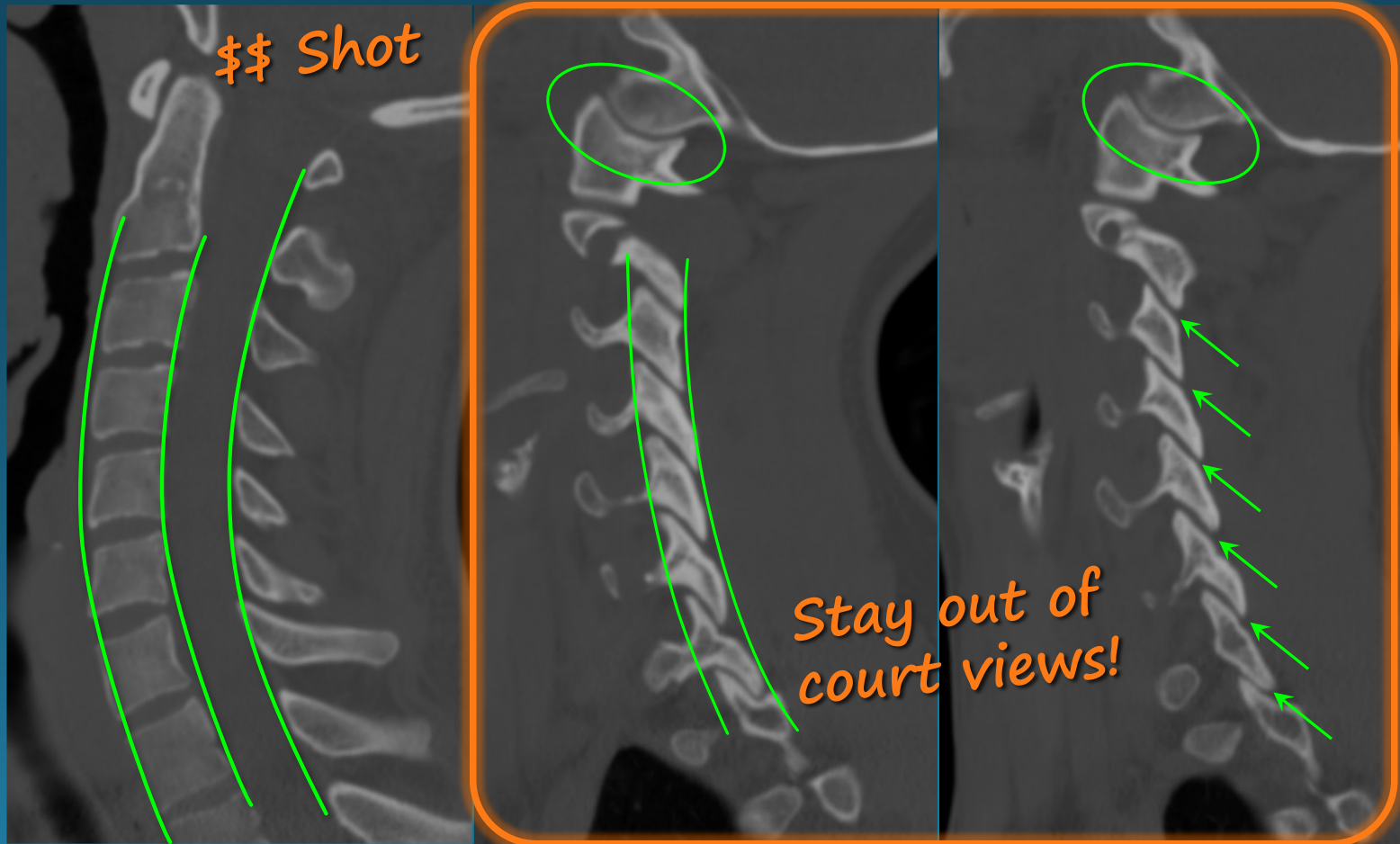
Pearls



SUBAXIAL C-SPINE ANATOMY



key CT images – sagittal

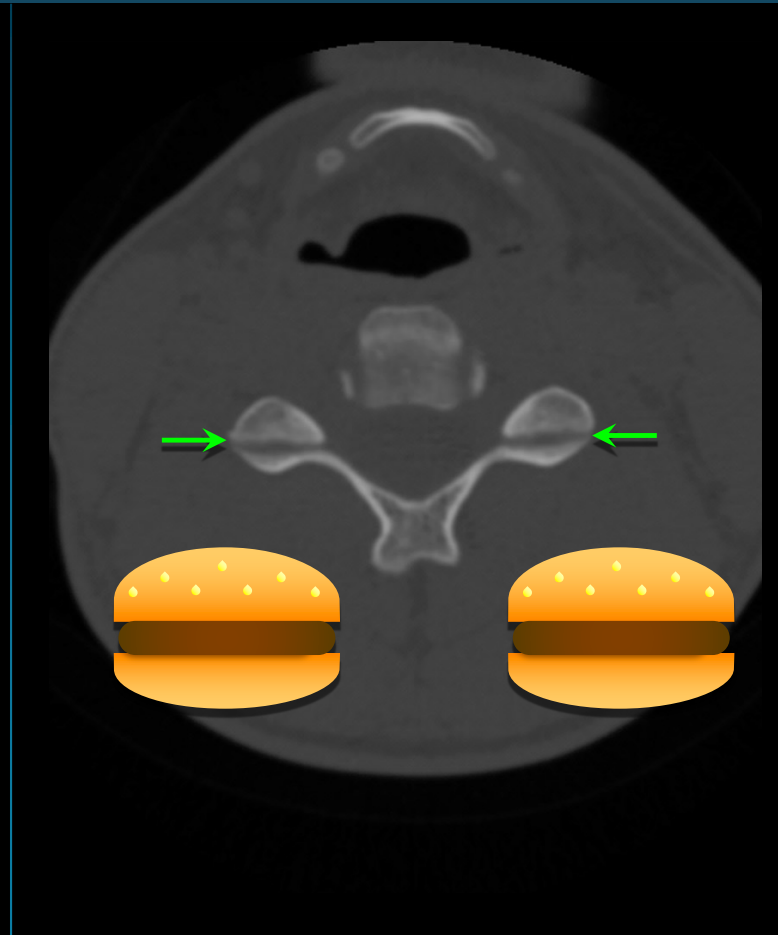


key CT images – transaxial

Fractured
transverse
foramen?

