Practical approach to Cervical Spine Trauma

- Dr. Donald E. Olofsson
Acknowledgments

- A sincere and special thanks to Dr. Tudor Hughes for his inspiration, outstanding teaching and for his images.
This was my best attempt.
With Tudor's help.

- Very professional.
Overview
Overview

- Readout
- Anatomy
- Technique
- Trauma
Overview

• The scout view and reconstruction.
• Plain films: In and out of collar, flexion and Extension views
• CT, series included and reconstructions
• Stable vs. unstable
• A few classifications
• Reading Algorithm
Reading Algorithm

- The scout view.
- Soft tissues including brain, tubes and lines.
- Bony alignment.
- Facet joint alignment.
- Look at common sites of fractures and the second fracture.
- Other bones, and maximal STS.
The scout view (The hidden view)

- Also known at the Naval Hospital as...The staff view, the overview, the First view.
- Almost always included...Not always pushed to PACS and not always viewed.
The scout view

- Within voice recognition (AGFA Talk) template you can add. [The scout view is unremarkable.]
There may be a free lateral view.
A nice frontal view.
You may find the cause of pain.
Scout view with humeral fractures
These were known fractures.
Scout view unremarkable
You can window and level the scout.
The Scout View

You will have to select the window/level from a different image.
You can enlarge the scout.
The Scout View
Discover unexpected findings.
The Scout View

Pneumothorax
CXR several hours prior to CT with Chest tube. The Scout View

• The lung was up prior to CT. The tube was either clamped for CT or not functioning.
• No AM CXR ordered.
• Ward team notified.
• Note: all of these scout views are from the same morning.
Pulling the scout view on AGFA

- Including the statement [The scout view is unremarkable.] in your template may help remembering to do this.
- You are responsible for the image anyway so the statement will not hurt you, and it may serve as a reminder to pull and look at the image.
What the scout view can show.

- Fractures/Dislocations
- Tubes and lines
- Associated injuries
- Pneumothorax
- Foreign bodies
Reconstructing the CT images

- Bring up the CT.
- Reconstruct the thin axial images.
- Bring up the sagittal images.
- Rotate to create a true axial.
Reconstructing the CT images

- Level the axial from the coronal view.
- Double click the axial image to enlarge.
- Scroll the axial images C1 to about C3.
- Rotate off the sagittal for C4.
- Scroll
- Rotate off the sagittal for C5-T1.
• The anatomy of C3-C6 is basically the same.
• The anatomy of C1, C2 and C7 are special.
C1 the Atlas:
Anterior and posterior arch & Lat Masses, Small transverse process (contains transverse foramen)

C2 the Axis:
Body, lat masses, lamina, spinous process and Ondontoid process (dens).
Craniocervical Ligaments

Cruciate ligament removed to show deepest ligaments: posterior view

Atlas (C1)
Axis (C2)
Posterior articular facet of dens (for transverse ligament of atlas)
Apical ligament of dens
Alar ligament
Anterior tubercle of atlas (C1)
Synovial cavities
Dens
Transverse ligament of atlas
Median atlantoaxial joint: superior view
- Body
- Lamina
- Spinous Process
- Transverse process
- Pedicle & Transverse process
- Articulating facets
Lateral view: Anatomy
Oblique View: Anatomy

dens
C2
left neural foramina
C3
superior articulating facets
C4
C5
C6
spinous processes
C7
inferior articulating facets
right 1st rib
C2
C3
C4
C5
C6
C7
Oblique View: Anatomy
Technique
Technique - Routine
Lateral view: Technique

30M MVA Thought to be paraplegic
Lateral view: Technique

C7-T1 Fracture Dislocation

30M MVA Thought to be paraplegic
Technique - Flexion / Extension

Open C1 posterior arch
Technique - Flexion / Extension
Technique - Flexion / Extension

30F post trauma 8d later
Flexion and Extension

Extension
Flexion and Extension

Flexion
Technique - CT

- Excellent visualization of fractures

- Must be optimized
  - Thin slices 1 - 1.25 - 2mm
  - Bone and soft tissue algorithm / window
  - Orthogonal planes
    - Thin recons
  - Use workstation
  - 3D for alignment
Technique - MRI

