



Imaging Evaluation of the Cervical Spine

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Incidence

- In the USA, there are 7,000 to 10,000 patients with cervical spine injuries who present for treatment annually.
- The mean direct costs for the first year after injury, based on injury level and the Frankel Neurologic Classification of injury severity, ranged from a high of **\$417,067** for ventilator dependent quadriplegics patients to a low of **\$122,914** in the group with near normal neurologic function.

Indications

- 1. Mental status less than alert or intoxicated
- 2. Reports neck pain
- 3. Midline neck tenderness
- 4. Neurologic signs and symptoms
- 5. Distracting injury (i.e. painful injuries elsewhere, e.g. extremity fractures)

An adequate spine series includes
three views:



- Visualization of C7-T1 may be limited by the amount of soft tissue in the shoulder region and can be enhanced by:
 1. **traction on arms** if no arm injury is present, or,
 2. **swimmer's view** (taken with one arm extended over the head).



Flexion and Extension Views

- 1-If a pure soft tissue injury is suspected
- 2-An injury of questionable stability is noted.



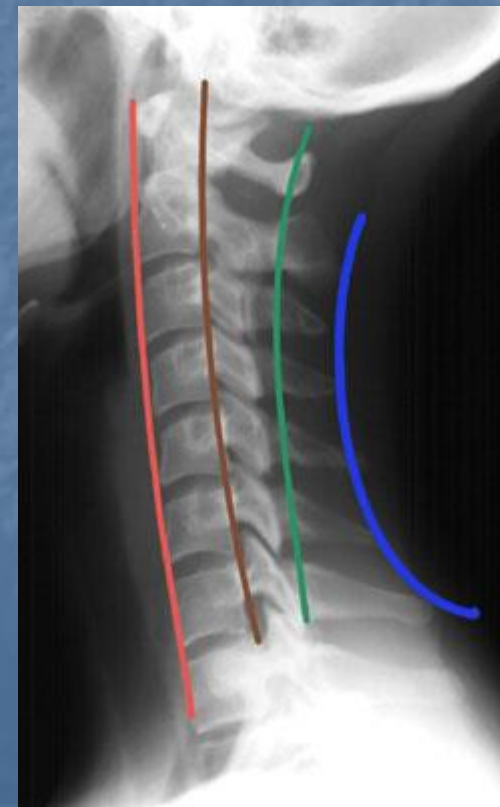
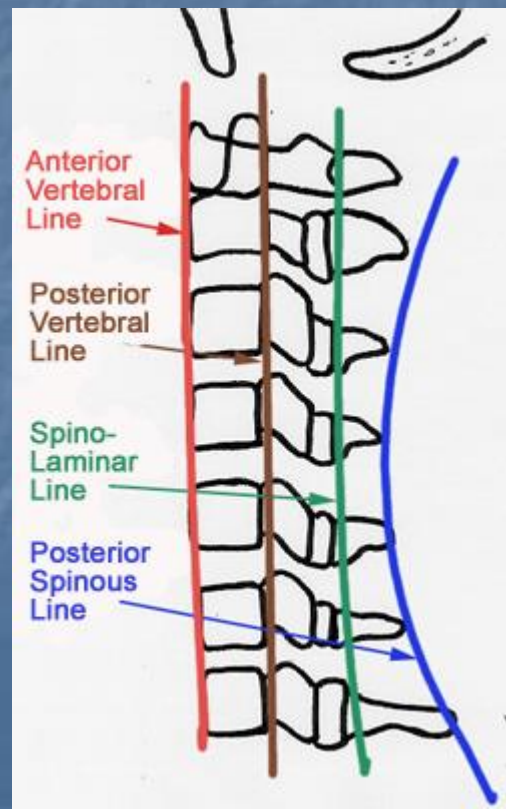


Interpretation

- A adequacy,
A alignment,
B bone,
C cartilage,
D disc, and
S soft tissue

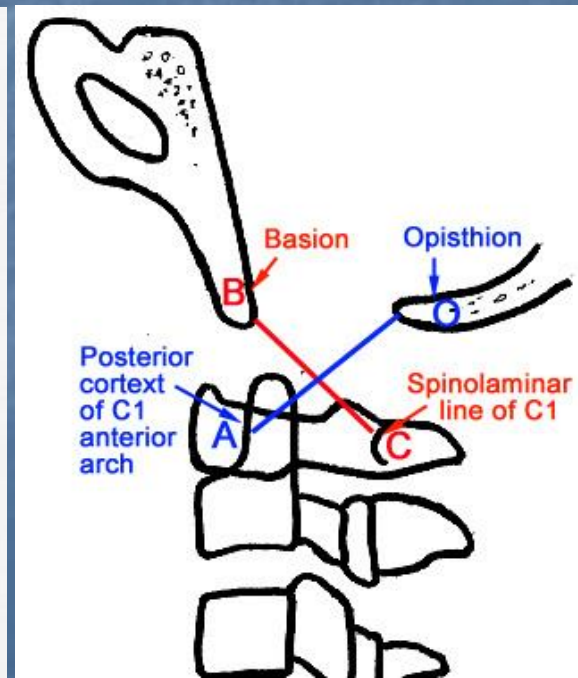
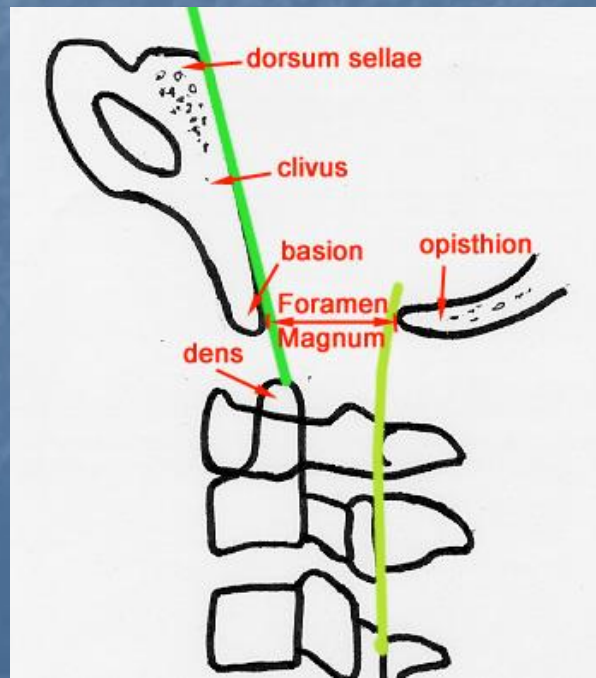
Alignment

- 1. Anterior vertebral line
(anterior margin of vertebral bodies)
- 2. Posterior vertebral line
(posterior margin of vertebral bodies)
- 3. Spinolaminar line
(posterior margin of spinal canal)
- 4. Posterior spinous line
(tips of the spinous processes)

