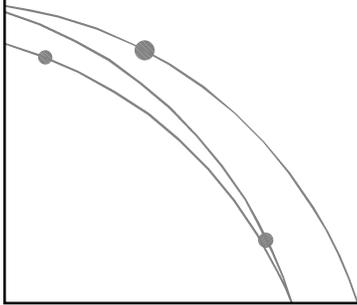


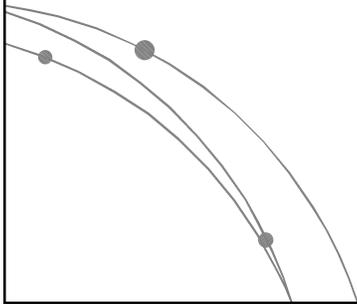
# Clinical Seminar IV

## C-spine and STN Pathology & Image Critique



1

## Pathologies



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# Clay Shoveler's Fracture

**Avulsion fracture of the spinous process in the lower cervical and upper thoracic region**

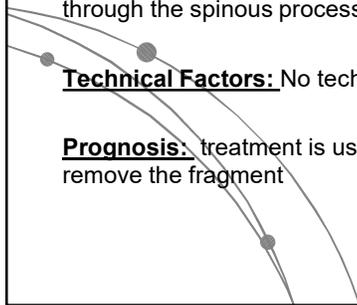
**Cause:** traumatic injury (MVA, direct blow to spine)

**Complications:** chronic neck pain and stiffness

**Radiographic appearance:** best seen on the lateral image as a lucency through the spinous process

**Technical Factors:** No technique change is necessary

**Prognosis:** treatment is usually conservative and surgery is rarely needed to remove the fragment

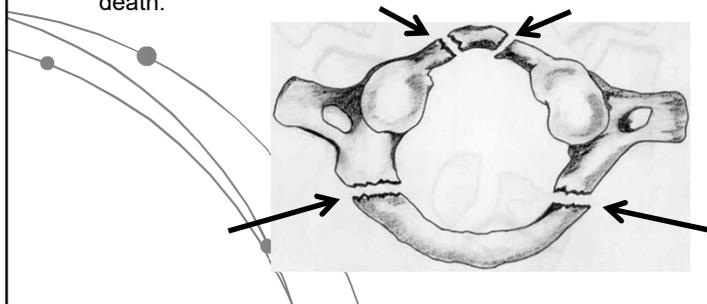


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# Jefferson Fracture

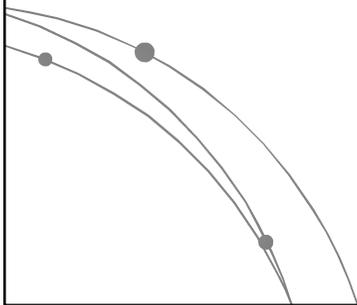
A comminuted fracture of the ring of the atlas; involves both the anterior and posterior arches and causes displacements of the fragments (comminuted).

- **Cause:** Loading force onto the atlas (Ex. diving into shallow water & the head strikes an obstacle, motor vehicle accidents in which the head is thrown forcefully against the windshield).
- **Complications:** If unstable, fracture will be at risk for spinal cord injury or death.

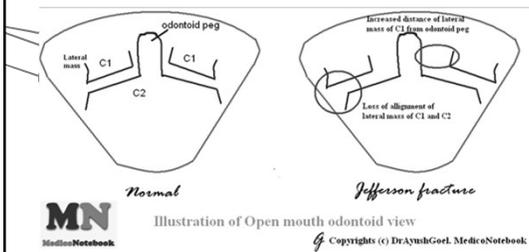
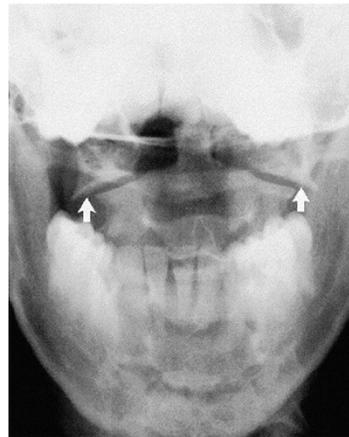
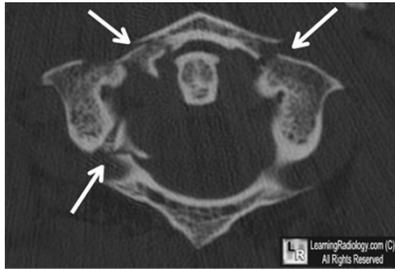


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- **Radiographic appearance:** Best visualized on odontoid view; Lateral displacement of lateral masses of C1 bilaterally.
- **Technical Factors:** No change from normal technique.
- **Prognosis:** Good with proper treatment (rigid collar for stabilized fracture; "halo"/cranial traction for unstable fracture).



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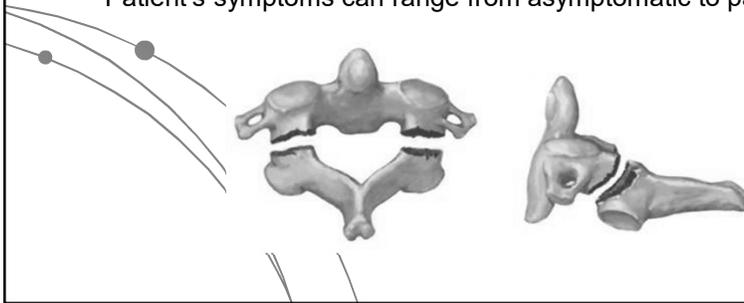


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# Hangman's Fracture

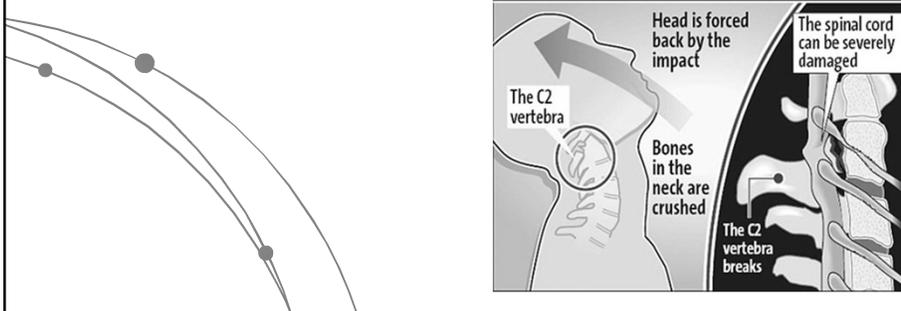
A fracture of the arch of C2 (axis)

- **Cause:** Results from hyperextension of the head on the neck. Named for result of a hanging, most commonly caused by MVCs.
- **Complications:** Often causes anterior subluxation of C2 onto C3. Patient's symptoms can range from asymptomatic to paralysis.