C6 or above warrants
vascular imaging

CTA needed



key CT images – coronal

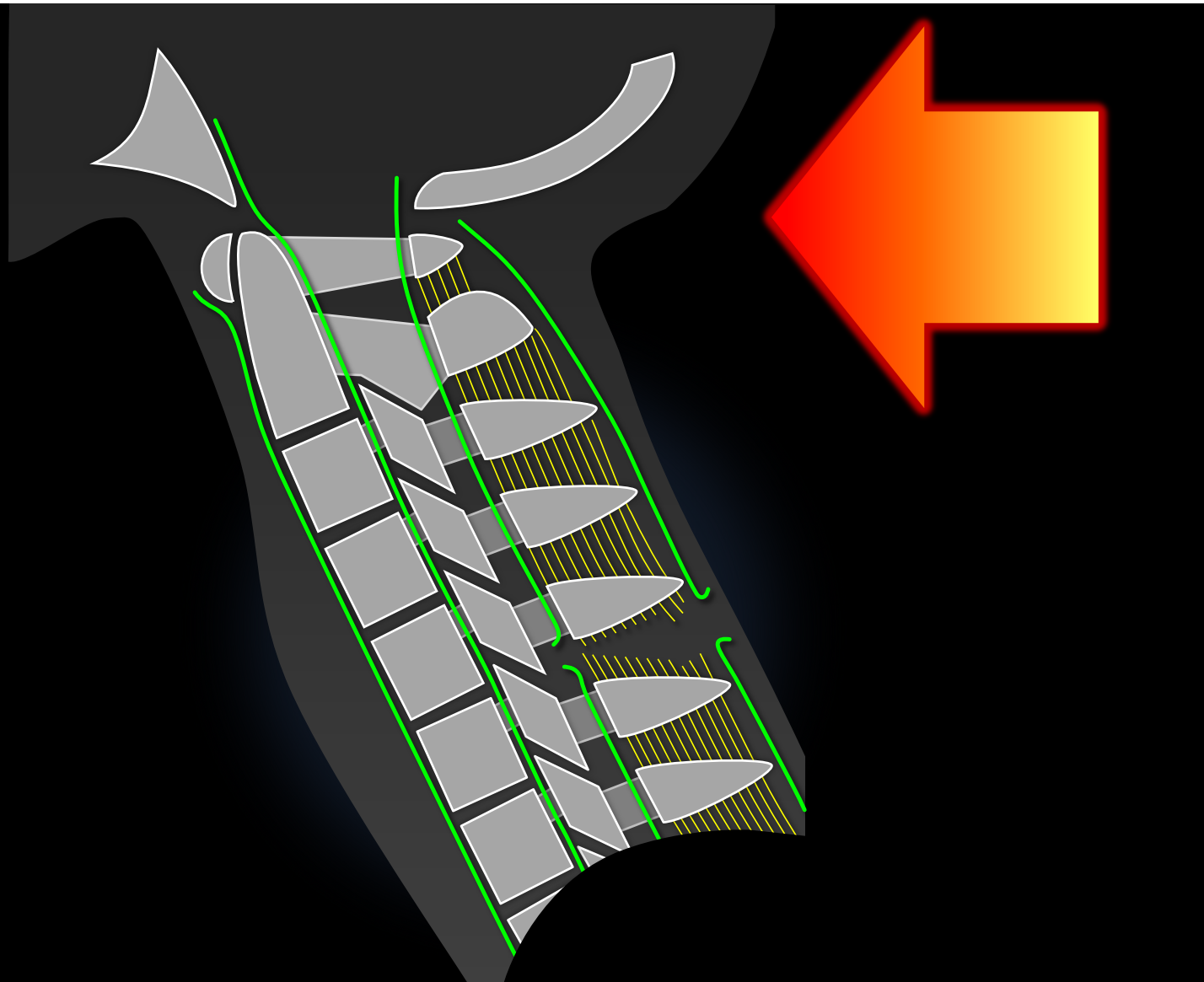


HYPERFLEXION



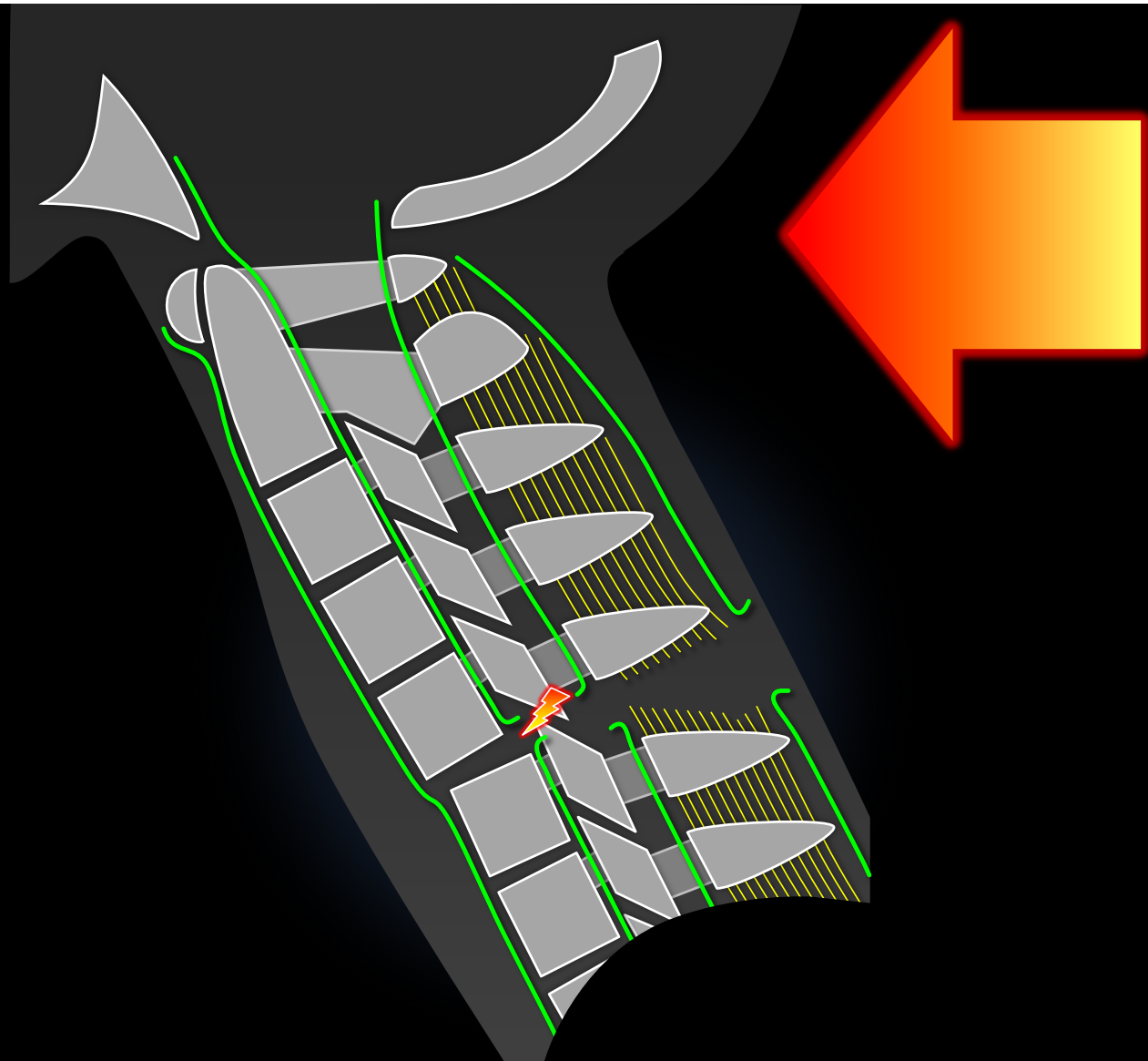
PLC x
PLL ok
ALL ok

hyperflexion
sprain



PLC x
PLL x
ALL ok

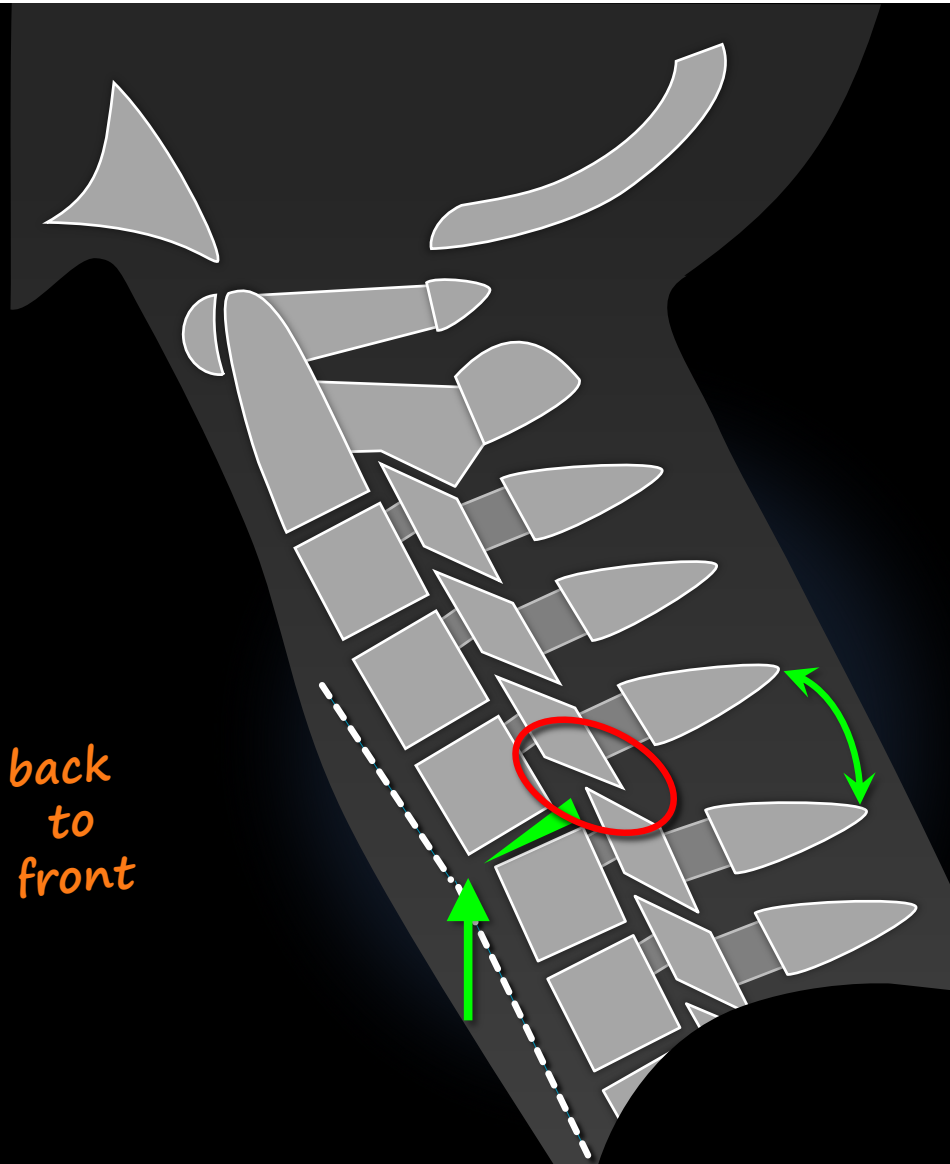
anterior
subluxation



hyperflexion hallmarks

- interspinous widening
- uncovered facets
- wide posterior disc space
- focal kyphosis
- anterior subluxation

back
to
front



hyperflexion hallmarks

- interspinous widening
- uncovered facets
- wide posterior disc space
- focal kyphosis
- anterior subluxation