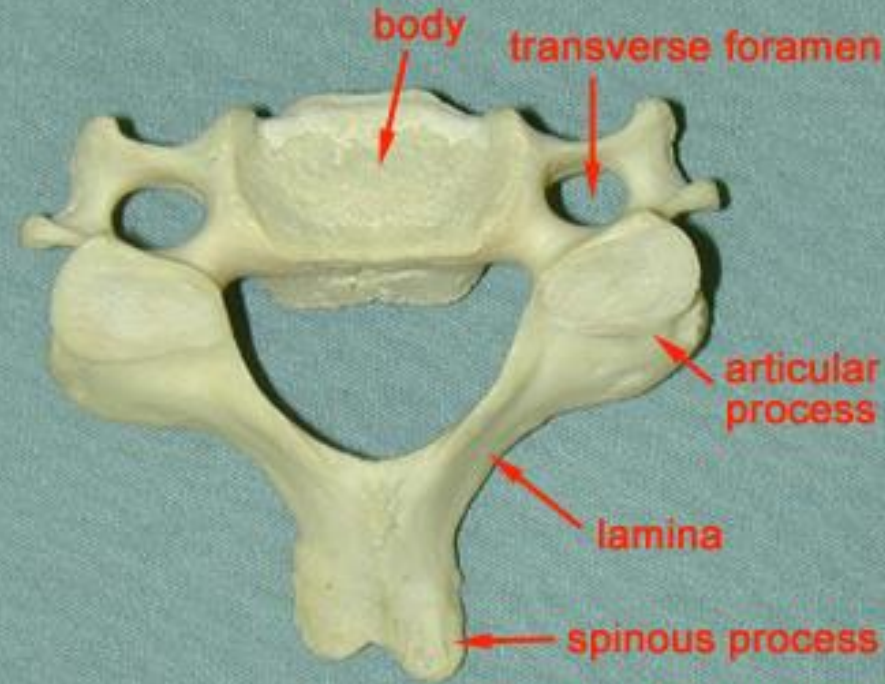
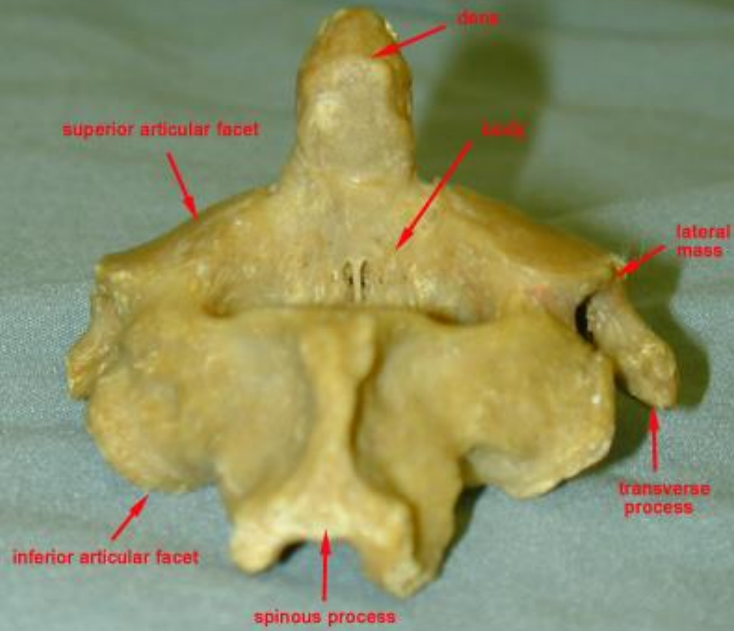
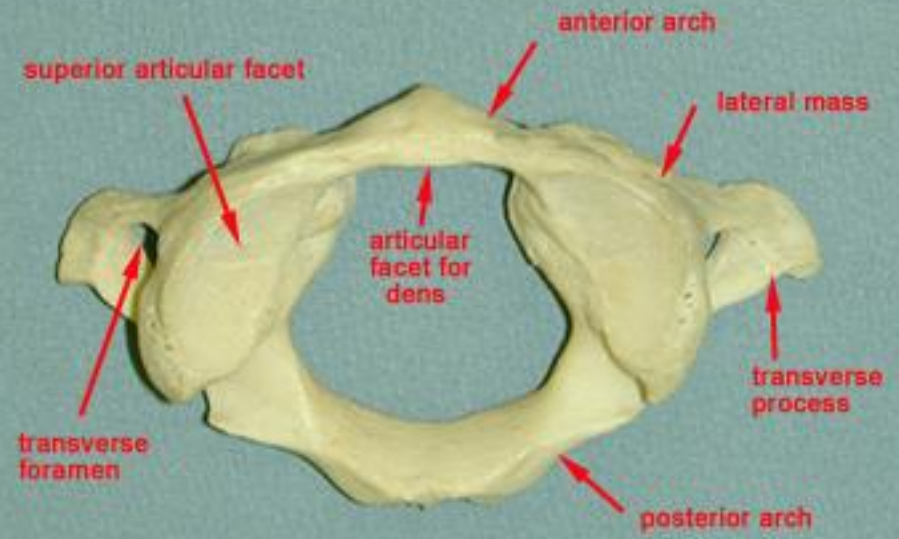
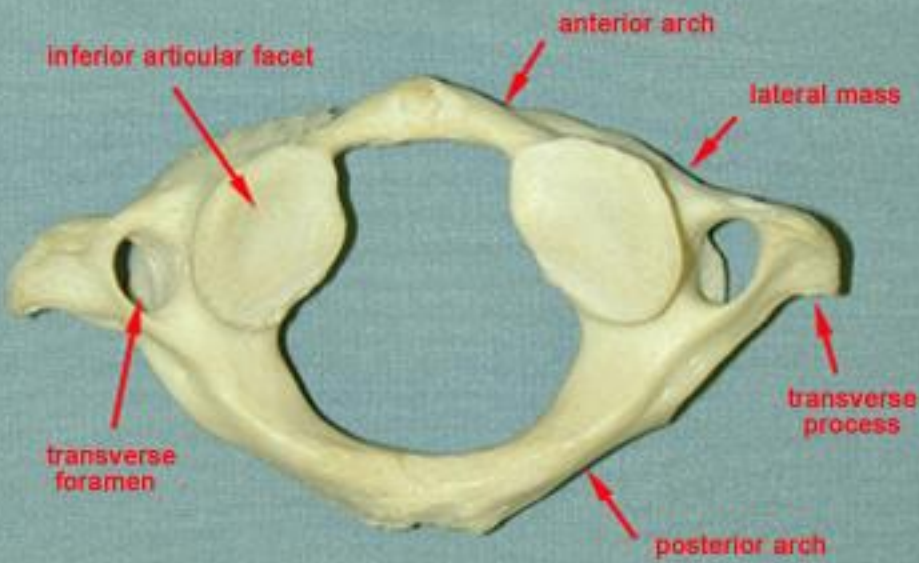


Atlanto-occipital Alignment

- The ratio of Basion - spinolaminar line of C1 to Opisthion - posterior cortex of C1 anterior arch normally ranges from 0.6 to 1.0, with the mean being 0.8. A ratio greater than 1.0 implies anterior cranio-cervical dislocation.