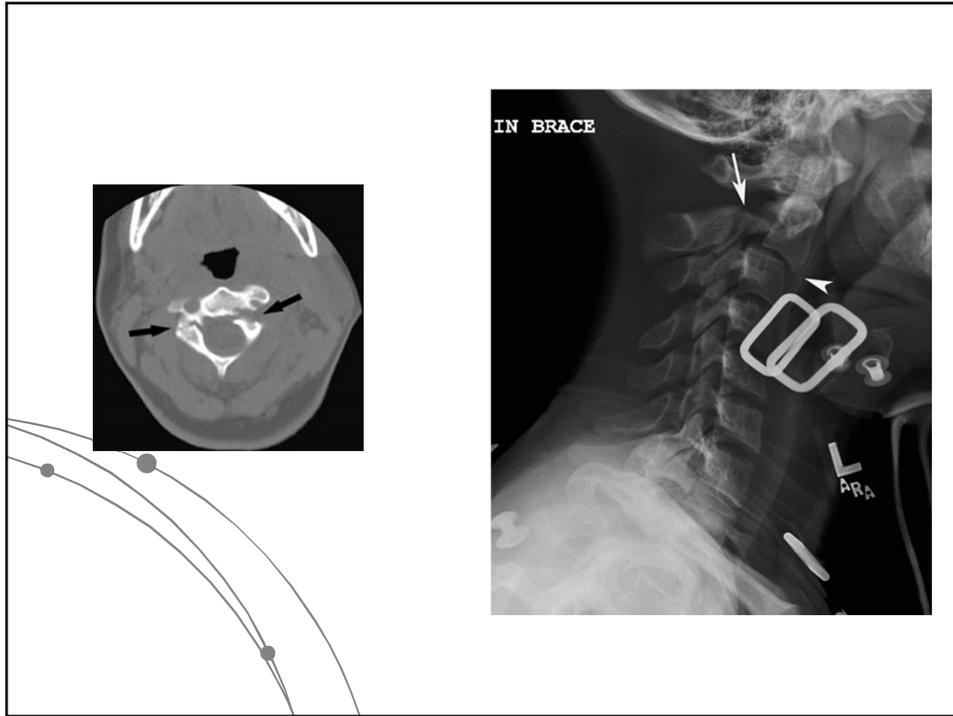


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- **Radiographic appearance:** Loss of alignment at C2/C3 with anterior displacement of C2 (as seen from lateral).
- **Technical Factors:** No change from normal technique. Best viewed lateral c-spine.
- **Prognosis:** Good - Can be treated surgically or with external immobilizers and bed rest.



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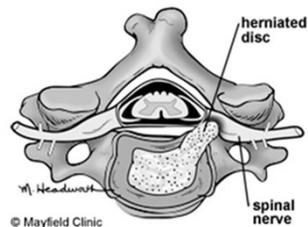
## Herniated Nucleus Pulposus (HNP)

Pathology of vertebral disc when the annulus fibrosus breaks open or cracks, allowing the nucleus pulposus to escape.

- **Causes:** Typically - lifestyle choices such as tobacco use, lack of regular exercise which contribute to poor disc health; natural biochemical changes; Poor posture & habitual use of incorrect body mechanics.

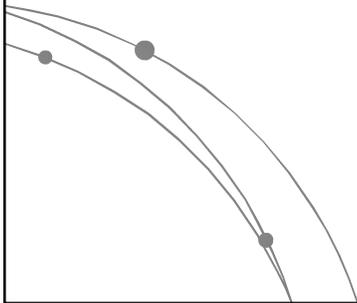
- **Complications:** Chronic back, arm or leg pain

“Cervical radiculopathy”



10

- **Radiographic appearance:** Narrowing of disc spaces (for cervical, tends to occur in C5-7 region).
- **Technical Factors:** No change from normal technique.
- **Prognosis:** Initially treated conservatively (bed rest, meds), possible surgery, conservative treatment does not alleviate pain.



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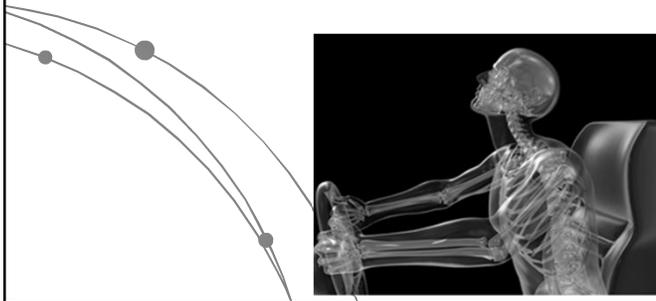


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# Hyperextension Injury (Whiplash)

Abnormal motion or force applied to the neck that causes movement beyond the neck's normal range of motion.

- **Causes:** MVA; sports injuries; falls; assaults
- **Complications:** Muscle spasms in the neck and shoulders; limited ROM; headaches; vision disturbances and tinnitus in severe cases