hyperflexion
spectrum

hyperflexion sprain



hyperflexion
spectrum

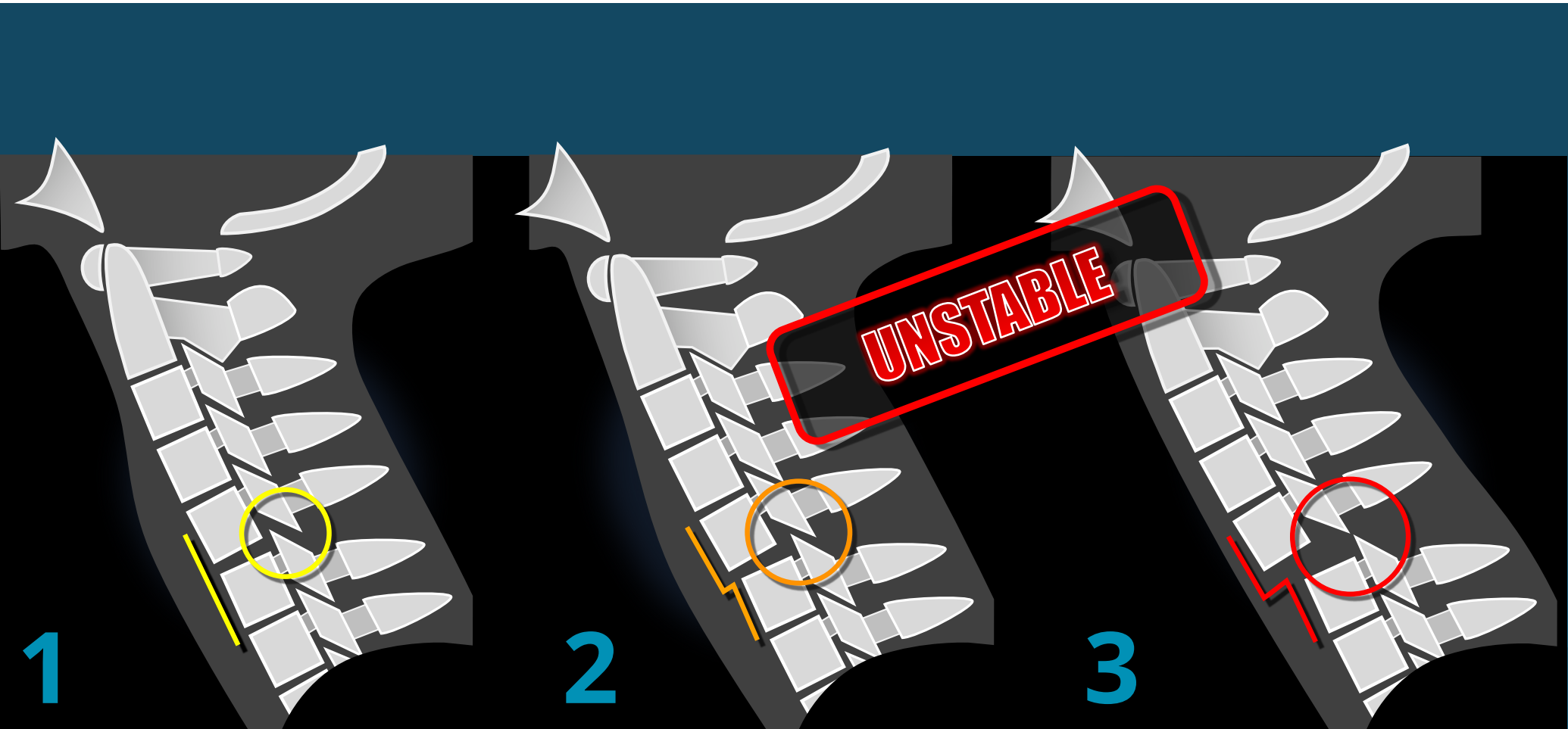
anterior subluxation



hyperflexion
spectrum

bilateral facet
dislocation





1

hyperflexion sprain

2

anterior subluxation

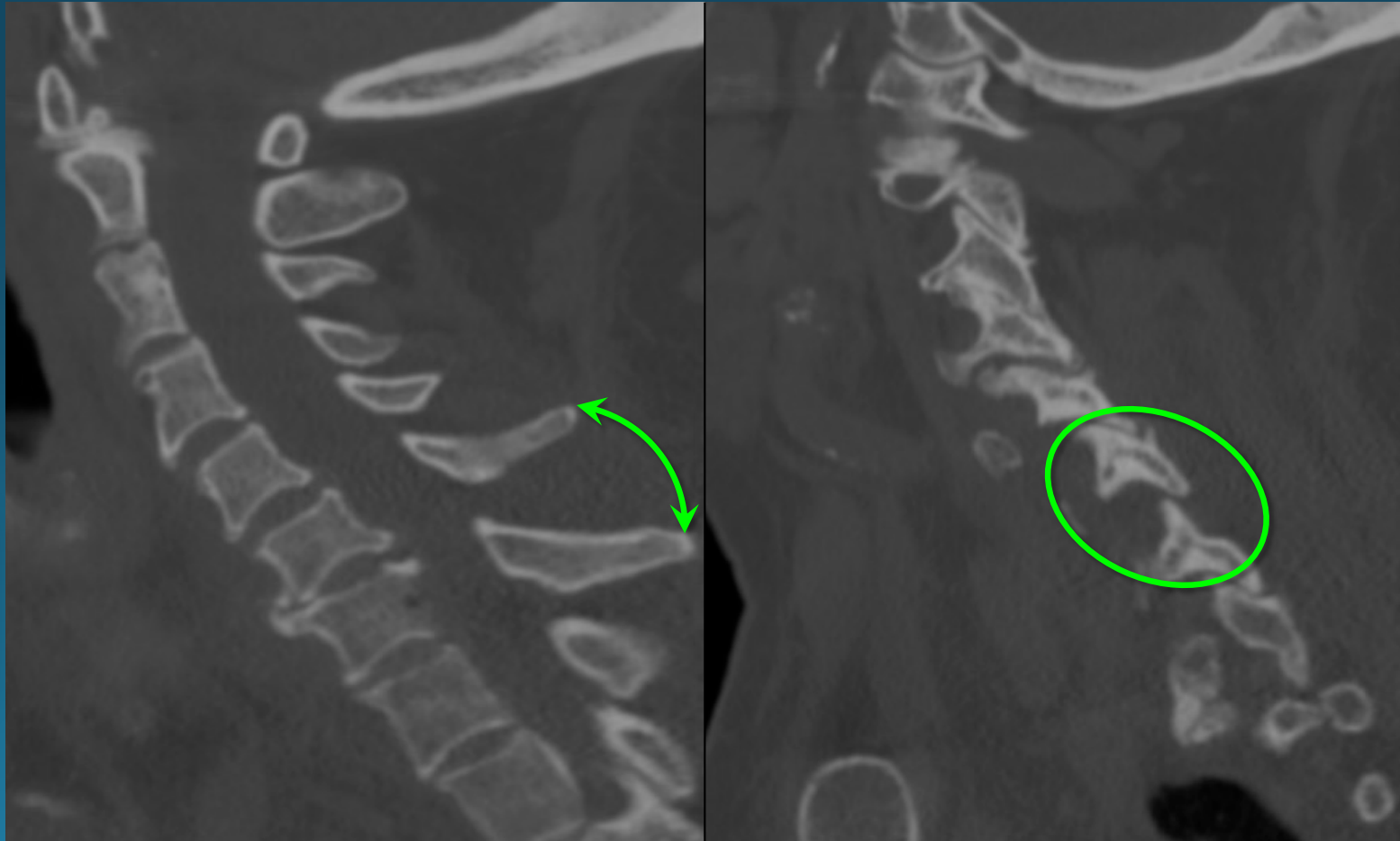
3

bilat. facet dislocation

hyperflexion spectrum

hyperflexion

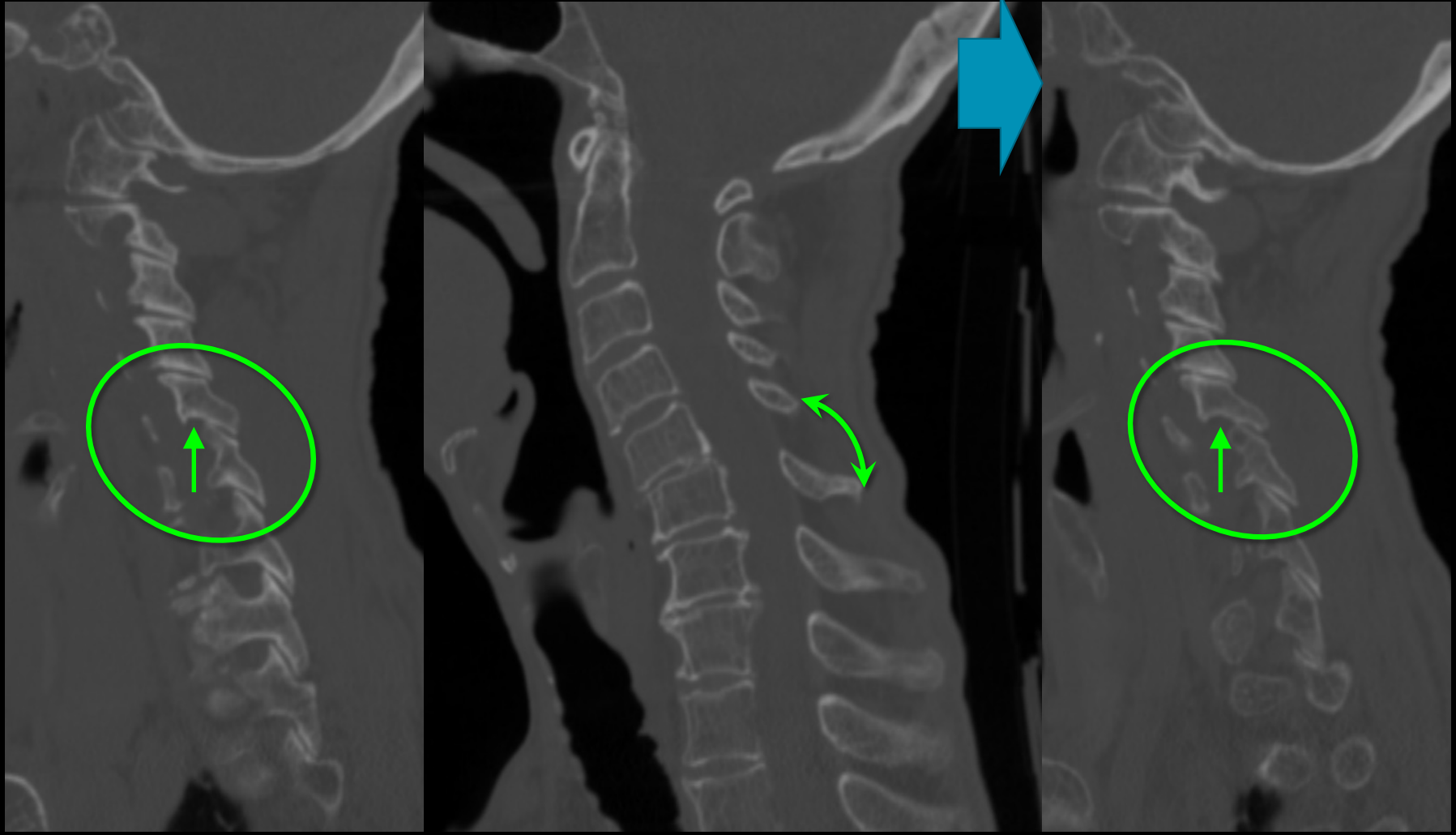
- interspinous widening
- uncovered facets