Bony Landmarks



Bony Landmarks



■ Cartilaginous Space

Cartilaginous Space **Pre dental space should be:**

< 3 mm in adults.

< 5 mm in adults < 10 mm in children.



- Disc spaces should be roughly equal in height at anterior and posterior margins.

Disc spaces should be symmetric.

Disc space height should also be approximately equal at all levels. In older patients, degenerative diseases may lead to spurring and loss of disc height.



Soft Tissue Space

Nasopharyngeal space (C1) - 10 mm (adult)

Retropharyngeal space (C2-C4) - 5-7 mm

Retrotracheal space (C5-C7) - 14 mm (children), 22 mm (adults).



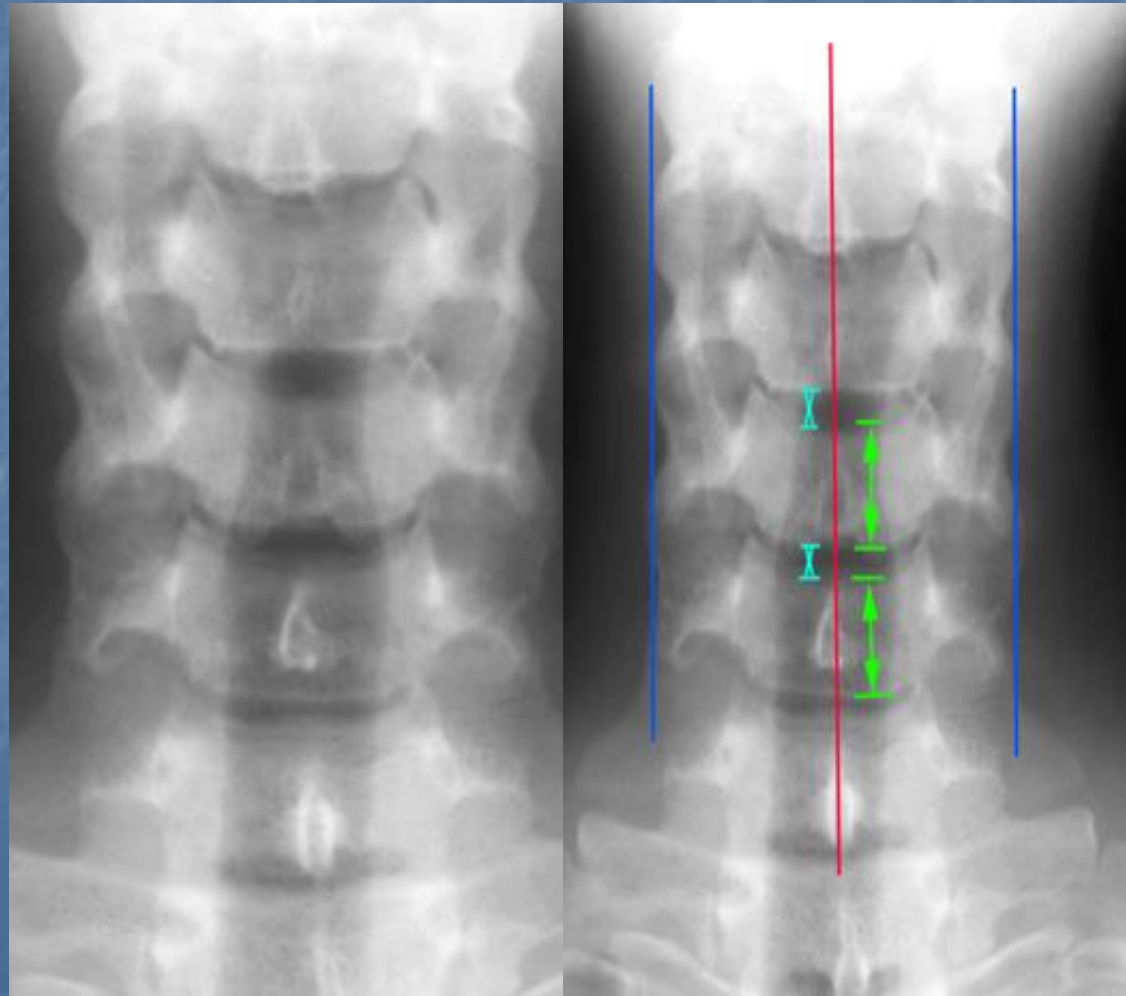
The AP View

- Alignment on the A-P view should be evaluated using the edges of the vertebral bodies and articular pillars.

The height of the cervical vertebral bodies should be approximately equal on the AP view.

The height of each joint space should be roughly equal at all levels.

Spinous process should be in midline and in good alignment. If one of the spinous process is displaced to one side, a facet dislocation should be suspected.