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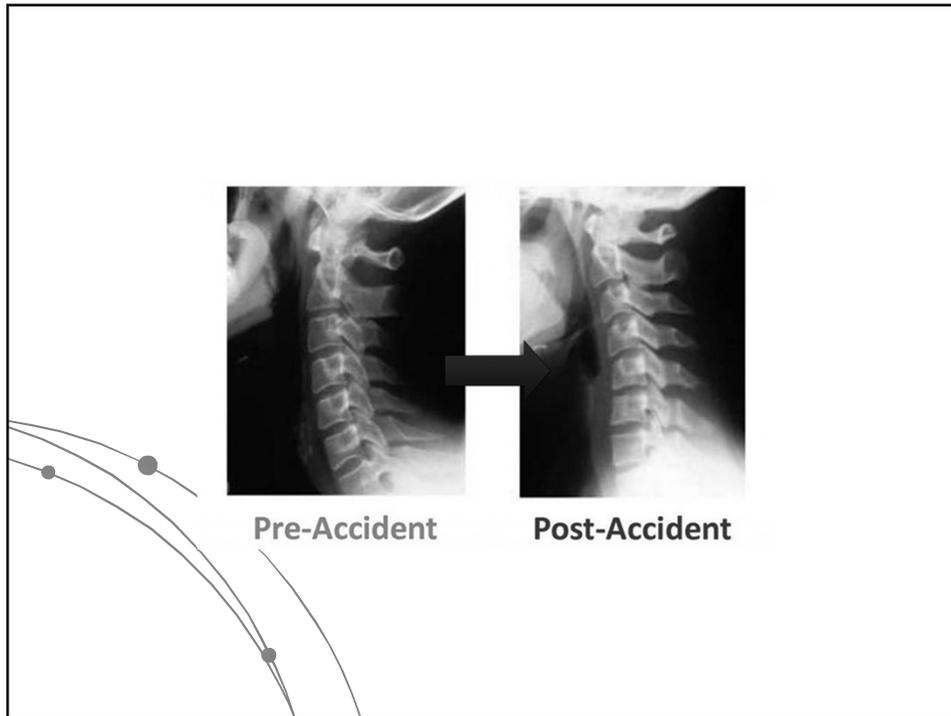
- **Radiographic appearance:** Straightening of the cervical spine – loss of lordosis
- **Technical Factors:** No change from normal technique
- **Prognosis:** Mild to moderate cases resolve in 4 to 8 weeks; severe cases may result in chronic pain from disc and/or nerve damage



## BASIC WHIPLASH SYMPTOMS

- ◆ Neck Pain
- ◆ Headache
- ◆ Shoulder Pain
- ◆ Low Back Pain
- ◆ Difficulty Swallowing
- ◆ Blurred Vision
- ◆ Ringing in the Ears
- ◆ Nausea
- ◆ Fatigue or Weakness
- ◆ Irritability
- ◆ Dizziness
- ◆ Vertigo (sense of rotation)

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## Croup

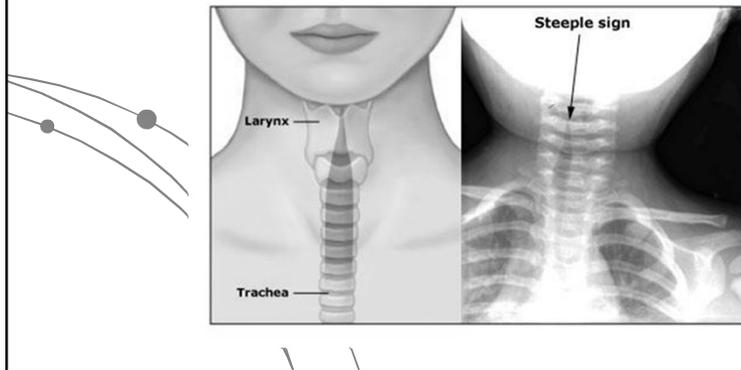
Viral infection primarily of young children– produces inflammatory obstructive swelling localized to the subglottic portion of trachea.

- **Cause:** Virus
- **Complications:** Atelectasis or Epiglottitis (swelling of the flap of tissue that prevents food and drink from entering the trachea) in severe cases it may interfere with breathing.

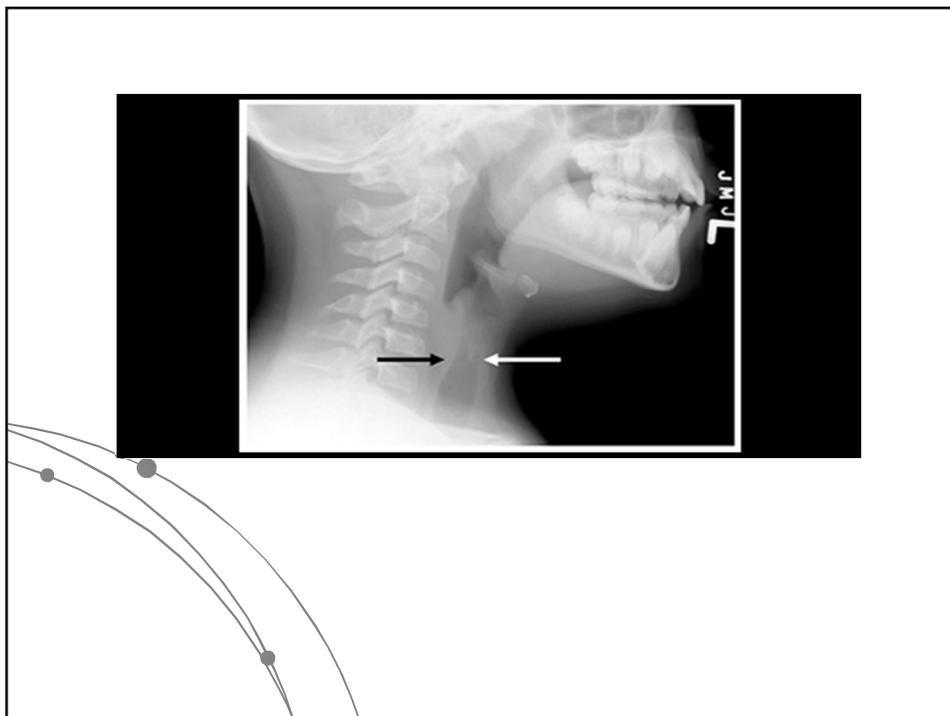


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- **Radiographic appearance:** Frontal soft tissue neck radiographs show tapered narrowing of the subglottic airway (“steep sign”)
- **Technical Factors:** Soft tissue neck technique
- **Prognosis:** Good with proper treatment – conventionally, steam mists. Corticosteroid treatment used in severe cases to help reduce swelling.