- Poor visualization of fractures
- Good for soft tissue injury
- Good for spinal cord injury assessment
- Good for spinal cord injury prognosis
- Good for root avulsion
C-5 facet fracture not well seen on plain films

Technique - CT
C-5 facet fracture not well seen on plain films

Technique - MR
CT: Type I Odontoid Fracture Technique - CT

- 2.5mm Standard algorithm
- 2.5mm Bone
- 1.25mm Bone
Optimizing CT

- Half axial acquisition.
- Reducing dose.
- Altering pitch.
- Slice thickness.
Fractures
1. Anterior vertebral body line
2. Posterior vertebral body line
3. Spinolamina line
4. Posterior spinous process line

Evaluate C1-C2 Area
- Adults: <3mm
- Child: <5mm
<table>
<thead>
<tr>
<th>Flexion</th>
<th>Unilateral facet dislocation</th>
<th>Stable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral facet dislocation</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Bilateral facet dislocation</td>
<td>Unstable</td>
<td></td>
</tr>
<tr>
<td>Wedge compression fracture</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Flexion teardrop fracture</td>
<td>Unstable</td>
<td></td>
</tr>
<tr>
<td>Clay-shoveler’s fracture</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Extension</td>
<td>Posterior arch C1 fracture</td>
<td>Stable</td>
</tr>
<tr>
<td>Hangman’s fracture</td>
<td>Unstable</td>
<td></td>
</tr>
<tr>
<td>Laminar fracture</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Pillar fracture</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Extension teardrop fracture</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Hyperextension dislocation fracture</td>
<td>Unstable</td>
<td></td>
</tr>
<tr>
<td>Compression</td>
<td>Jefferson fracture</td>
<td>Unstable</td>
</tr>
<tr>
<td>Burst fracture</td>
<td>Stable</td>
<td></td>
</tr>
<tr>
<td>Complex</td>
<td>Odontoid fractures</td>
<td>Unstable</td>
</tr>
<tr>
<td>Atlantooccipital disassociation</td>
<td>Unstable</td>
<td></td>
</tr>
</tbody>
</table>
Compression Fractures

- Stable
- Burst fracture
- Unstable
- Jefferson fracture
Flexion: stable vs. unstable

- Stable
- Unilateral facet dislocation
- Wedge Compression
- Clay Shovel's

- Unstable
- Bilateral facet dislocation
Extension: stable vs. unstable

- Posterior arch C1
- Laminar
- Pilar
- Extension tear drop

- Hangman’s
- Hyperextension dislocation fracture
Pseudo (physiologic) Subluxation

- In children
- Ligament laxity
- Check Posterior Spinal (cervical) Line
- More than 2-3mm offset (SLL anterior to PSL at C2) must be considered traumatic.
• Atlanto Occipital Dislocation
Atlanto Occipital Dislocation

- 40% missed dx at presentation
- STS +/- Retropharyngeal air
- Avulsion fractures occipital condyle or lower tip of clivus
- Classification:

  ![Diagram of Atlanto Occipital Dislocation]

  Normal | I | II | III
Atlanto Occipital Dislocation

Causes:
- Traumatic
- Nontraumatic
  - RA
  - Congenital Skeletal Abnormalities
  - Down’s
  - Infection
  - CPPD
- Prognosis not good
  - (but 20% may have no deficit!)
Atlantooccipital subluxation

- **BDI (Basion Dental Interval)**
  - Vertical distance of basion above dens <12 mm

- **BAI (Basion Axial Interval)**
  - Anterior distance of basion from PSL 4 – 12 mm

- **Powers ratio:**
  - Basion to C1 Posterior lamina line / Opisthion to posterior cortex of the anterior C1 tubercle <1

- X method of Lee
- Clival line
Occipito atlas separation

Power’s ratio

BC should be less than AO

Evaluation of traumatic atlantooccipital dislocations.

Lee C, et al  
Occipito atlas separation

Clival Line - Normal
Occipito atlas separation

Basion Axial Interval

Harris JH Jr


Radiologic diagnosis of traumatic occipitoaxial dissociation:
Atlanto-occipital Dislocation.

Atlanto-occipital Dislocation.


Atlanto axial and cranial atlas separation 32M
Atlanto-occipital Dislocation.
Atlanto-occipital Dislocation.

Radiologic diagnosis of traumatic occipitovertebral dissociation:
Atlanto-occipital Dislocation.