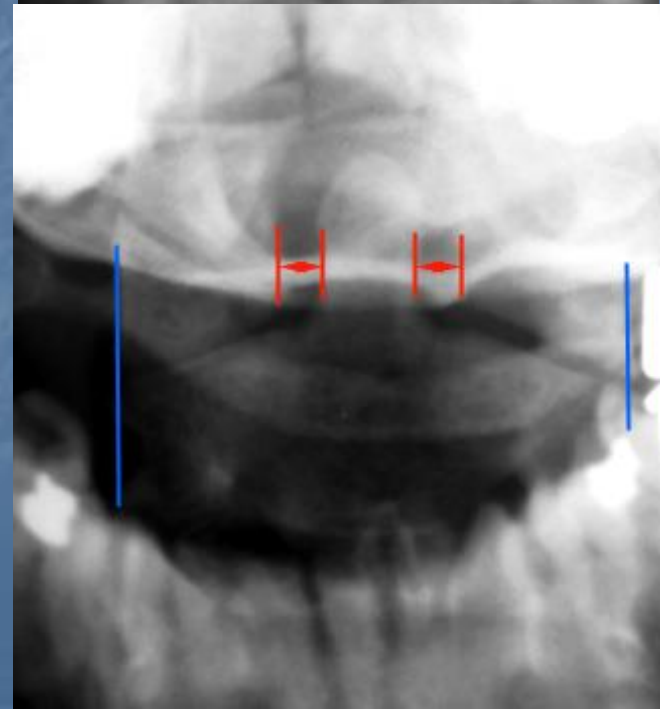
The Odontoid View

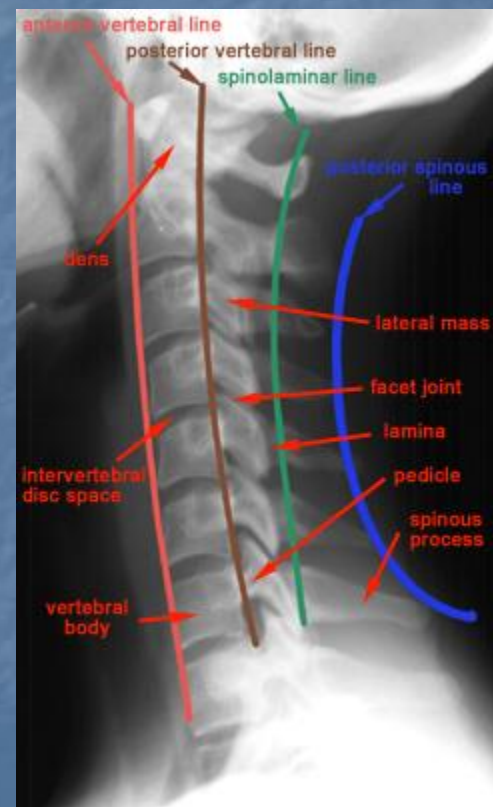
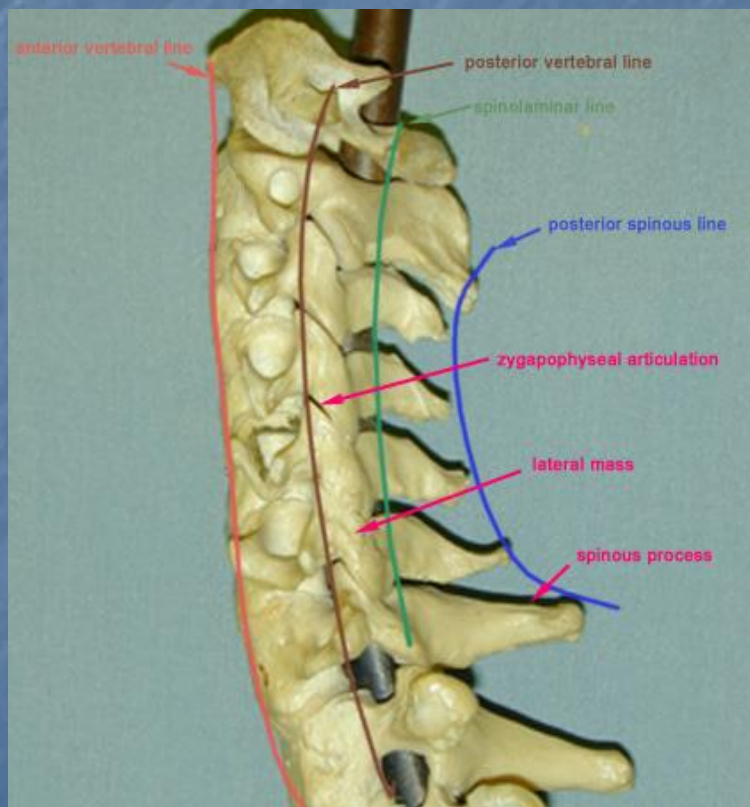
- An adequate film should include the entire odontoid and the lateral borders of C1-C2.
- examine the **Alignment**.
Occipital condyles should line up with the lateral masses and superior articular facet of C1.

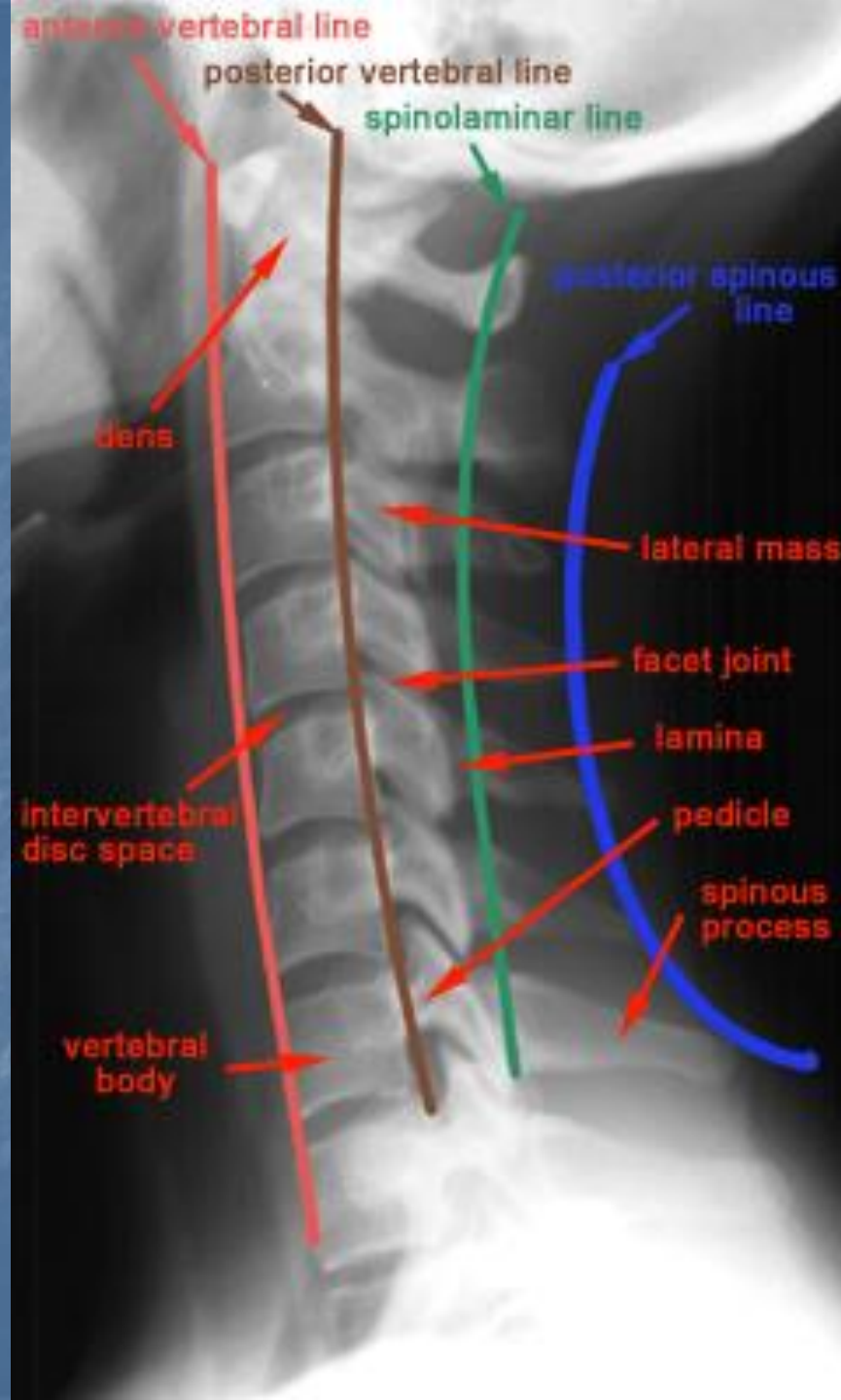
- The distance from the dens to the lateral masses of C1 should be equal bilaterally,
- Any asymmetry is suggestive of a fracture of C1 or C2 or rotational abnormality.
- The tips of lateral mass of C1 should line up with the lateral margins of the superior articular facet of C2. If not, a fracture of C1 should be suspected.