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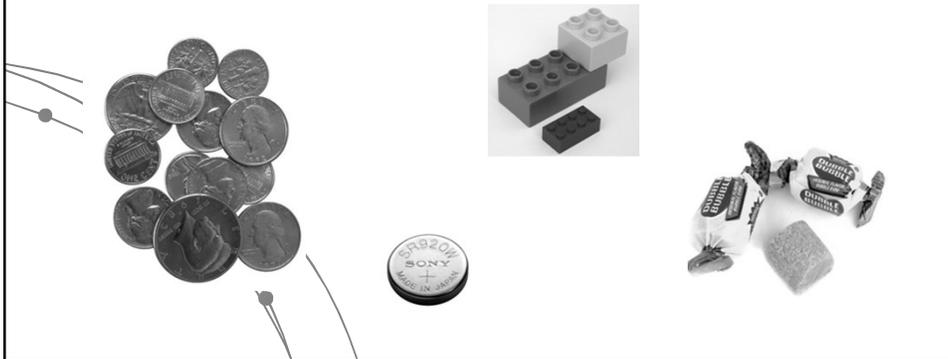


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# Intrabronchial foreign body

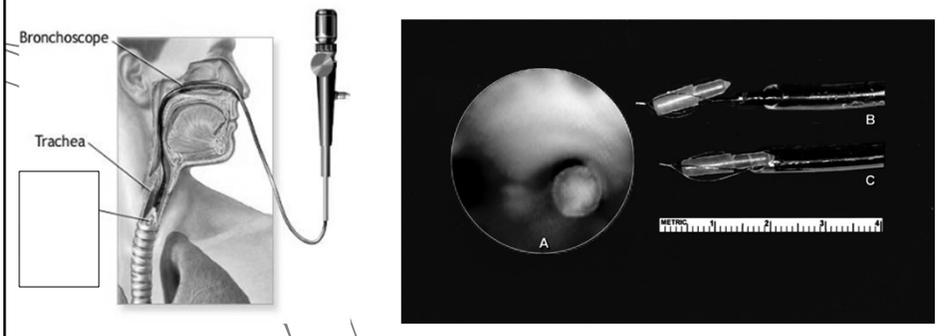
Partial or complete obstruction with a FB

- **Cause:** iatrogenic (caused by doctor/ treatment), self-induced
- **Complications:** atelectasis, post-obstructive pneumonia, infections

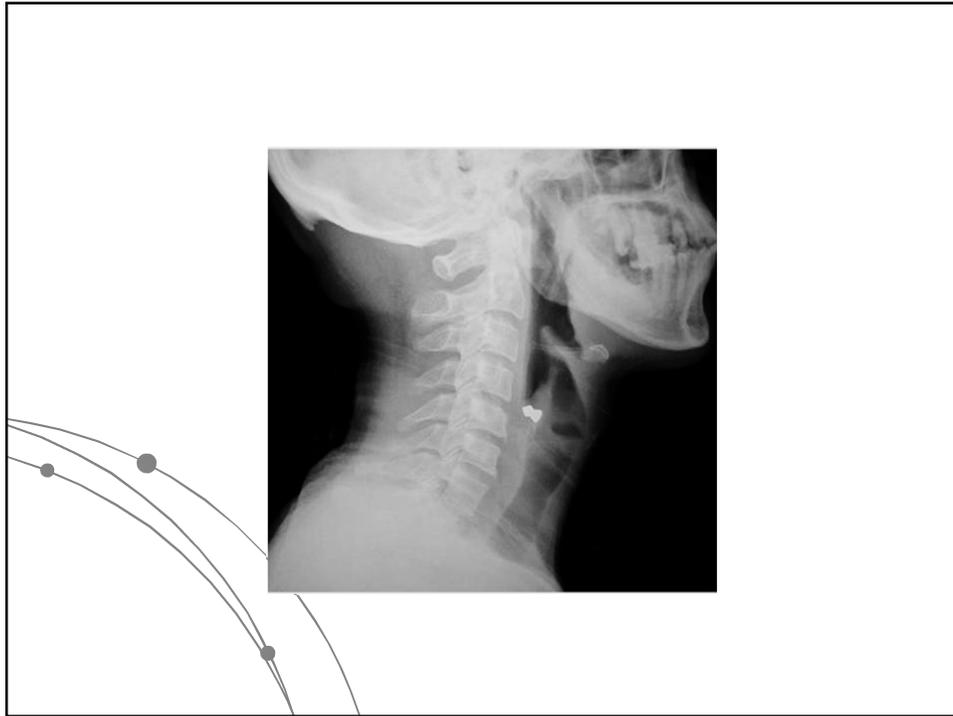


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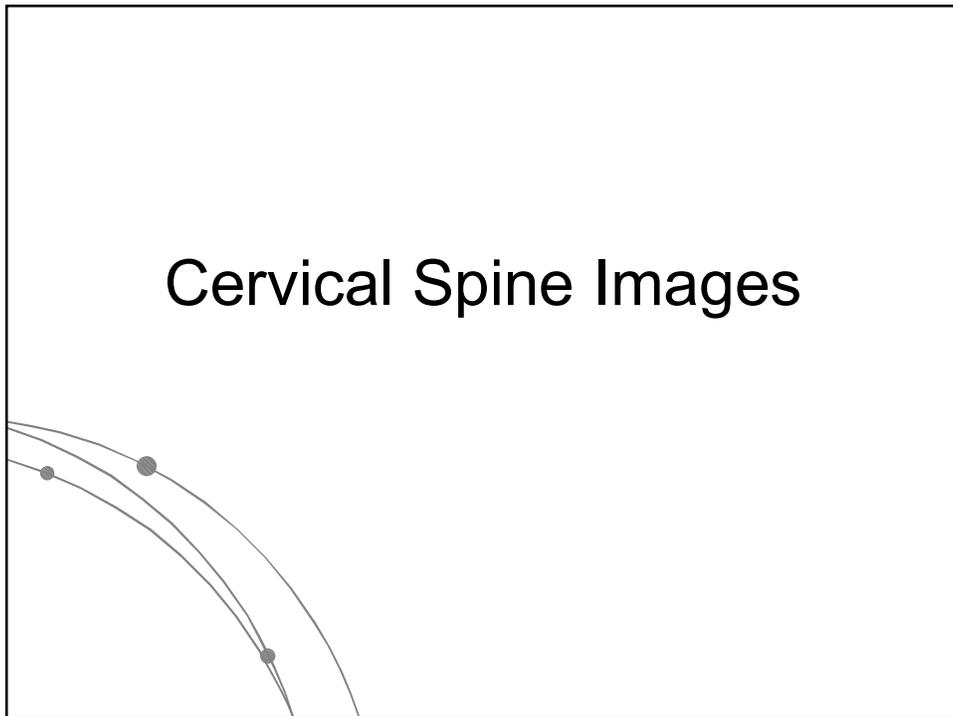
- **Radiographic appearance:** shift heart and mediastinum towards affected side.
- **Technical Factors:** No change from normal technique.
- **Prognosis:** life threatening if full obstruction, morbidity and mortality may be increased if bronchoscopic evaluation is delayed.