13 y.o girl s/p MVA unconscious
Atlanto-occipital Dislocation.
Atlantooccipital subluxation
Fractures
  – Jefferson
  – Isolated posterior arch

Subluxation
  – Atlanto axial
  – Rotary
• Jefferson Fracture
Jefferson Fracture  
(Burst Fracture of C1)

• Compression to vertex
• Diving injury
• Rx. Halo for 3m
Jefferson Fracture
(Burst Fracture of C1)

• Radiographic findings
  - AP open mouth is key
  - C1 lateral masses laterally displaced
  - >2mm bilaterally always abnormal
  - 1-2mm unilaterally may be head tilt
Jefferson Fracture (Burst Fracture of C1)

Vertical Compression – **Unstable**

1. Unilateral or Bilat FX’s of both ant and post arches of C1

2. Displacement of lateral masses.

3. CT required for defining full extent of fracture and detecting fragments in spinal cord/canal

4. Treatment: Halo placement for 3 months
Jefferson Fracture
(Burst Fracture of C1)

Vertical Compression – Unstable

1. Unilateral or Bilat FX’s of both ant and post arches of C1

2. Displacement of lateral masses.

3. CT required for defining full extent of fracture and detecting fragments in spinal cord/canal

4. Treatment: Halo placement for 3 months
Jefferson Fracture

- Axial loading
- Often 4 part Fx, or single both side fractures
- Splaying of lateral masses
- Disruption of transverse ligament
- Best seen on AP odontoid and axial CT
Jefferson Fracture
Atlanto Axial Distance

- Females < 2mm
- Males < 3mm
- Children < 4mm

Hinck 1966
• Odontoid Fracture
Dens Fractures

TYPE 1 - Avulsion fx of the tip.
Considered Stable

TYPE II - Fx at Base of Dens.
Most Common
Poor blood supply
Unstable

TYPE III - Fx into body of axis
Best Prognosis
Unstable
Type I Odontoid Fracture
Type I Odontoid Fracture
- Type 2
- Odontoid Fracture
Type II Odontoid Fracture
Type II Odontoid Fracture
Type II Odontoid Fracture
Type 3
Odontoid Fracture
Displaced type 3 odontoid fx
Low Type III Odontoid fracture
Type III Odontoid Fracture
Type III Odontoid Fracture
• Hangman
Fracture
Hangman Fracture - Unstable

- Traumatic Spondylolisthesis of the Axis
- Bilateral C2 pars (common) or Pedicle (less common)
- Hyperextension and traction injury of C2
  - MVA (chin to dashboard)
  - Hanging
- The odontoid and its attachments are intact.
- Nerve damage is uncommon owing to the width of the canal at this level.
Hangman Fracture - Unstable

- Traumatic Spondylolisthesis of the Axis
- Bilateral C2 pars (common) or Pedicle (less common)
- Hyperextension and traction injury of C2
  - MVA (chin to dashboard)
  - Hanging
- The odontoid and its attachments are intact.
- Nerve damage is uncommon owing to the width of the canal at this level.
**Hangman Fracture - Unstable**

**Effendi classification**

**Grade 1:** extension injury, displacement < 2mm. Rx flexion.

**Grade 2:** extension injury, displacement > 2mm and angulation. Rx flexion.

**Grade 3:** flexion injury, C2-3 facet joint subluxation/dislocation. Rx extension.
Hangman Fracture - Unstable

Effendi classification

Type I: bilateral pars fractures, normal C2/C3 disc space and minimal / no displacement of C2 body. LE1

Type II: displacement of anterior fragment, abnormal C2/C3 disc LE2b

Type III: anterior displacement of the anterior fragment, body of C2 in flexed position, bilateral facet dislocation LE2a/LE3
Levin and Edward’s

Type 1: Neural arch fracture, < 3mm displacement, no angulation

Type 2: A; + angulation

Type 2: B; + >3mm displacement

Type 3: + bilateral facet dislocation C2-3

Hangman Fracture - Unstable
• Hangman Effendi 1
Hangman Fx
Hangman Fracture – Effendi 1

32 Y.O. Drunk, fell off cliff
• Hangman effendi 2
Hangman Fracture – Effendi ll – LE2a

Posterior arch C1 Fx
Hangman Fracture – Effendi 1ll – LE3
• Fractures
  – Tear drop
    • Flexion
    • Extension
    • Posterior
  – Burst
  – Posterior arch
  – Clayshoveller’s Fracture