Finally, examine the **Bony Margins**.

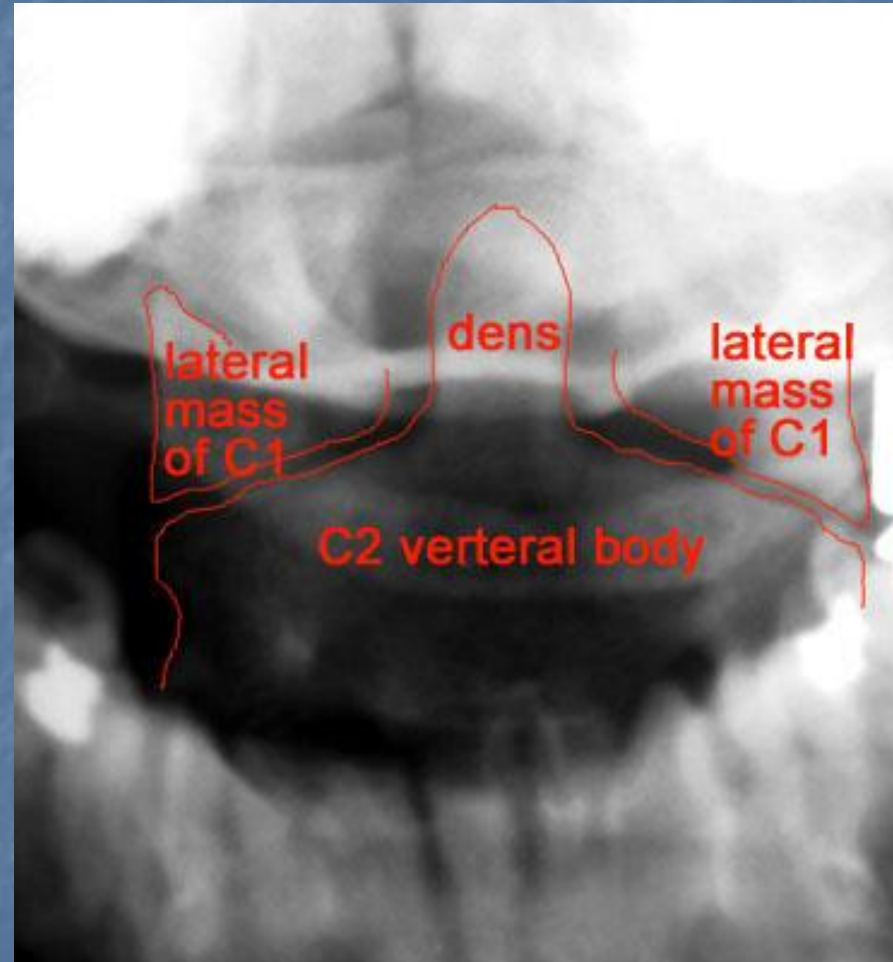
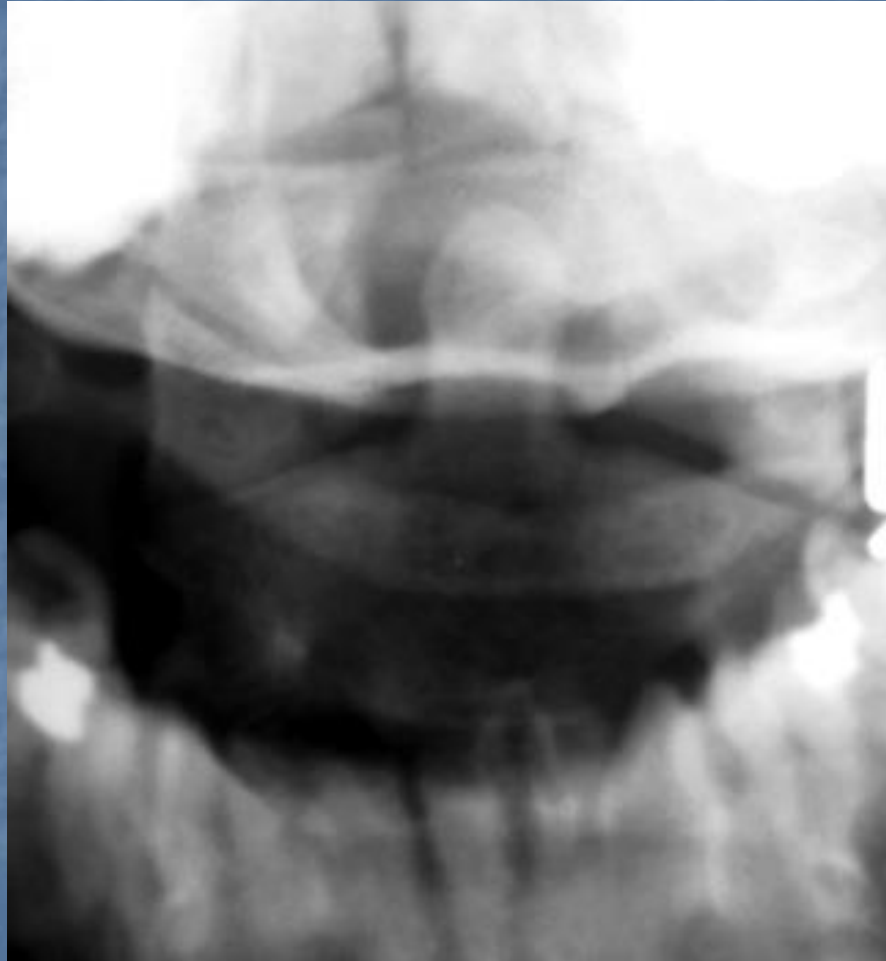
the Odontoid should have uninterrupted cortical margins blending with the body of C2.