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## Lateral

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest.
- All seven cervical vertebrae and at least 1/3 of T1 (otherwise a separate radiograph of the cervicothoracic region is recommended)
- C4 in the center of the radiograph.
- Neck extended so mandibular rami are not overlapping the atlas and axis.
- Superimposed or nearly superimposed rami of the mandible.
- No rotation or tilt of the cervical spine
  - Superimposing zygapophyseal joints and open intervertebral disk spaces
  - Superimposed or nearly superimposed rami of the mandible
  - Spinous processes shown in profile
- Soft tissue and bony trabeculation



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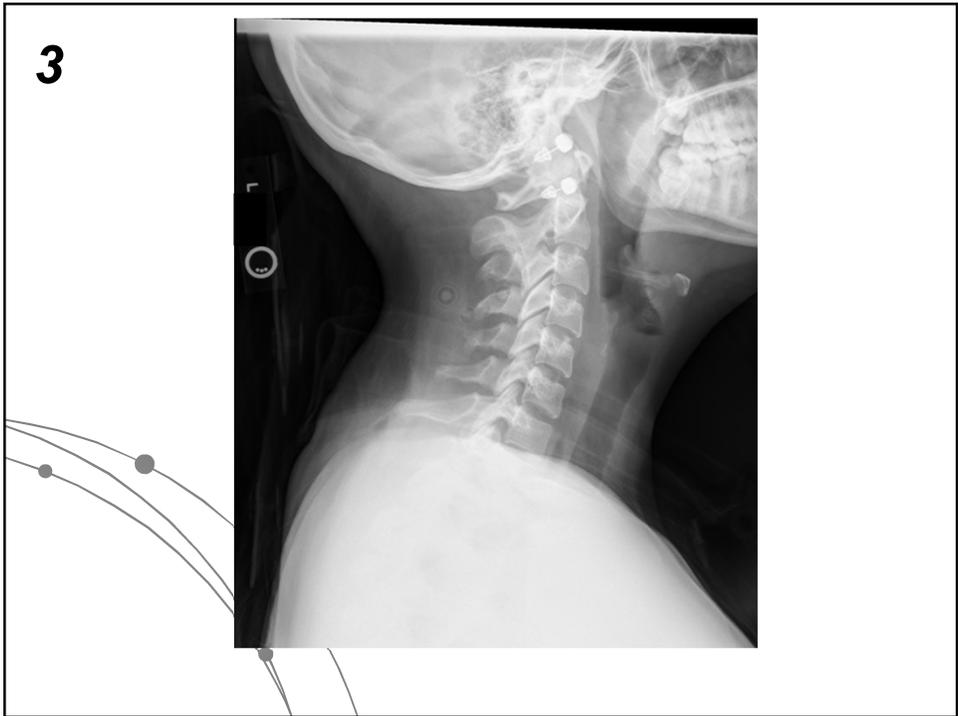
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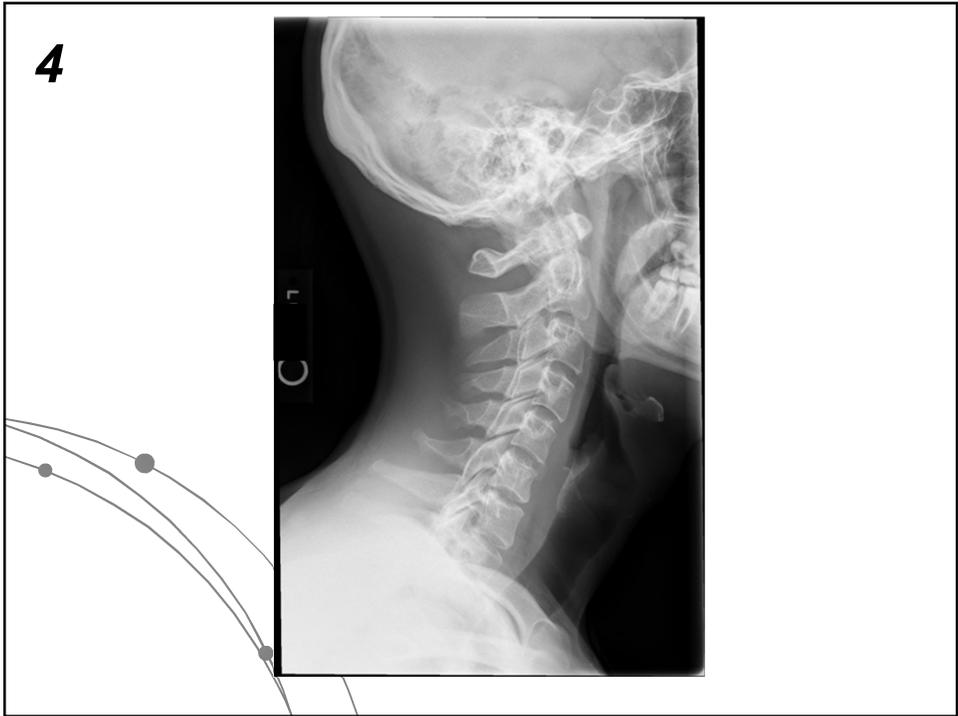
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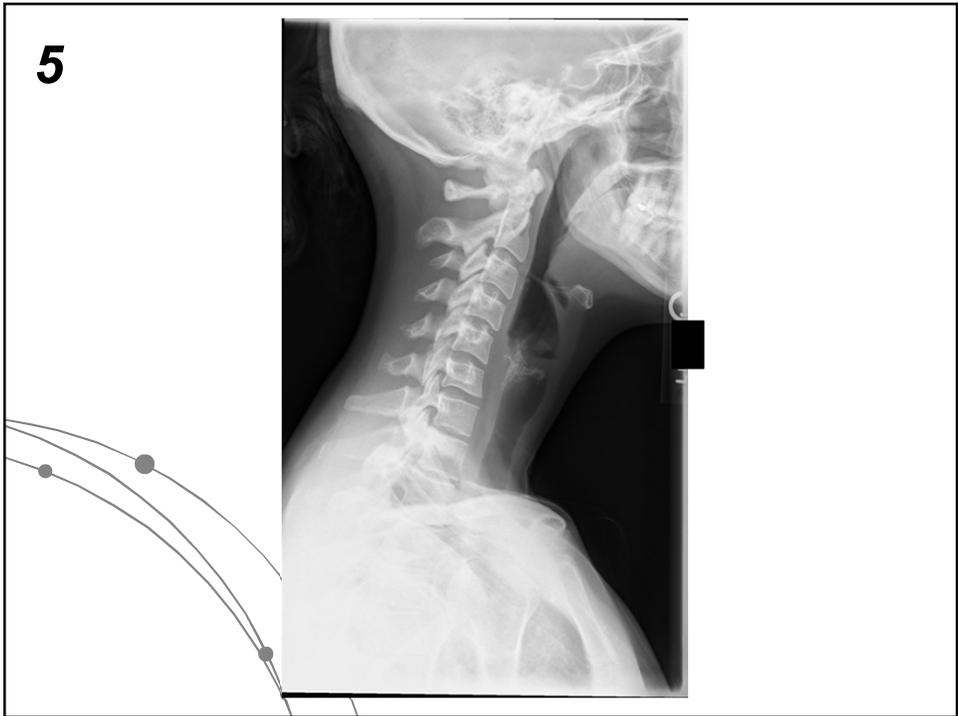
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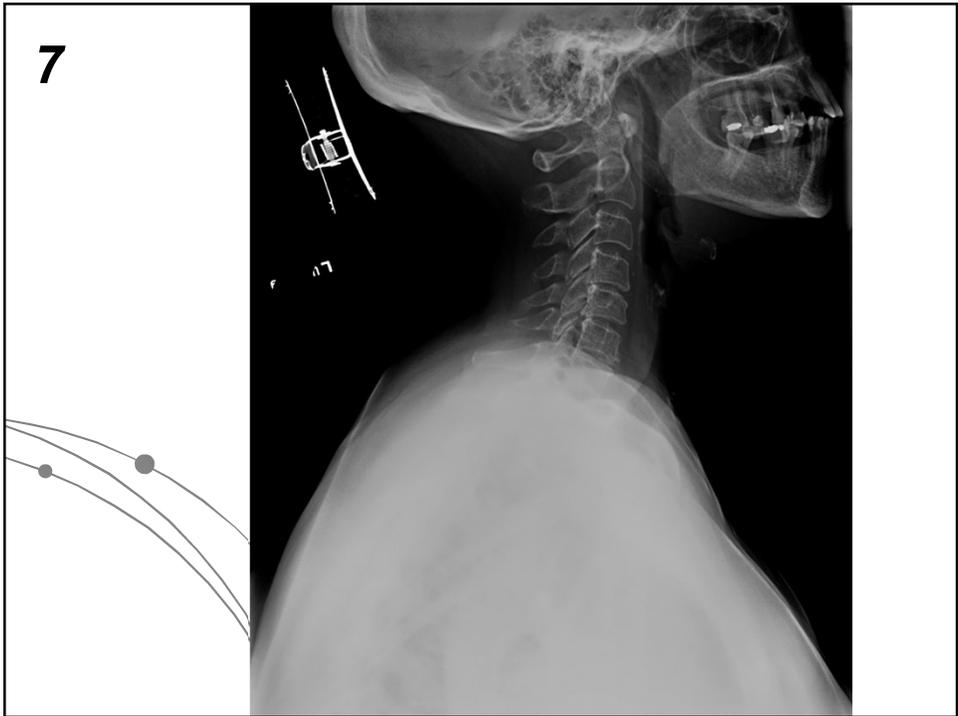
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## Conedown