• Dislocations
  – Unifacet
  – Bifacet

• Fracture Dislocations
  – Unilateral
  – Bilateral
  – Floating lateral mass
• Wedge
• Compression
Wedge Compression Fracture

- Usually stable
- Loss of height anterior vertebral body
- Buckled anterior cortex
- Anterosuperior fracture of body
- Differentiate from Burst
  - Lack of vertical fracture component
  - Posterior cortex intact
• Flexion
Teardrop
Flexion Teardrop

- Flexion Fracture Dislocation

- Unstable

- Most severe Cervical spine injury

- Anterior cord syndrome
  - Quadriplegia
  - Loss of anterior column senses
  - Retention of posterior column senses

- Associated with Tx or Lx spine Fx in 10%
Flexion Teardrop

- Teardrop fracture – anteroinferior
- All ligaments disrupted
- Posterior subluxation of vertebral body
- Bilateral subluxated or dislocated facets
- Spinal canal compromise
C5-C6 Flexion Distraction Teardrop
C4 Flexion Teardrop

Tear drop 2 level dislocation
C5 and C7 tear drop fractures
C5 and C7 tear drop fractures
1. Significant Prevert ST Swelling

2. Comminuted Fx of body of C6 with Anterior displacement of a teardrop fracture fragment.
• Extension Teardrop
Extension Teardrop Fracture

- Avulsion fracture of anteroinferior corner of C2>C3>C4

- Radiographic findings
  - Teardrop pulled off by ALL
  - Vertical height of fragment >= width
C2 Extension Teardrop
C3 Extension Teardrop
C5 Extension Teardrop
• ALL
• Rupture
Anterior Longitudinal Ligament Rupture
• Posterior Teardrop
C6 Posterior Teardrop
C6 Posterior Teardrop
• Burst Fracture
Burst Fractures

- Same mechanism as Jefferson Fx but located at C3-C7.

- Injury to spinal cord (due to displacement of posterior fragments) is common.

- Requires CT to evaluate.

- Stable
C5 Burst Fracture
Burst FX of C5 Flexion teardrop mechanism

1. Prevert ST Swelling
2. Comminuted FX of C5 w/slight retrolisthesis of C5/6
3. Extension of Fx into the posterior elements
CT, Burst FX of C5

48 y.o s/p mva with quadriplegia
• Facet Dislocation
Facet Dislocation - Subluxations

- Anterior subluxation (hyperflexion strain)
  - The Posterior Ligament complex is disrupted. (30-50% can show delayed instability)

- Unilateral facet dislocation (stable)
  - Results from simultaneous flexion and rotation

- Bilateral Facet Dislocation (unstable)
  - Results from extreme flexion of head and neck without axial compression
Facet Dislocation - Subluxations

- **Anterior subluxation** (hyperflexion strain)
  - The Posterior Ligament complex is disrupted. (30-50% can show delayed instability)

- **Unilateral facet dislocation** (stable)
  - Results from simultaneous flexion and rotation

- **Bilateral Facet Dislocation** (unstable)
  - Results from extreme flexion of head and neck without axial compression
Facet Dislocation - Subluxations

- **Anterior subluxation (hyperflexion strain)**
  - The Posterior Ligament complex is disrupted. (30-50% can show delayed instability)

- **Unilateral facet dislocation (stable)**
  - Results from simultaneous flexion and rotation

- **Bilateral Facet Dislocation (unstable)**
  - Results from extreme flexion of head and neck without axial compression
Unilateral
Facet Dislocation
Unilateral Facet Dislocation

- Simultaneous flexion and rotation
- Best seen on lateral and oblique views
- Vertebral body subluxation < ½ of AP width
- Disrupted “shingles on a roof” on oblique view
- Facet within foramen on oblique view
- Disrupted posterior ligaments
- Disrupted SP line on AP
- Butterfly appears
Rotational Subluxation

1. Prevert ST Normal
2. Normal Alignment
3. Abrupt change in rotation at level of C4-C5.
4. Facets superimposed at C5-6-7.