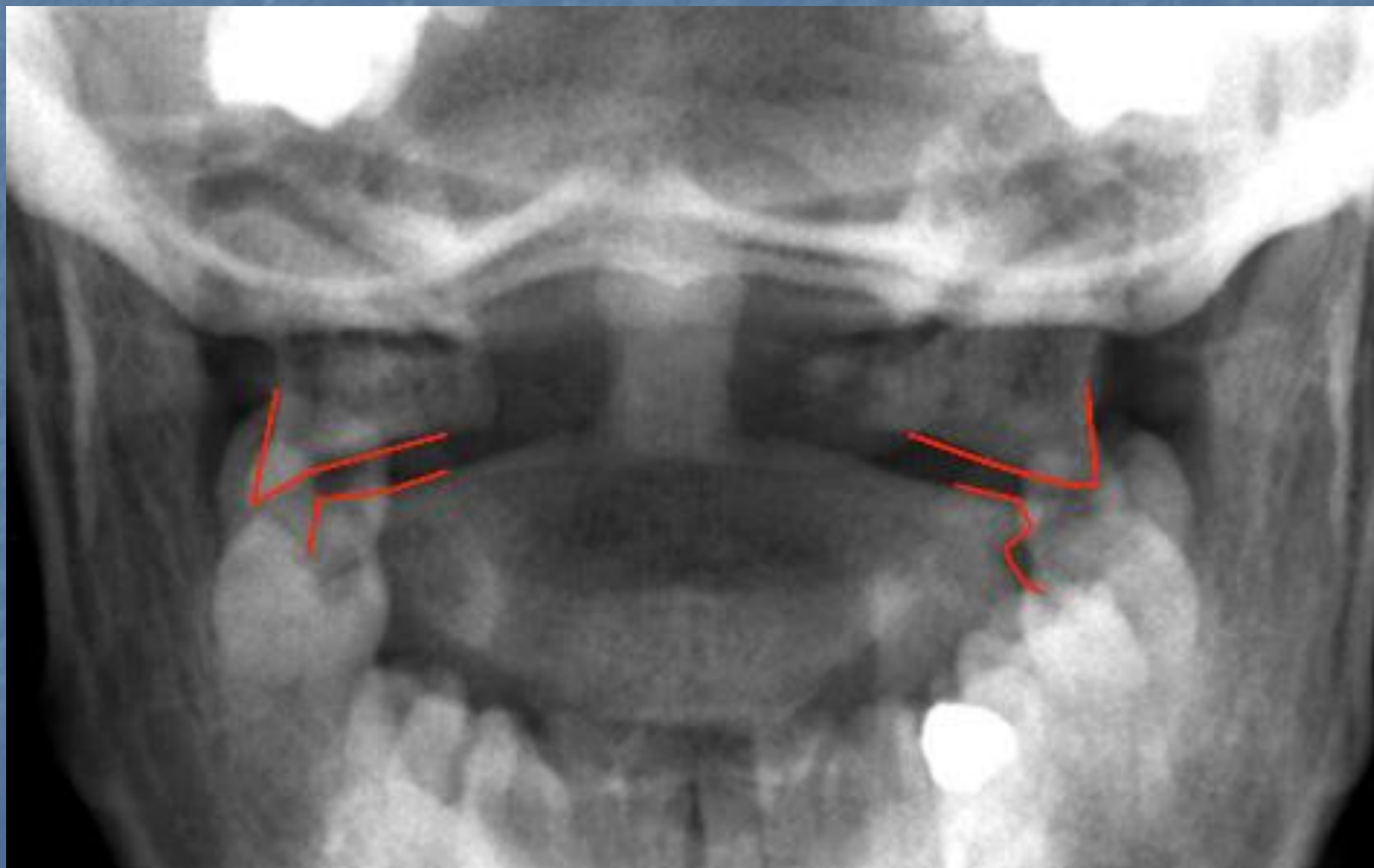




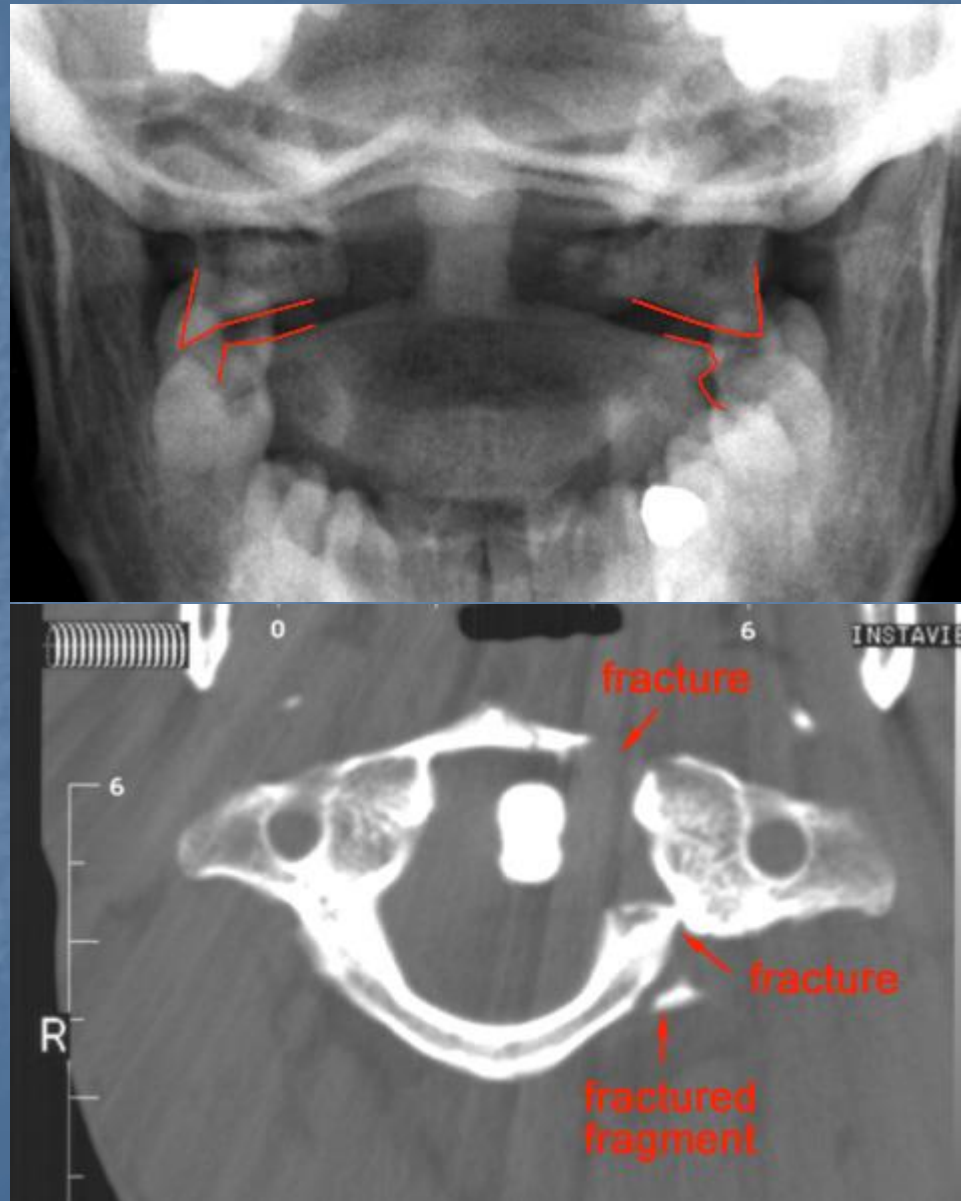




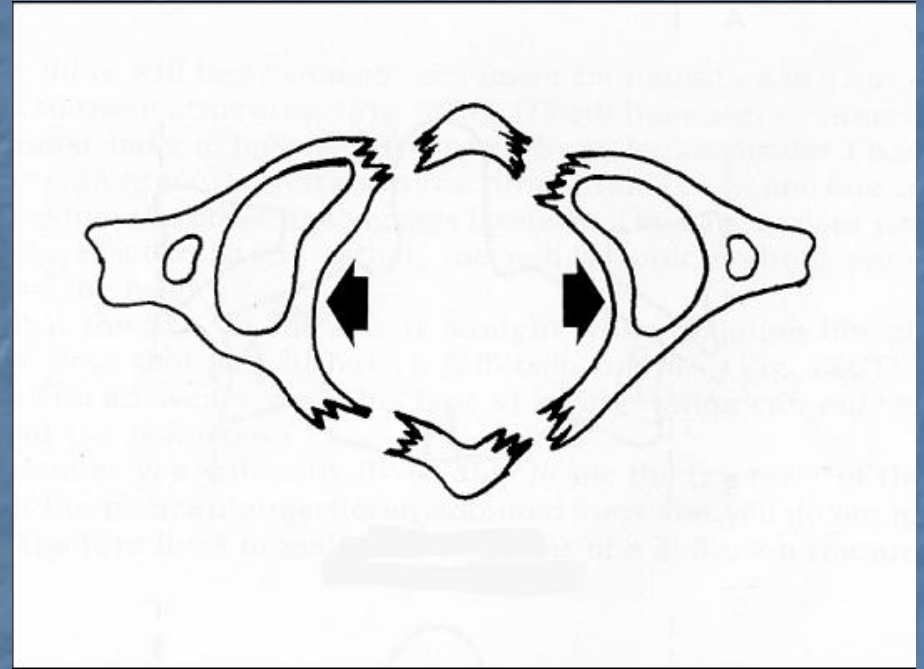
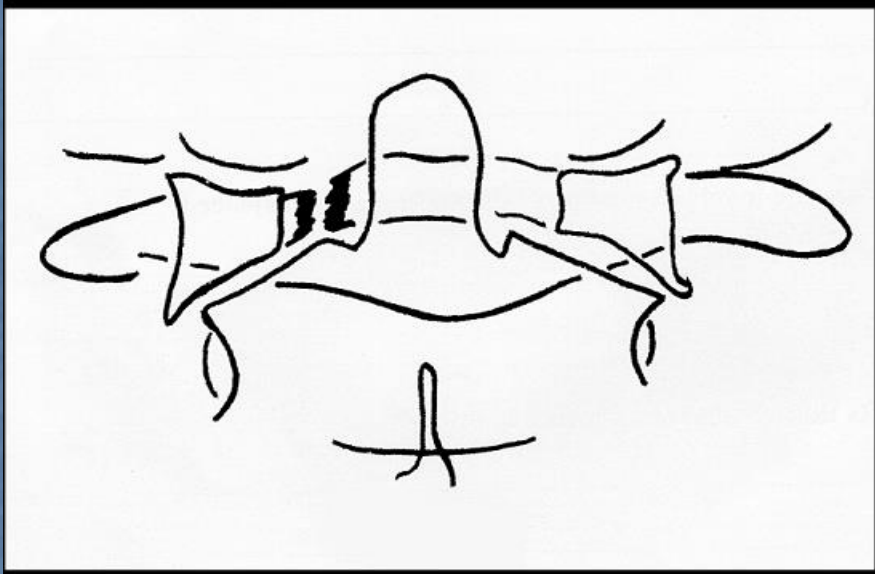




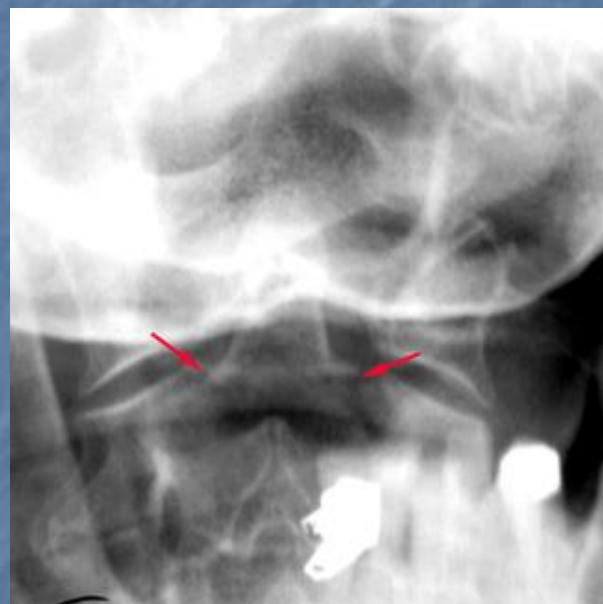
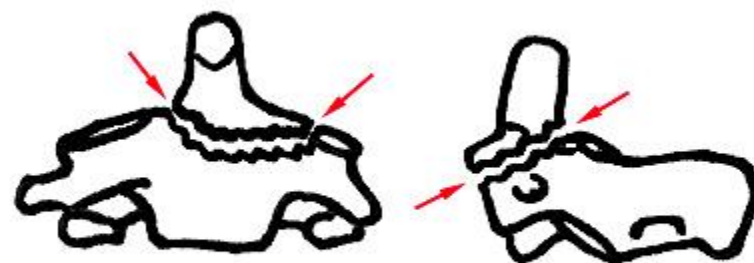