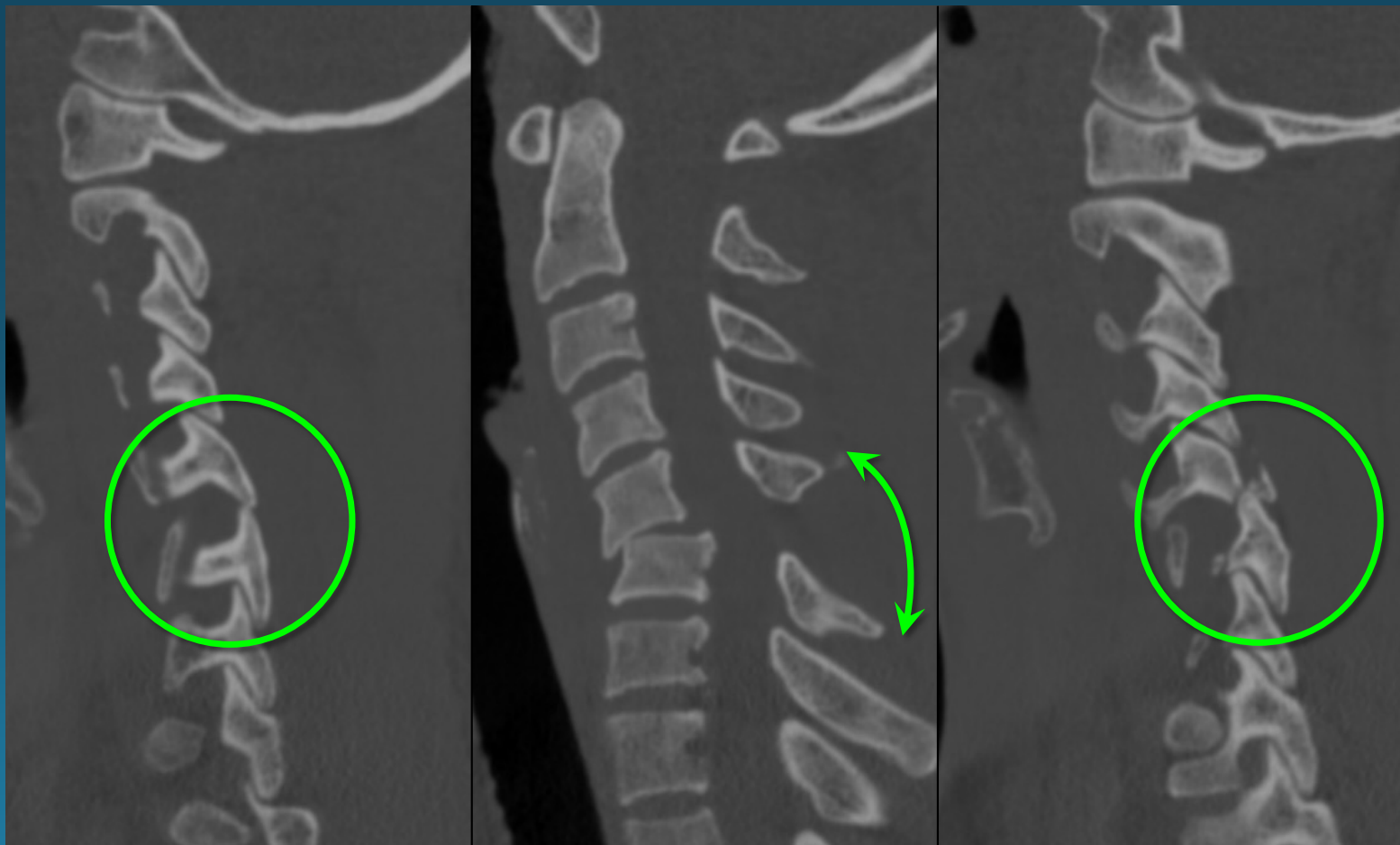
CASE

positional?