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest.
- Visualization of C2-C7, without rotation from lateral position.
- Visualization of bony structures of C7-T1 and joint space with adequate penetration

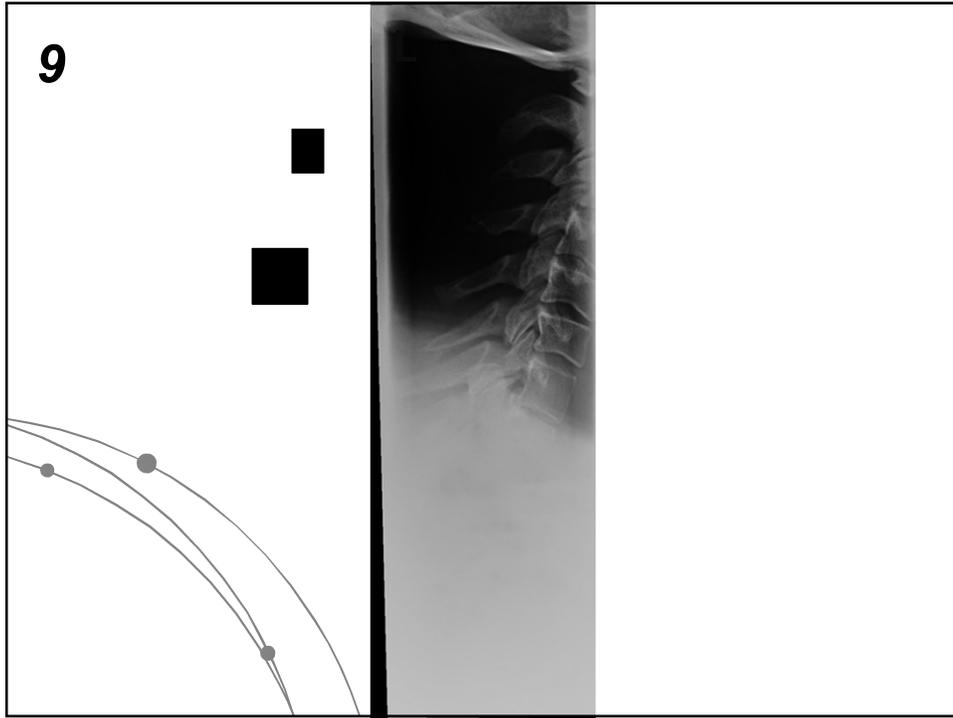


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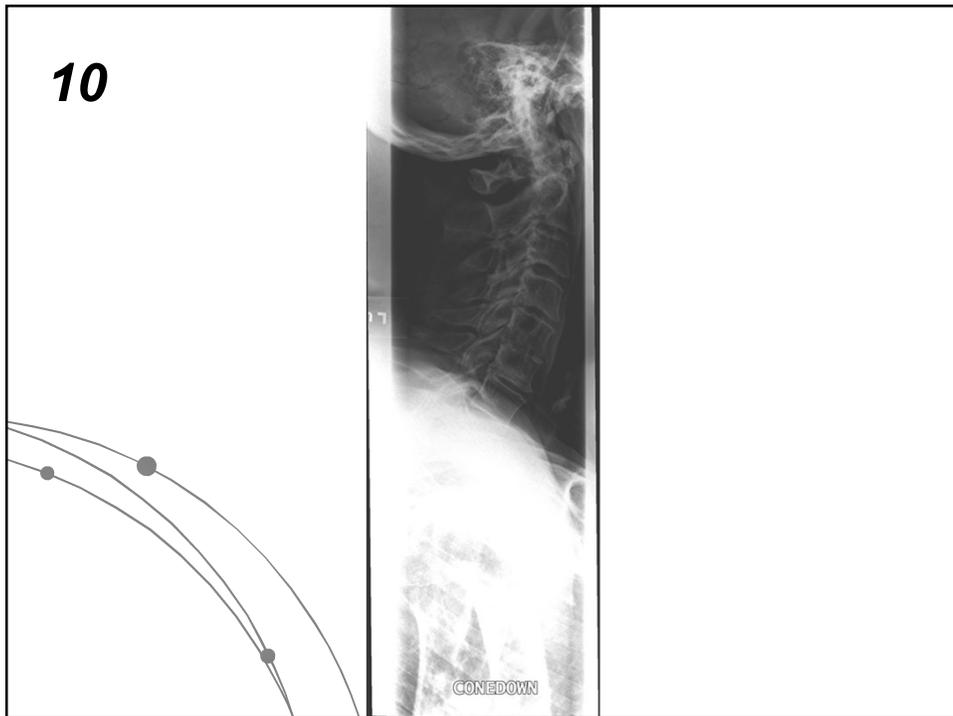
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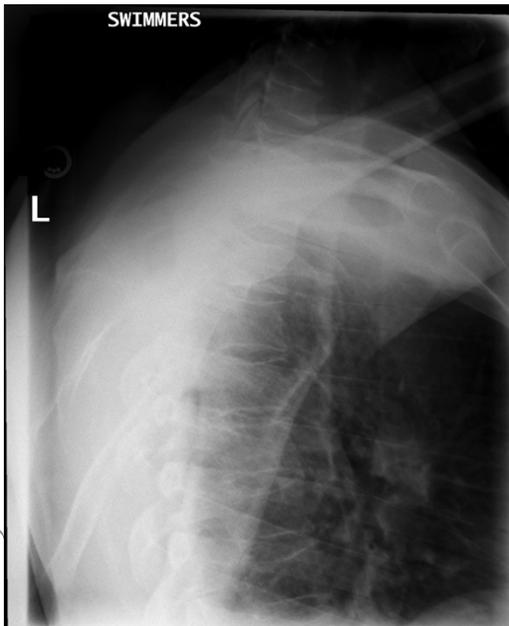
## Swimmer's

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest.
- Adequate x-ray penetration through the shoulder region demonstrating the lower cervical and upper thoracic vertebra, not appreciably rotated from lateral position.
- Humeral heads minimally superimposed on vertebral column.
- Soft tissue and bony trabecular detail.



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AP

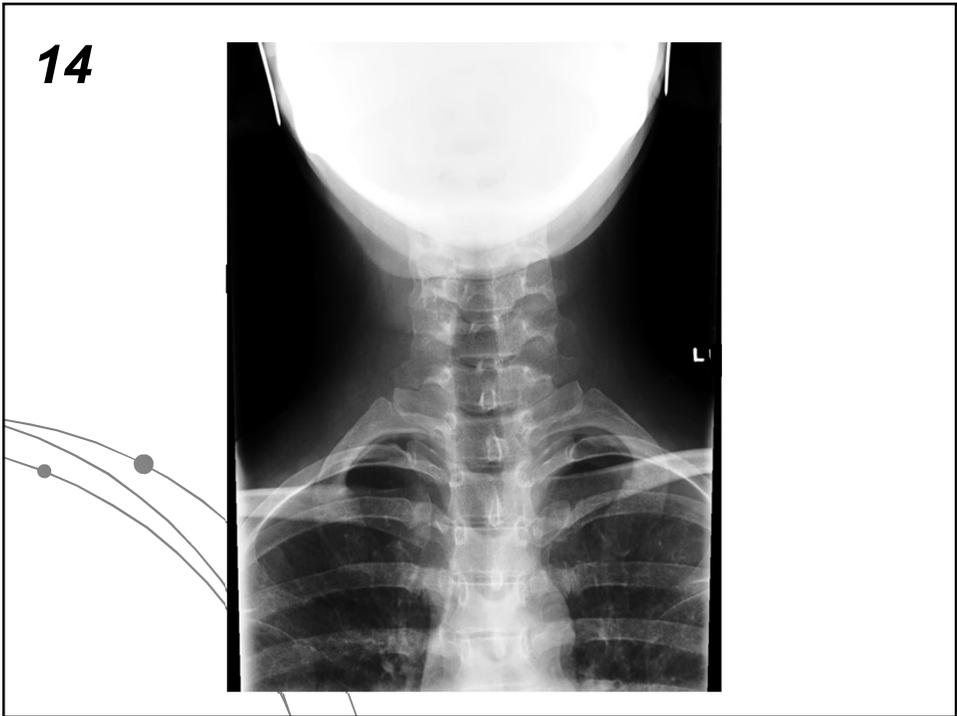
- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest.
- Area from superior portion of C3 to T2 and surrounding soft tissue.
- Shadows of the mandible and occiput superimposed over the atlas and most of the axis.
- Open intervertebral disk spaces
- Midsagittal plane of head and neck perpendicular to plane of IR, without tilt or rotation.
  - Spinous processes equidistant to the pedicles and aligned with the midline of the cervical bodies.
  - Mandibular angles and mastoid processes equidistant to the vertebrae
- Soft tissue and bony trabecular detail.