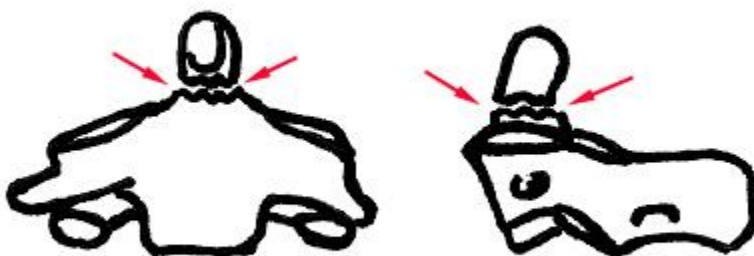
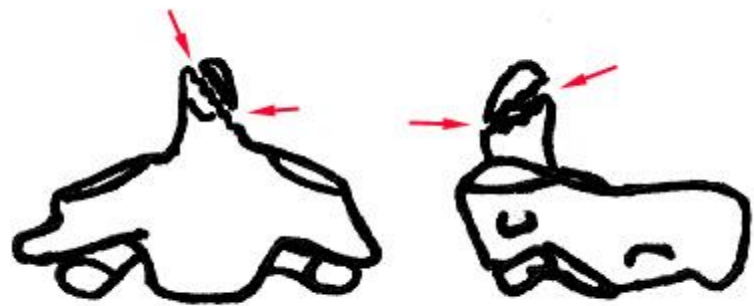
- A lateral displacement of >2 mm or unilateral displacement may be indicative of a C1 fracture. CT is required to define the extent of fracture and to detect fragments in the spinal canal.

