Outline

1. Background
2. Anatomy
3. Cases
3. Wrap Up
Background

7-10k cervical spine injuries in US annually

~50% have associated spinal cord trauma

Alert stable patients without distracting injuries
   Clinical decision rules to guide imaging
   NEXUS: National Emergency X-Radiograph Utilization Study
   CCR: Canadian C-Spine Rule

Symptomatic, disoriented, obtunded patients
   IMAGING NECESSARY
Canadian C Spine Rule

Any high-risk factor that mandates radiography?
Age ≥65 yr or dangerous mechanism or paresthesias in extremities

No

Any low-risk factor that allows safe assessment of range of motion?
Simple rear-end motor vehicle collision or sitting position in the emergency department or ambulatory at any time or delayed (not immediate) onset of neck pain or absence of midline cervical-spine tenderness

Yes

Unable

Able to rotate neck actively?
45° left and right

Yes

No radiography

Note: Complete exam of the cervical spine MUST include all of C7 and at least superior endplate of T1
If cervical spine trauma known -> CT

YES!!!
If ligamentous or spine cord injury -> CT + MR
Anatomy
Anatomy: Frontal radiograph & CT
Anatomy: Lateral radiograph
Anatomy: Sagittal CT
Anatomy: Open mouth odontoid & CT
Anatomy

Atlanto-occipital alignment: Anterior margin of foramen magnum should line up with dens. Basion to dens interval <10 mm (BDI)

Normal Anatomy: Axial CT image of C1
THREE COLUMN CONCEPT
Anterior, Middle, and Posterior columns as indicated

UNSTABLE: fracture of middle column and *either* anterior or posterior column
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Case #1:

34yoM riding an ATV, lost control and crashed

Cervical spine CT ordered as part of trauma CT series
Findings: On 3 sagittal CT images, there is Basion-dens interval excessive, >10 mm, in this case almost 5 cm = Atlanto-occipital dislocation

Case #1: Atlanto-occipital dislocation:

More common in children
Nearly always fatal
Hyperextension with distraction injury

UNSTABLE
Case #2:

Pediatric patient in MVA

Extreme example of... Atlanto-occipital dislocation
Case #3:

19yoF boating at a lake with friends, dove head first into shallow water and now with neck pain

Radiographs were ordered (before you saw the patient)
Case #3:

Findings: On open mouth odontoid and lateral radiographs, lateral masses of C1 do not line up appropriately and there is a posterior C1 arch fracture.
Findings: On CT there are C1 anterior and posterior arch fractures (normal is intact C1 ring) = Jefferson fracture

Case #3:

Jefferson fracture:

Compression fracture of bony C1 ring involving both anterior and posterior C1 arches
Axial loading injury
Transverse ligament may also be injured
Treatment is conservative with hard collar

STABLE

Exception: transverse ligament disrupted (unstable)
Case #4:

27yoM single vehicle MVC vs tree, neck pain
CT cervical spine ordered
Case #4:

Clay Shoveler fracture:

Hyperflexion injury

Most commonly C6, C7, or T1

Usually with contraction of paraspinal muscles pulling on spinous processes

STABLE
Case #5:

31yoM head on MVC, neck pain

Cervical spine CT ordered
On 3 sagittal and 1 axial cervical spine CT, grade II-III anterolisthesis of C6 on C7, posterior elements fractures (C6), bilateral jumped and locked facets with fractures = Traumatic C6-7 spondylolisthesis with bilateral locked facets

Bilateral Locked Facets:

Anterior dislocation of vertebral body

Jumping of inferior articular process over the superior articular process of vertebral body below – locked in this position
  Can be uni- or bilateral

Extreme flexion type injury of head/neck

High risk of cord damage
UNSTABLE
Case #6:

45yoF brought in by EMS following high speed motorcycle collision

Cervical spine CT ordered as part of trauma protocol
Case #6:

On 1 axial and 2 sagittal cervical spine CT images, fractures of the bilateral pars interarticularis of C2 = Hangman fracture

Hangman fracture:

Also known as traumatic spondylolisthesis of the axis

Result of hyperextension and distraction, classically after high speed MVC with chin hitting dashboard

STABLE

(Despite name, not commonly seen in hangings - more likely cause of death in that case = asphyxiation)
Wrap Up!

If C-spine trauma -> think CT!

If ligamentous or spinal cord injury -> think MR!

4 spinal lines: anterior & posterior vertebral, spinolaminar, posterior spinous

UNSTABLE: middle column + either anterior or posterior

Named fractures: Jefferson, Clay Shoveler, Hangman
More at www.rads.web.unc.edu and @UNCRadRes

Thank you!