33 y.o. s/p MVA
Rotational Subluxation

33 y.o. s/p MVA
C2-3 Unilateral jumped facet
C6-7 Unilateral jumped facet
C5-6 Unilateral jumped facet
C5-6 Unilateral jumped facet
C5-6 Unilateral locked facet

Lost Hamburger sign

33 y.o s/p MVA
1. Prevert ST Normal

2. Gd I anterolisthesis of C6 on C7

3. Facets of C7 and T1 superimposed while facets of C6 are abruptly obliqued on C7
Unilateral facet lock, C6 on C7
• Bifacet Dislocation
Bifacet Dislocation

- Extreme flexion without compression
- Unstable
- Vertebral body anterolisthesis > ½ AP body
- Batwing or bowtie appearance of adjacent facets
- Wide SP on AP view
- Disrupted ALL, disc and posterior ligaments
C7-T1 Bifacet dislocations
C7-T1 Bifacet dislocations

Sag T1

Sag T2

Sag STIR
• Unifacet Fracture Dislocation
Unifacet Fracture Dislocation

- More common than pure dislocation
- Signs as before + fracture
- Fracture of facet often not seen on radiographs
C5-6 Uni Facet Fracture Subluxation

1+4+6+3+1

61M MVA
C5-6 Uni Facet Fracture Subluxation
C5-6 Uni Facet Fracture Subluxation
C4-5 Fracture Dislocation
C4-5 Fracture Dislocation
C4-5 Fracture Dislocation
C4-5 Fracture Dislocation
C6-7 Fx subluxation
C5-6 Uni Fx dis with post op unstable C4-5
C5-6 Uni Fx dis with post op unstable C4-5
• Bifacet Fracture Dislocation
Bifacet Fracture Dislocation

• Higher energy than bifacet dislocation

• MVA
Facet Fracture
Hyperextension fracture dislocation

- Severe circular hyperextension force
  - Impact on forehead
- Anterior vertebral displacement
- Unstable
Hyperextension fracture dislocation

- Radiographic findings
  - Mild anterior subluxation
  - Comminuted articular mass fracture
  - Contralateral facet subluxation
  - Disrupted ALL, PLL
Hyperextension fracture dislocation

- Comminuted articular fracture
- Anterior displacement
- Facet subluxation
Clay Shovlers

• The shoveler: Special power shoveling.

• Weakness: Spinous process fractures.

http://www.imdb.com/title/tt0132347/
The Mystery Men
• Clay Shoveler’s Fracture
Clay Shoveler’s Fracture

- Oblique avulsion fx of spinous process
- C7 > C6 > T1 levels
- Due to powerful hyperflexion
Clay Shoveler’s Fracture

- Best seen on lateral view
Clay Shoveler’s Fx

1. Oblique avulsion fx of the spinous process (C7 > C6 > T1)

2. Mechanism: Hyperflexion

3. Stable
Old C6 clay shoveler’s
• Flexion Subluxation
Anterior Subluxation

- Hyperflexion sprain
- Posterior ligament complex disrupted
- 20-50% show delayed instability
Anterior Subluxation

- Radiographic findings
  - Localized kyphotic angle
  - Fanning
    - Widened interspinous/interlaminar distance
  - Posterior widening of disc space
  - Subluxation of facet joints
  - Anterior subluxation
Facet Dislocation - Subluxations

- Anterior subluxation (hyperflexion strain)
  - The Posterior Ligament complex is disrupted. (30-50% can show delayed instability)

- Unilateral facet dislocation (stable)
  - Results from simultaneous flexion and rotation

- Bilateral Facet Dislocation (unstable)
  - Results from extreme flexion of head and neck without axial compression
C3-4 Flexion subluxation injury
Unstable Posterior Ligamentous Injury at C5-C6

27 y.o. female 3 mo s/p trauma with more recent “neck crackings” by chiropractor.
Unstable Posterior Ligamentous Injury at C5-C6

27 y.o. female 3 mo s/p trauma with more recent “neck crackings” by chiropractor.
Stability
Stability is a function of ligamentous injury.

Can be inferred from radiographs for certain fracture patterns.

Not 100% accurate:
  - Eg. Flexion subluxation
An unstable injury, is one which can progress and cause cord injury.