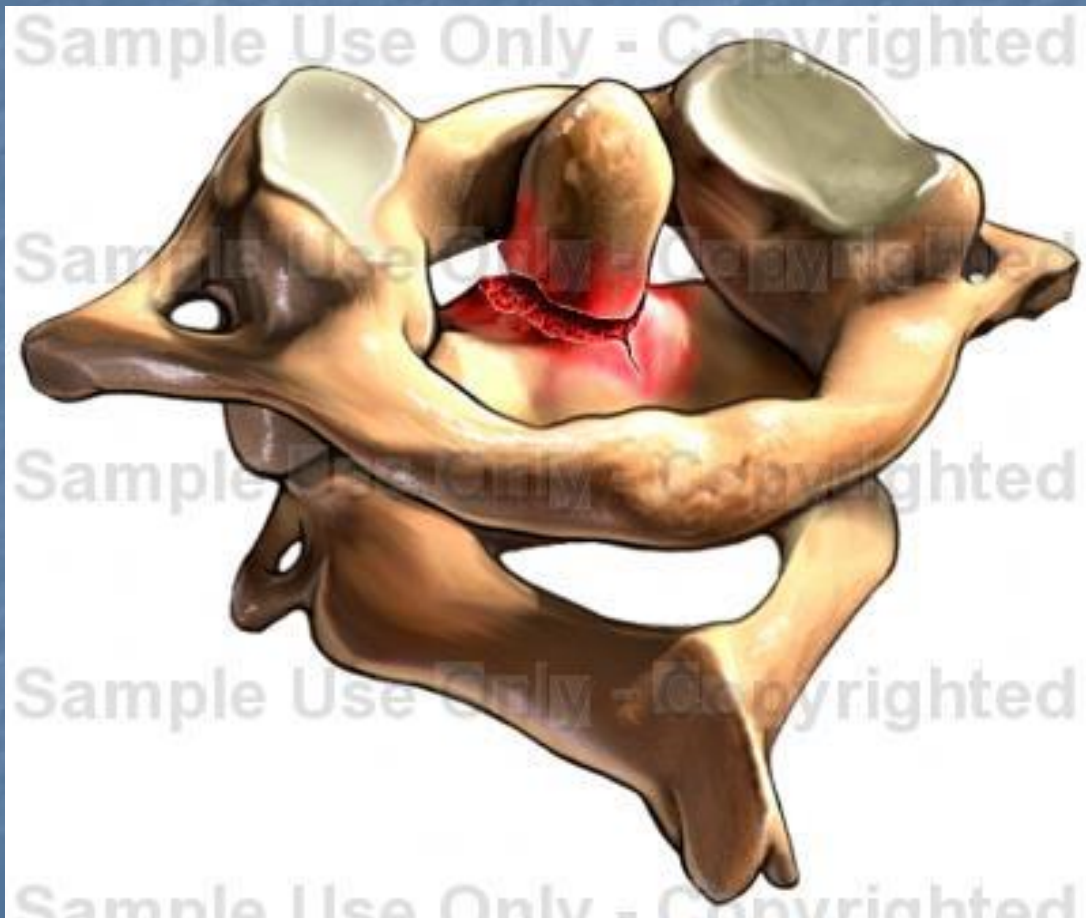


Jefferson Fracture









Hangman's Fracture

- 1. Prevertebra I soft tissue swelling.

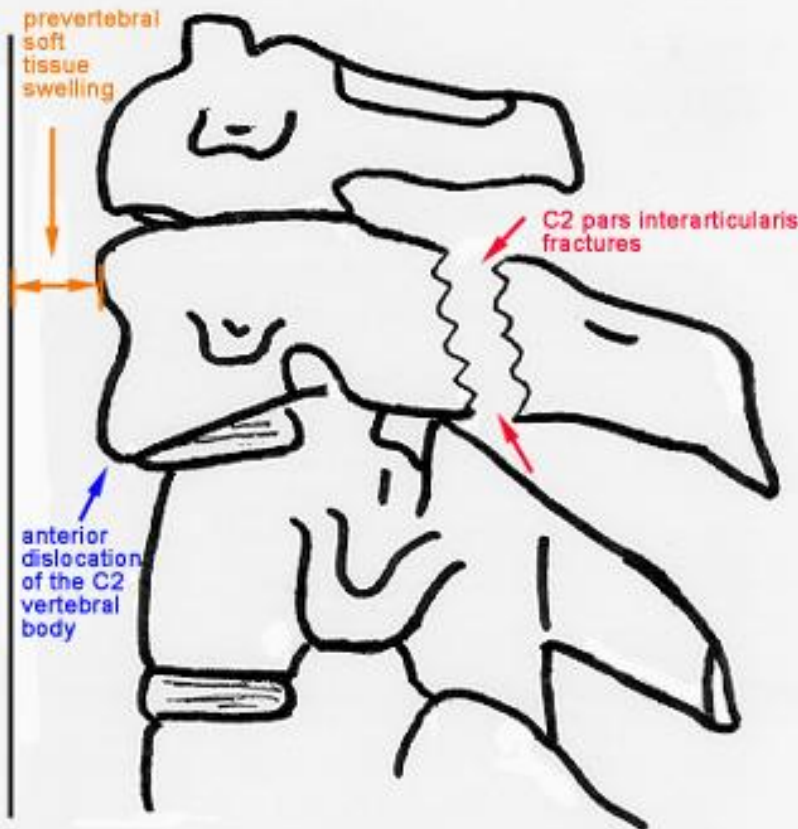
Stability: unstable

Mechanism: hyperextension

- 2. Avulsion of anterior inferior corner of C2 associated with rupture of the anterior longitudinal ligament.

- 3. Anterior dislocation of the C2 vertebral body.

- 4. Bilateral C2 pars interarticularis fractures.



Flexion Teardrop Fracture

Mechanism: hyperflexion and compression

Stability: unstable

- 1. Prevertebral swelling associated with anterior longitudinal ligament tear.
- 2. Teardrop fragment from anterior vertebral body avulsion fracture.
- 3. Posterior vertebral body subluxation into the spinal canal.
- 4. Spinal cord compression from vertebral body displacement.
- 5. Fracture of the spinous process.



Bilateral Facet Dislocation

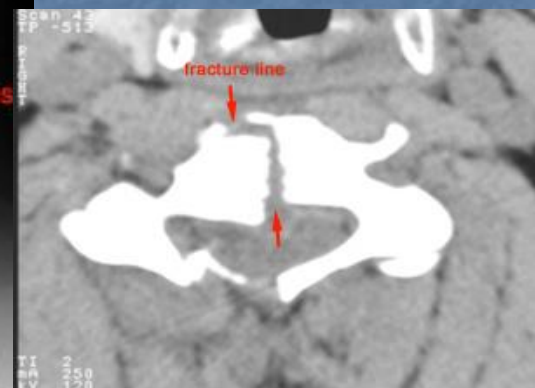




Clay Shoveler's Fracture

- **Mechanism:**
powerful
hyperflexion





Pseudosubluxation