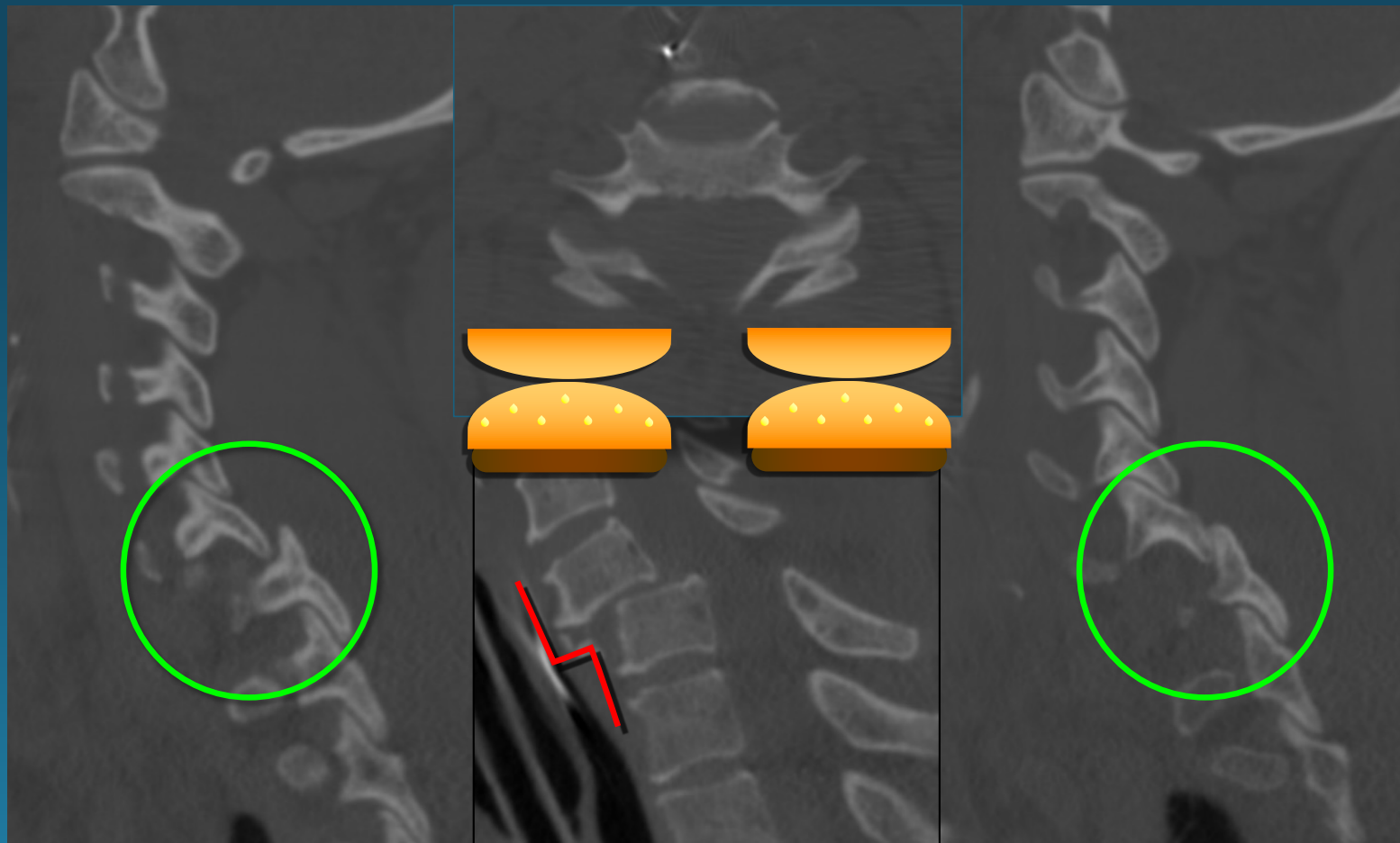


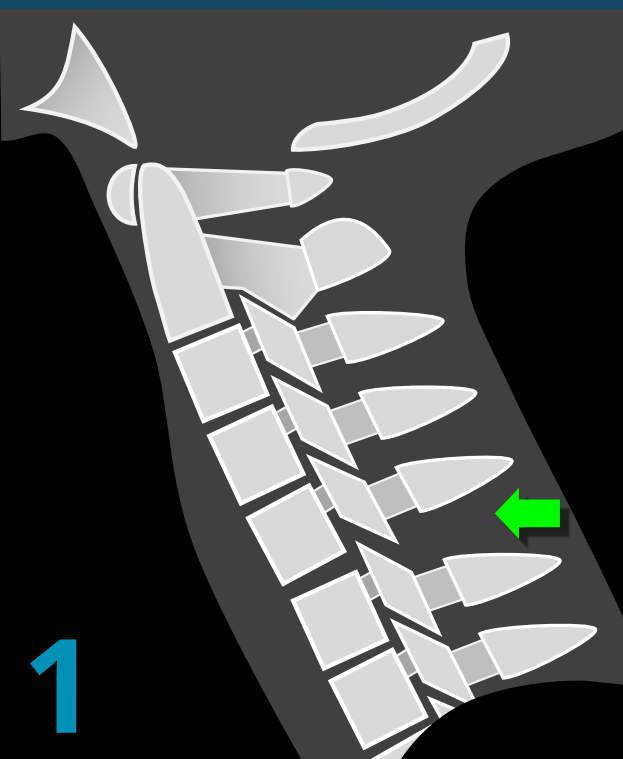
hyperflexion sprain

bilateral facet dislocation
perched



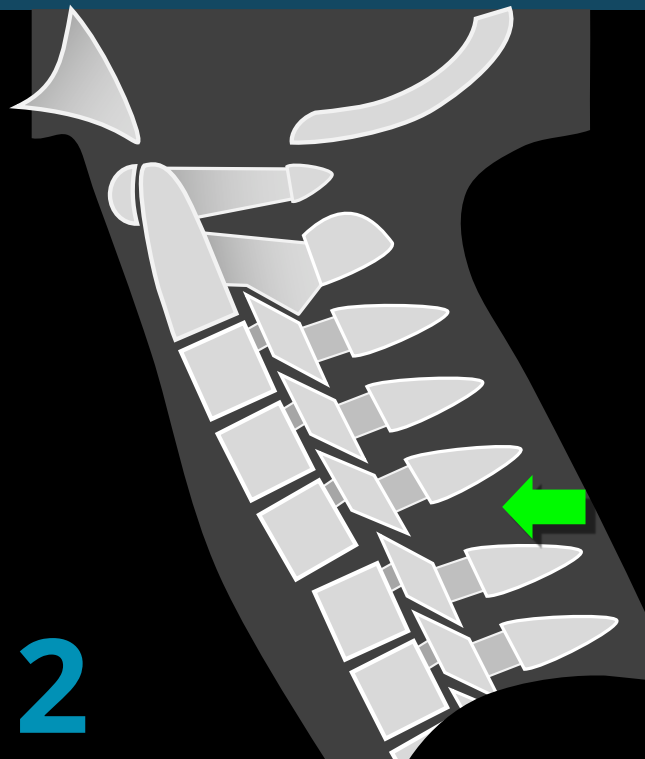
bilateral facet dislocation
jumped





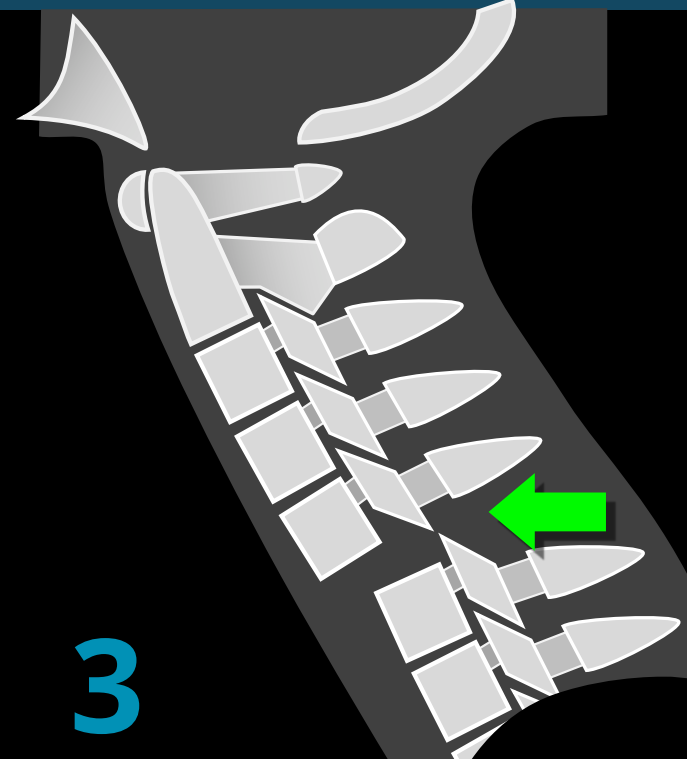
1

hyperflexion sprain



2

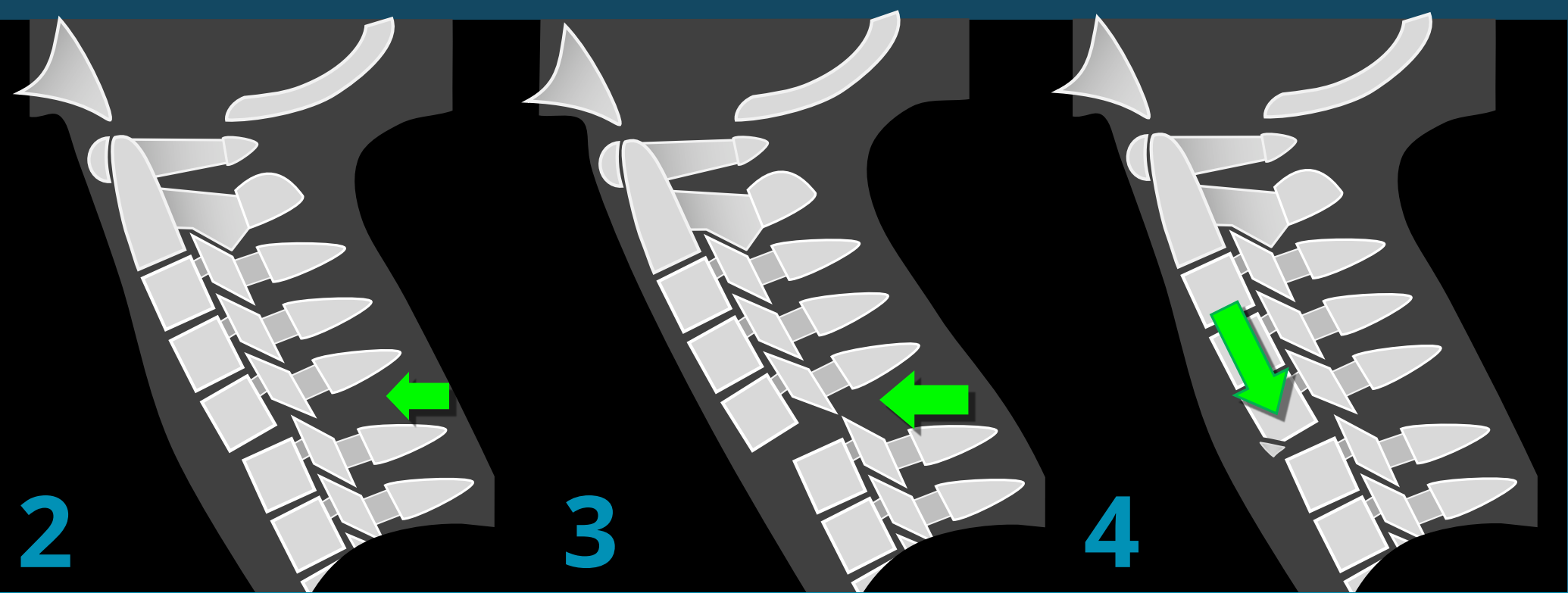
anterior subluxation



3

bilat. facet dislocation

hyperflexion spectrum



2

anterior subluxation

3

bilat. facet dislocation

