Cervical Spine

UNC Radiology Residency Educational Scholarship

University of North Carolina School of Medicine
Department of Radiology 2020
Jeremy Kim MD            Sheryl Jordan MD
Learning objectives

By the end of this activity, participants will be able to:

1. Understand cervical spine anatomy
2. Know what test to expect and order in the setting of trauma
3. Relay mechanisms of cervical spine injury
Module Outline

I. Background
II. Anatomy
III. Cases
III. Wrap up/Questions
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
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
If ligamentous or spine cord injury - CT + MR
Ligaments of Spine -- Median

- Vertebral Body
- Intervertebral Disc: Nucleus Pulposus, Anulus Fibrosus
- Anterior Longitudinal Ligament
- Posterior Longitudinal Ligament
- Spinous Process
- Ligamentum Flavum
- Interspinous Ligament
- Supraspinous Ligament

Sobotta
Anatomy: Lateral radiograph

- Anterior vertebral line
- Posterior vertebral line
- Spinolaminar line
- Posterior spinous line
- Intervertebral disc space
- Vertebral body
- Pedicle
- Spinous process
- Lamina
- Facet joint
- Lateral mass
- Double cortical line
- Spineus process
- Pedicle
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 ring.
THREE COLUMN CONCEPT
Anterior, Middle, and Posterior columns as indicated

UNSTABLE: fracture of middle column and either anterior or posterior column
Module Outline

I. Background
II. Anatomy
III. Cases
III. Wrap up/Questions
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.

Atlanto-occipital dislocation:
- More common in children
- Nearly always fatal
- Hyperextension with distraction injury
- UNSTABLE
Pediatric patient in MVA

Extreme example of... Atlanto-occipital dislocation
27yoM single vehicle MVC vs tree, neck pain

CT cervical spine ordered
Findings: On axial and sagittal cervical spine CT, postero-inferiorly displaced fractures of C6 and C7 spinous processes = Clay Shoveler fractures

Clay Shoveler fracture:

Hyperflexion injury

Most commonly C6, C7, or T1

Usually with contraction of paraspinous muscles pulling on spinous processes

STABLE
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
45yoF brought in by EMS following high speed motorcycle collision

Cervical spine CT ordered as part of trauma protocol
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)
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)
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

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)
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
Welcome to the UNC Radiology Residency Education Website!

We are pleased to provide this educational resource for our residency program.

UNC Rad OGenda, subspecialty block ed resources, Phone Numbers, HSL custom build e-books, helpful hints can be found on this site.

ABR Core exam intel
Block 15 Schedule
Chief's Survey
RadExam
RSNA Physics Modules

UNC Radiology Conference schedule 2018-19

Rady Formal Didactic Curriculum

More at www.rads.web.unc.edu www.msrads.web.unc.edu and @UNCRadRes

Thank you!