---

**FIG. 8.13 CLASSIFICATION OF INJURIES TO THE CERVICAL SPINE BY MECHANISM OF INJURY AND STABILITY**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FLEXION INJURIES</strong></td>
<td></td>
</tr>
<tr>
<td>Subluxation</td>
<td>Stable</td>
</tr>
<tr>
<td>Dislocation in facet joints (locked facets)</td>
<td>Stable</td>
</tr>
<tr>
<td>Unilateral</td>
<td>Stable</td>
</tr>
<tr>
<td>Bilateral</td>
<td>Unstable</td>
</tr>
<tr>
<td>Odontoid fractures</td>
<td></td>
</tr>
<tr>
<td>Type I</td>
<td>Stable</td>
</tr>
<tr>
<td>Type II</td>
<td>Unstable</td>
</tr>
<tr>
<td>Type III</td>
<td></td>
</tr>
<tr>
<td>Wedge fracture</td>
<td>Stable</td>
</tr>
<tr>
<td>Clay-shoveler’s fracture</td>
<td>Stable</td>
</tr>
<tr>
<td>Teardrop fracture</td>
<td>Unstable</td>
</tr>
<tr>
<td><strong>EXTENSION INJURIES</strong></td>
<td></td>
</tr>
<tr>
<td>Fracture of posterior arch of C-1</td>
<td>Stable</td>
</tr>
<tr>
<td>Hangman’s fracture</td>
<td>Unstable</td>
</tr>
<tr>
<td>“Extension teardrop” fracture</td>
<td>Stable</td>
</tr>
<tr>
<td><strong>COMPRESSION INJURIES</strong></td>
<td></td>
</tr>
<tr>
<td>Jefferson’s fracture</td>
<td>Unstable</td>
</tr>
<tr>
<td>Burst fracture</td>
<td>Stable</td>
</tr>
<tr>
<td>Flexion</td>
<td>Anterior Subluxation</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Unilateral facet dislocation</td>
<td></td>
</tr>
<tr>
<td>Bilateral facet dislocation</td>
<td></td>
</tr>
<tr>
<td>Wedge compression fracture</td>
<td></td>
</tr>
<tr>
<td>Flexion teardrop fracture</td>
<td></td>
</tr>
<tr>
<td>Clay-shoveler’s fracture</td>
<td></td>
</tr>
<tr>
<td>Extension</td>
<td>Posterior arch C1 fracture</td>
</tr>
<tr>
<td>Hangman’s fracture</td>
<td></td>
</tr>
<tr>
<td>Laminar fracture</td>
<td></td>
</tr>
<tr>
<td>Pillar fracture</td>
<td></td>
</tr>
<tr>
<td>Extension teardrop fracture</td>
<td></td>
</tr>
<tr>
<td>Hyperextension dislocation fracture</td>
<td></td>
</tr>
<tr>
<td>Compression</td>
<td>Jefferson fracture</td>
</tr>
<tr>
<td>Burst fracture</td>
<td></td>
</tr>
<tr>
<td>Complex</td>
<td>Odontoid fractures</td>
</tr>
<tr>
<td></td>
<td>Atlantooccipital disassociation</td>
</tr>
</tbody>
</table>
Cervical Spine - Stability

• MRI
  – Shows
    • Edema of soft tissues
    • Paravertebral hematoma
    • Ligamentous disruption
  – Still does not indicate instability
  – Negative study does not indicate stability
Flexion Extension views
- Patient should be erect
- Should wait 2w for spasm to resolve
- Must see to T1
- Must move > 30 degrees
Cx-Spine signs of instability on Flex/Ex.

- Subluxation greater than 3.5mm
- Angular deformity of more than 11 deg.
- Compression fx more than 25% loss of height
- Narrowing of the disk space.
- Widening of the interspinous distance 1.5X
- Facet joint widening
PEARLS

- One view is no view.
- 20% of spinal fractures are multiple
- 5% of spinal fractures are at discontinuous levels
- Most spinal fractures occur in upper (C1-C2) or lower (C5-C7) regions
• Spinal cord injury occurs
  – At time of trauma 84%
  – As a late complication 15%

• Any signs/symptoms of cord injury require MRI.

• Get CT in patients with unexplained prevertebral soft tissue swelling.
Online credits:

- www.crayola.com
- www.rad.washington.edu
- www.ispub.com
- www.radiographicceu.com
If your head comes away from your neck, it’s over!

The Highlander

http://www.imdb.com