4

flexion teardrop

hyperflexion spectrum

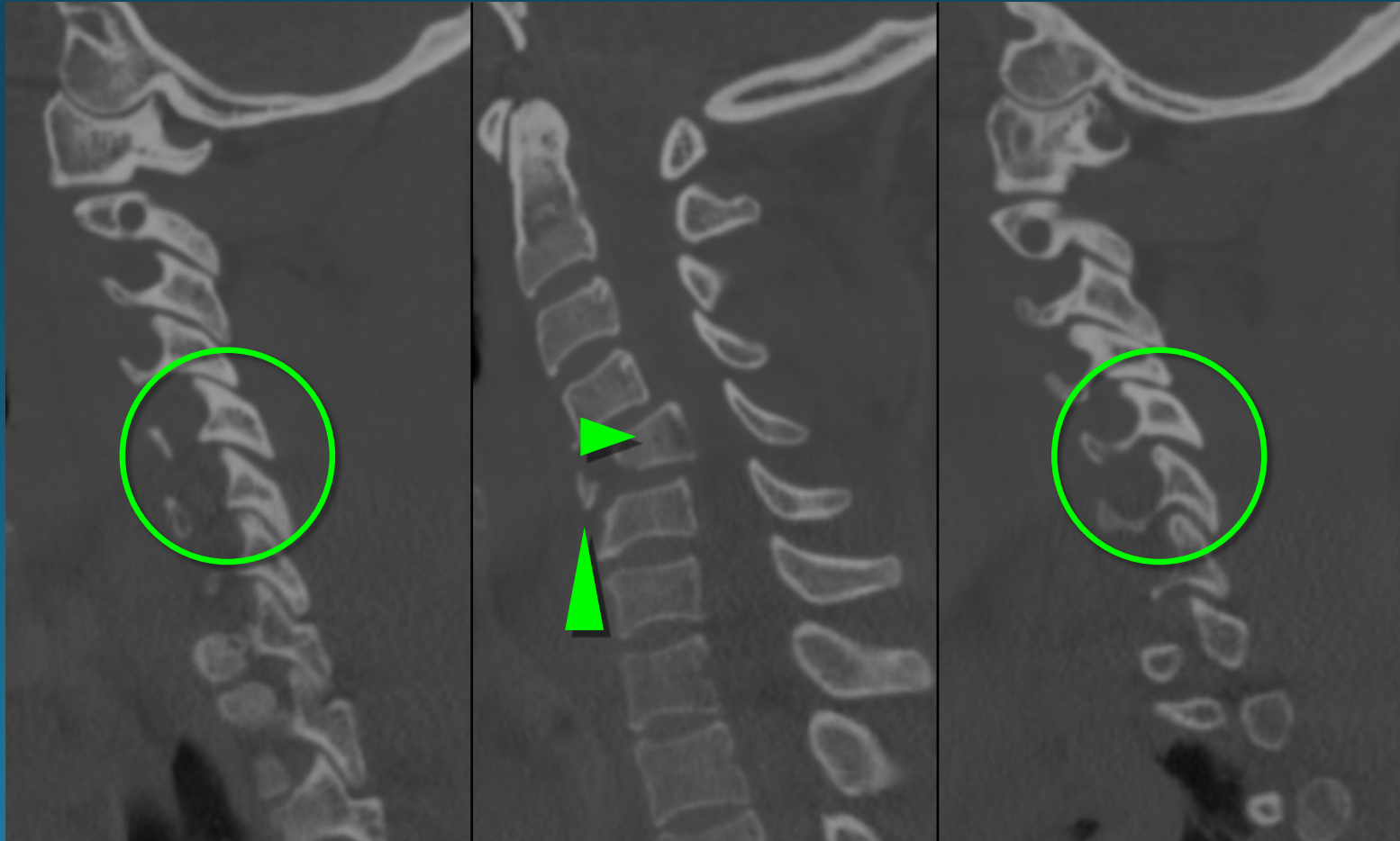
CERVICAL SPINE TRAUMA



flexion teardrop

4

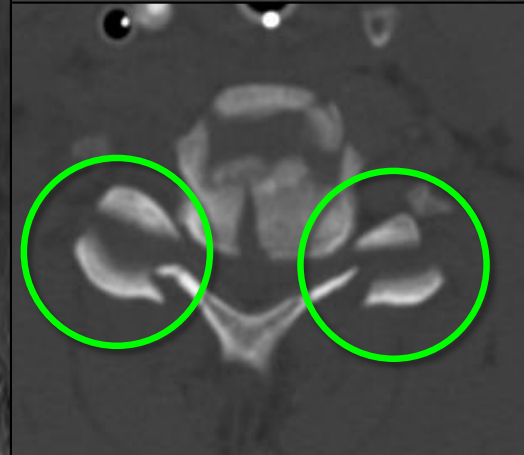
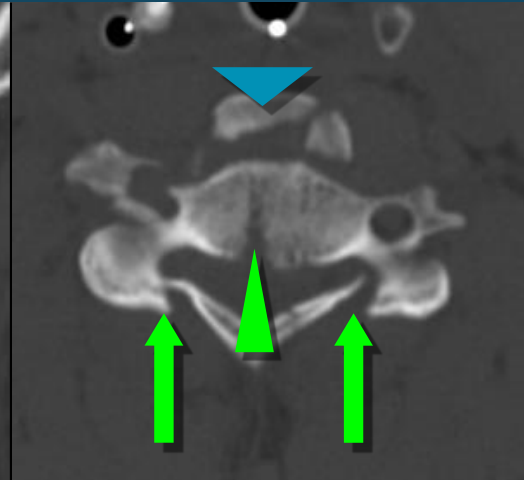
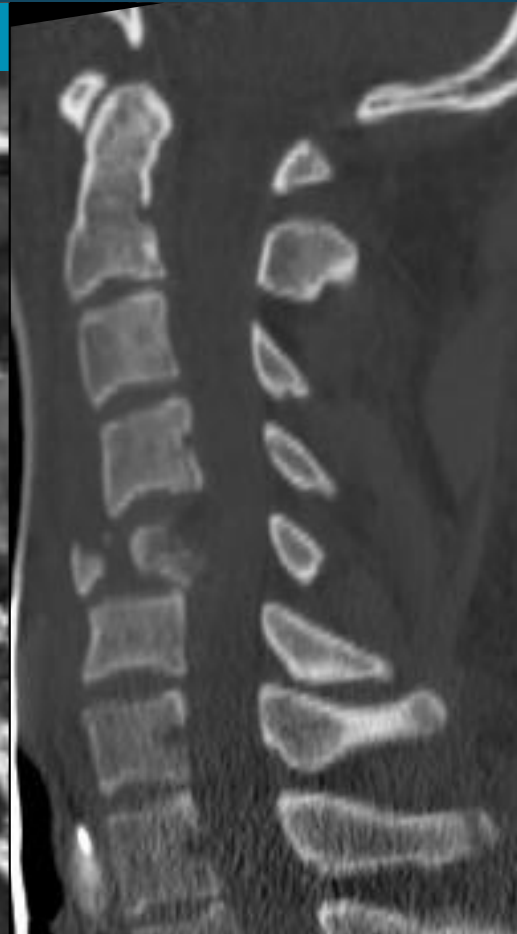
flexion teardrop



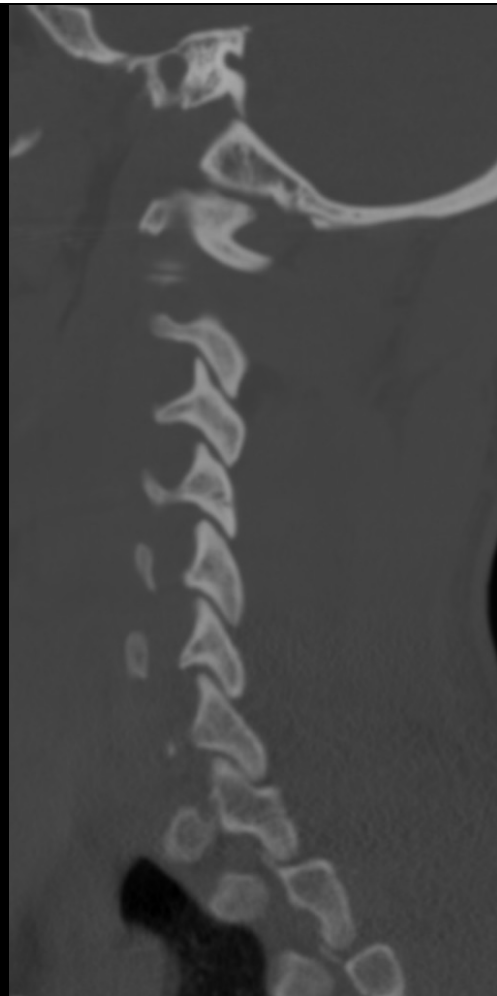
4

flexion teardrop

Anterior cord syndrome



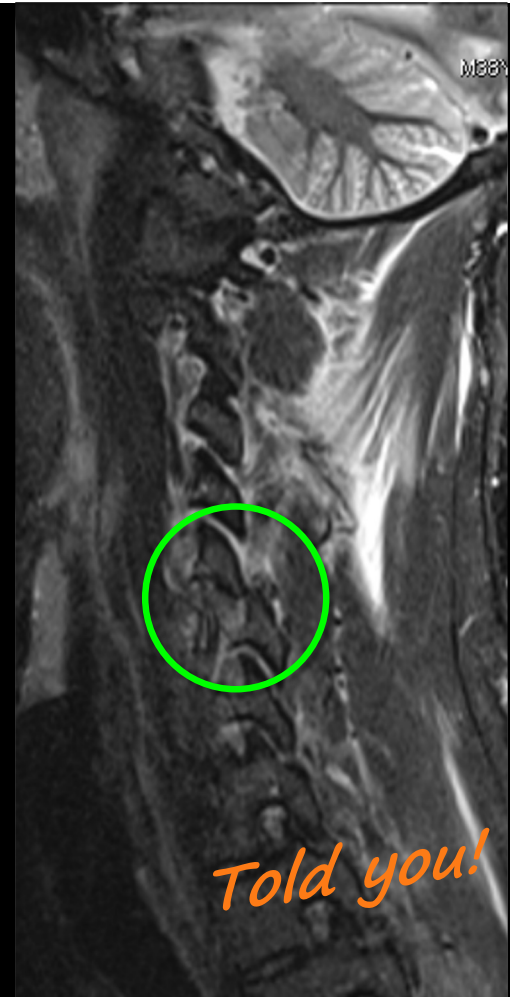
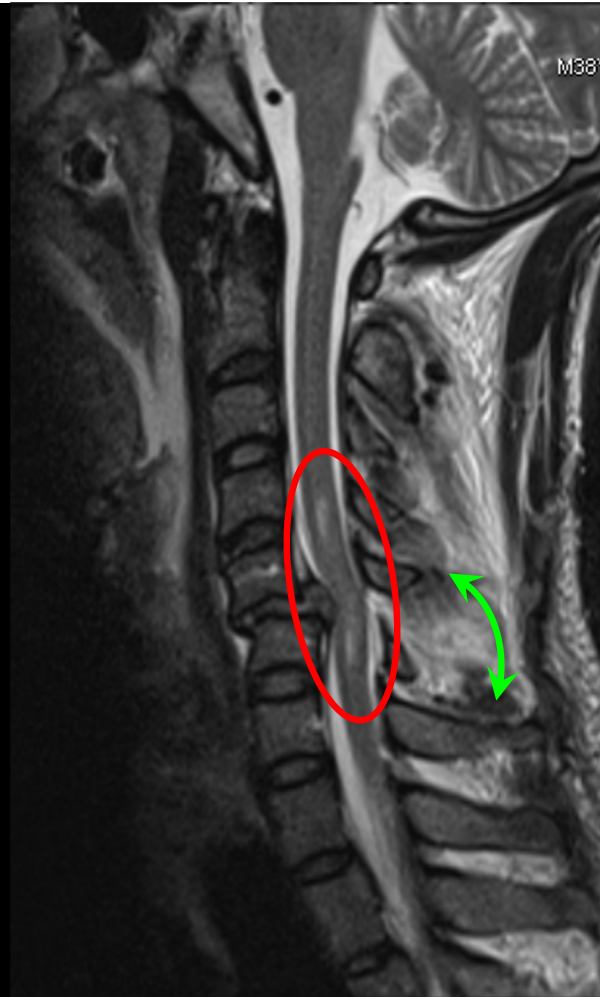
CASE



*this is
going to
be bad!*

facet fracture

Feb 7

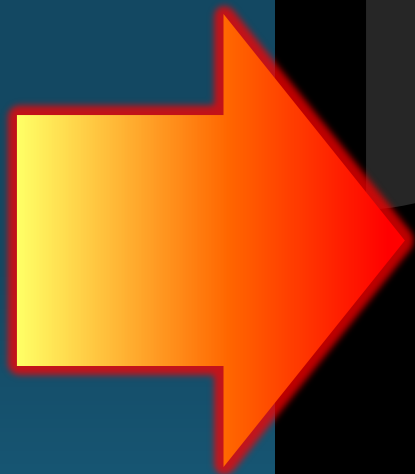


bilateral facet dislocation
Feb 9

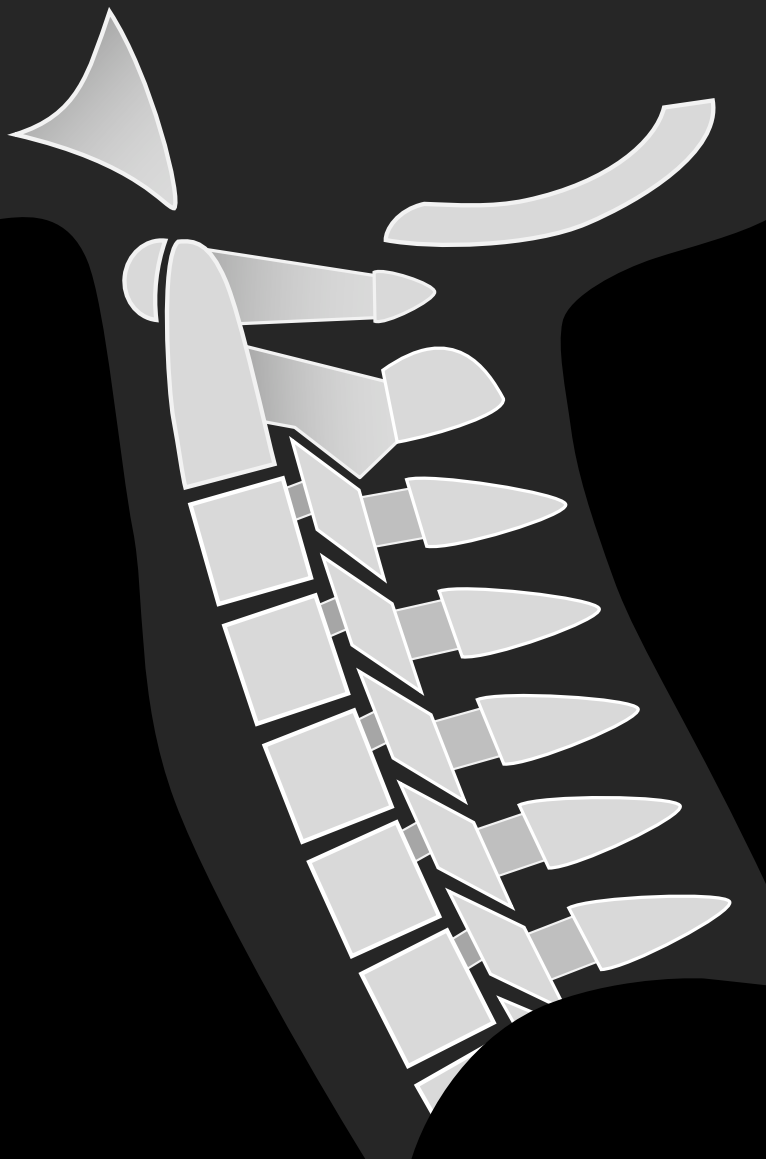
HYPEREXTENSION

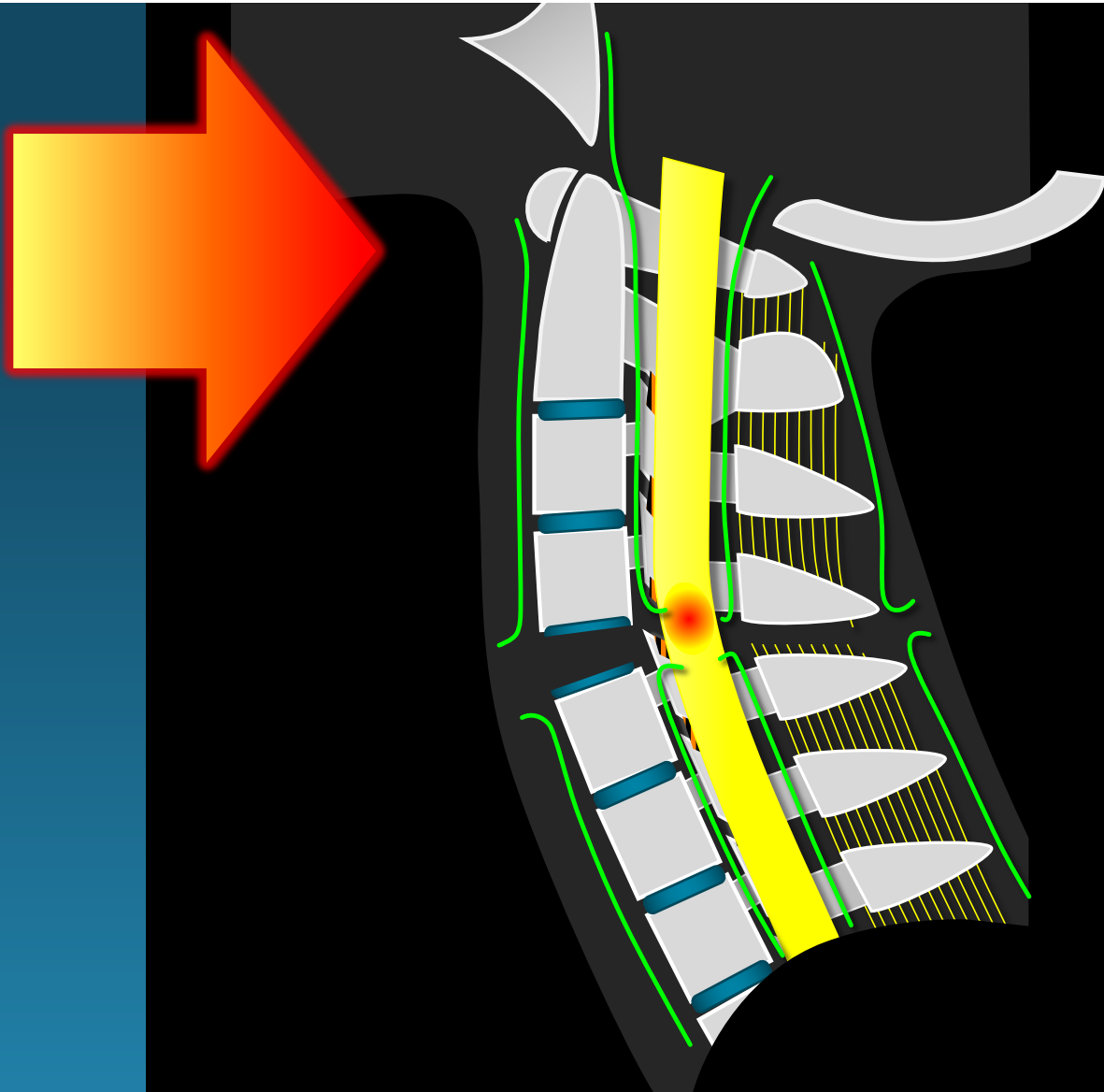


It's a whiplash injury – his head flung back when he opened the hospital bill



Keep in mind...
RECOIL





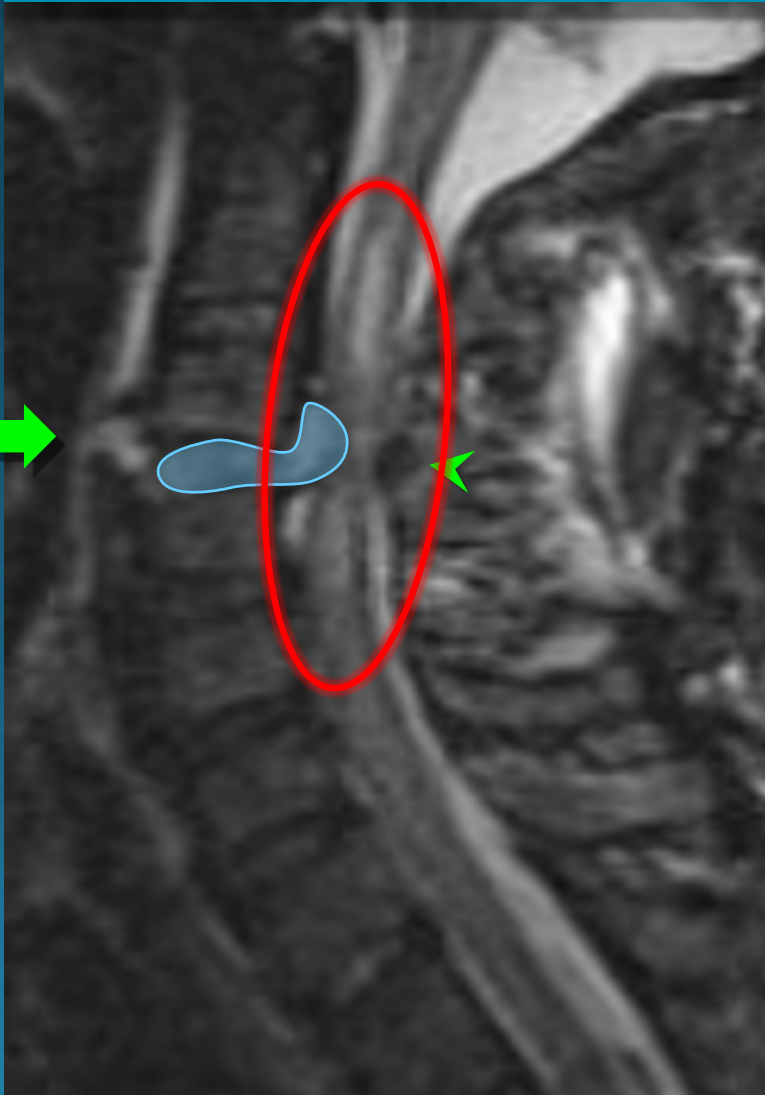


Central cord syndrome

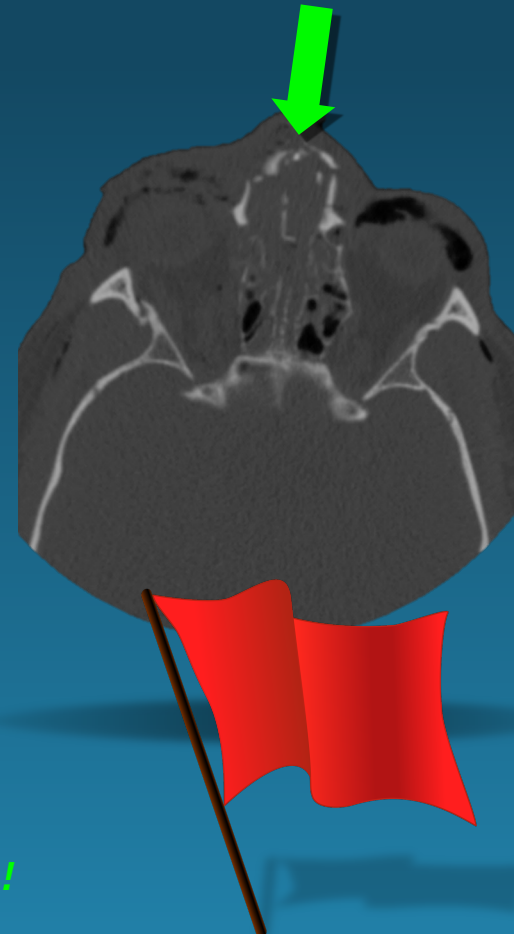
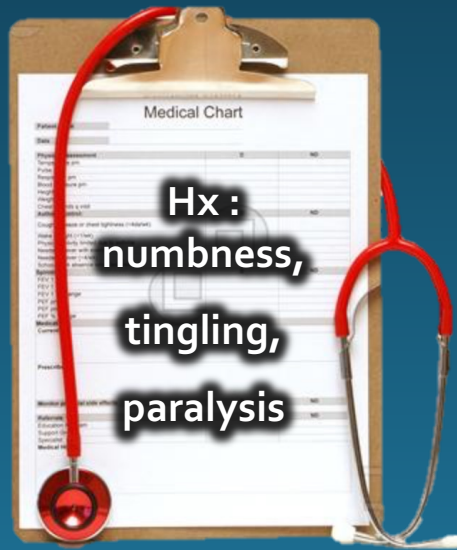
hyperextension dislocation

MRI

- disc herniation
- lig. flavum thickening
- central cord syndrome



CERVICAL SPINE TRAUMA



think hyperextension injuries!

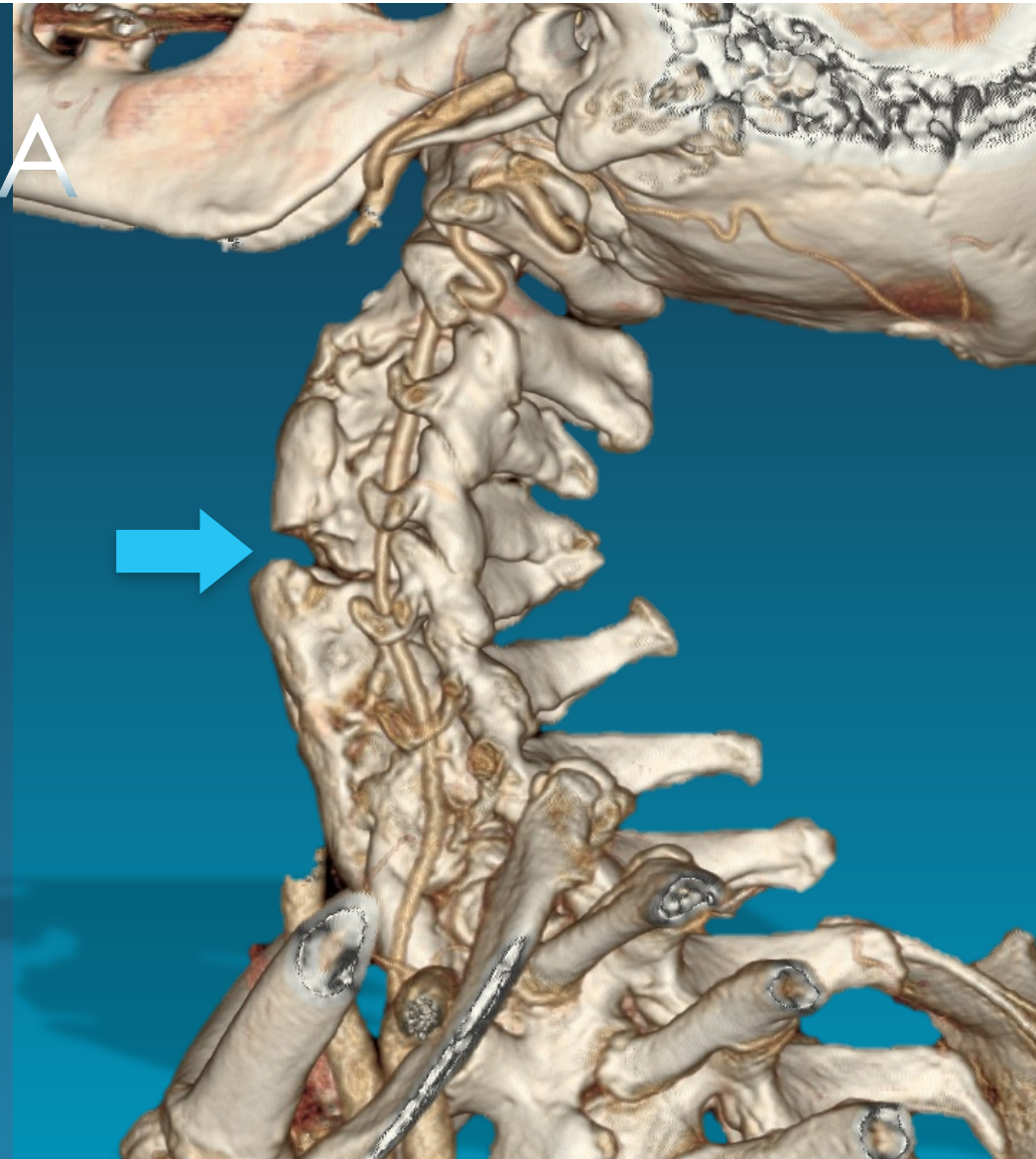
FUSED SPINE HYPEREXTENSION



C-SPINE TRAUMA

Fused Spine Hyperextension Injuries

- Ankylosing Spondylitis
- DISH
 - Intervertebral bridging with fusion
 - Poor bone quality
 - Fragile, esp. in extension



C-SPINE TRAUMA

Fused Spine Hyperextension Injuries

- Risk for profound neurologic deficits
 - Increases with missed Dx
- Noncontiguous injury rate high
 - Screen entire spine

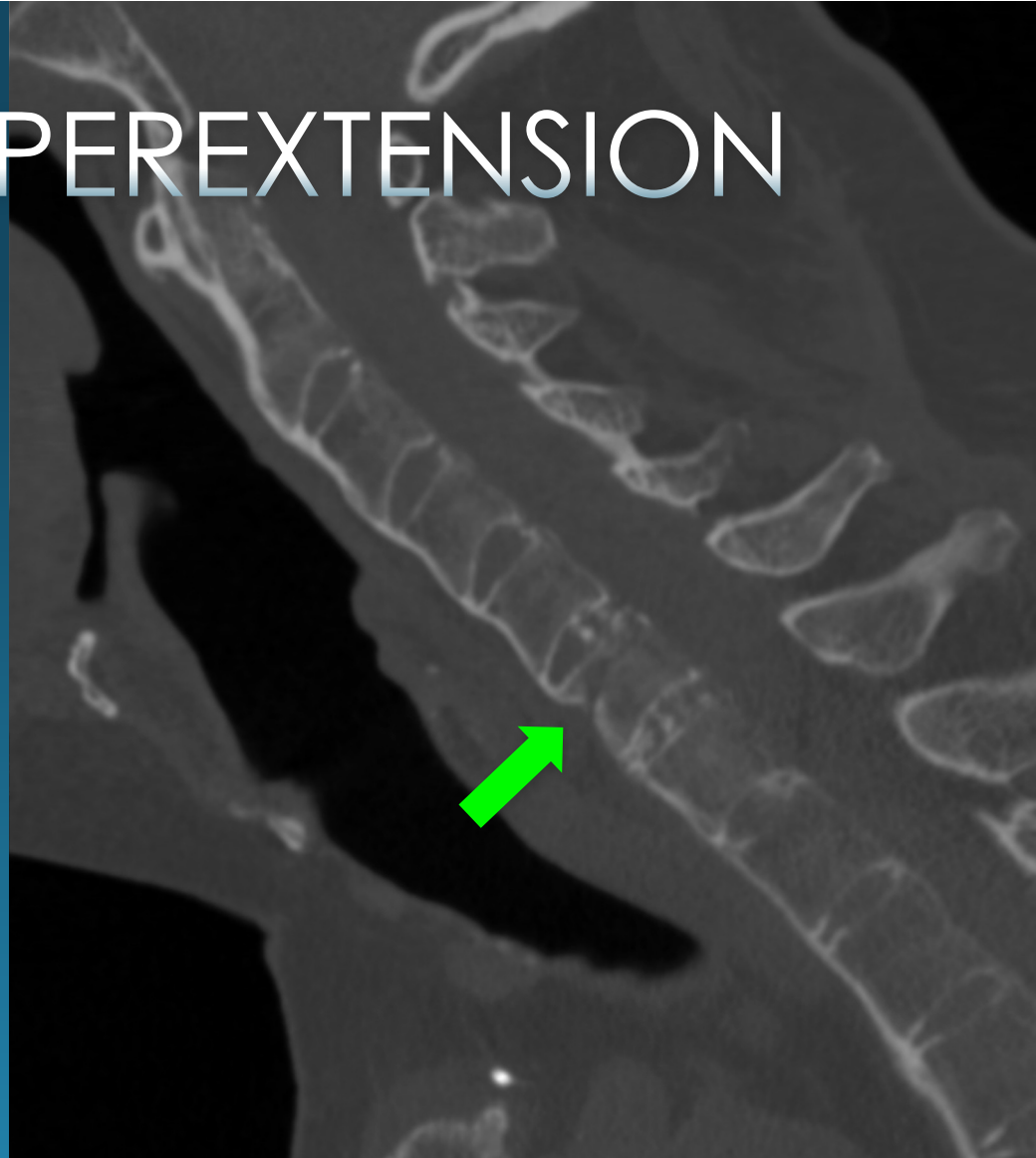
Screen for vascular injury!



FUSED SPINE HYPEREXTENSION

Imaging Findings

- **May be occult**
 - Osteoporosis
 - Spontaneous reduction
 - High index of suspicion
 - Look for forehead bump
- **Often horizontal fx**
 - Best on sagittal
 - May cross vertebral body or fused disk



fused spine
hyperextension injury

screen the entire spine!



CERVICAL SPINE TRAUMA

• Summary

• Hyperflexion

- Interspinous widening
- Facet malalignment

back to front

• Hyperextension

- Hx, forehead/facial bump
- Concern in fused spine

front to back





THANK YOU!



BOSTON MEDICAL CENTER