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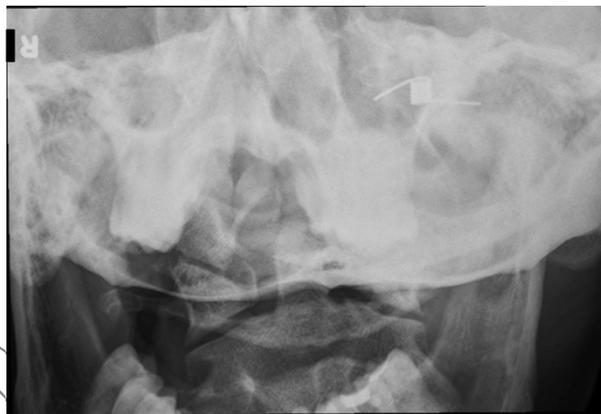
## Odontoid

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest.
- Dens, atlas, axis and articulations between the first and second cervical vertebrae.
- Entire articular surfaces of the atlas and axis (to check for lateral displacement).
- Mouth open wide.
- Superimposed occlusal plane of the upper central incisors and the base of the skull, demonstrating proper neck flexion
  - If the upper incisors are projected over the dens, the neck is flexed too much towards the chest.
  - If the base of skull is projected over the dens, the neck is extended too much.
- Shadow of the tongue not projected over the atlas and axis.
- Mandibular rami equidistant from dens, demonstrating proper head rotation.
- Soft tissue and bony trabecular detail.



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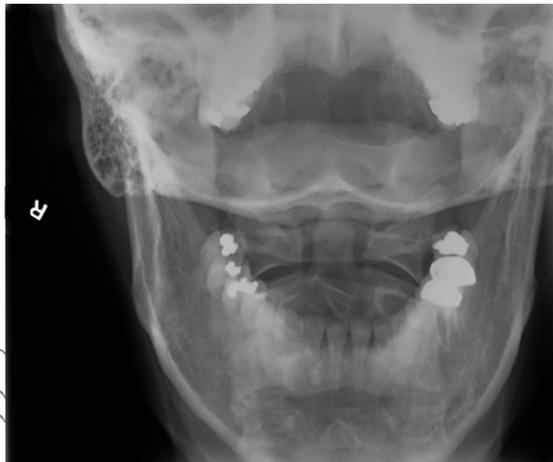
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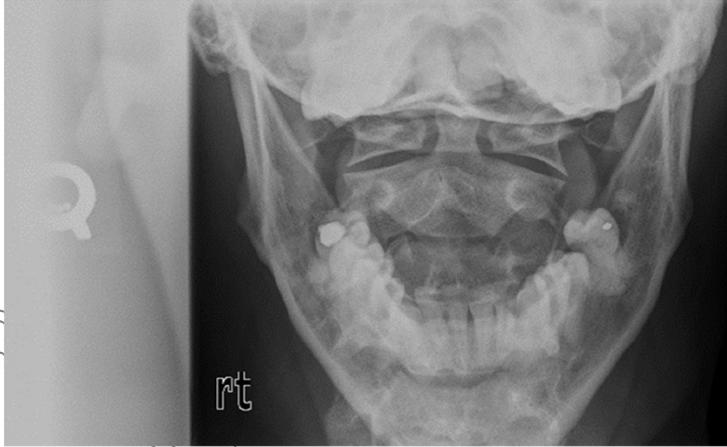
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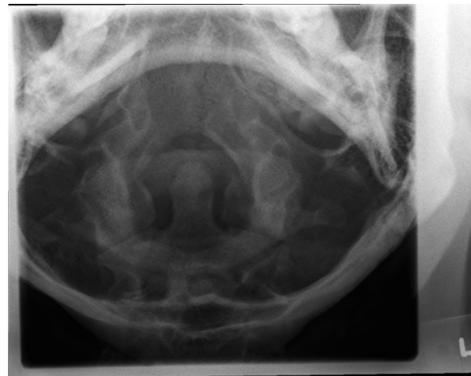
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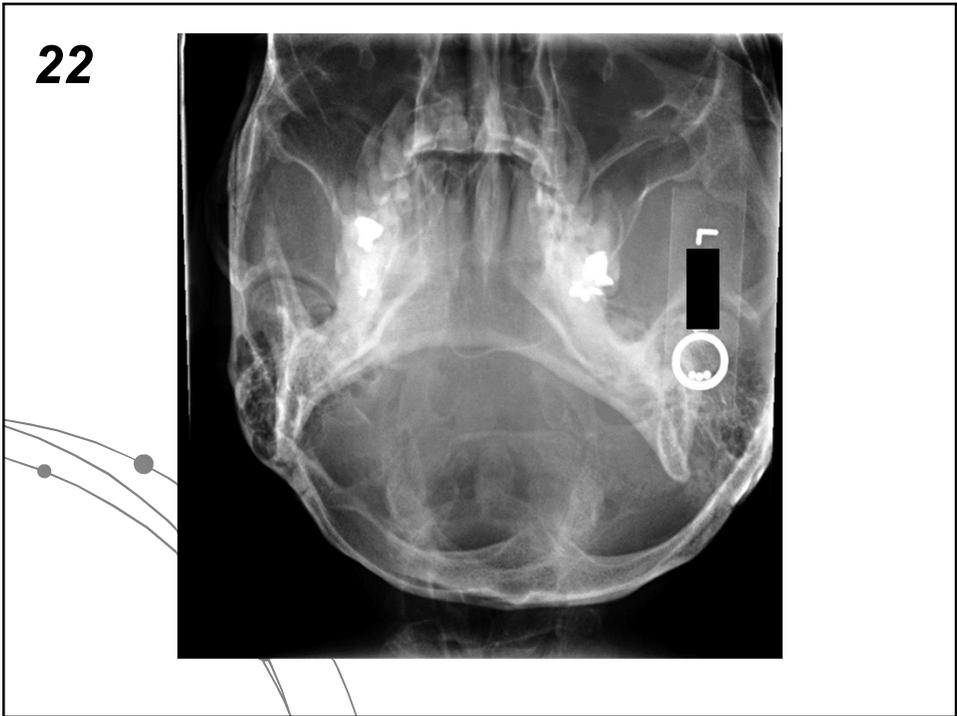
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## AP Fuchs

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest.
- Entire dens within the foramen magnum.
- No rotation of the head or neck, demonstrated by symmetry of the mandible, cranium, and vertebrae.
- Soft tissue and bony trabecular detail.



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## Obliques – RAO/LAO

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest.
- All seven cervical and the first thoracic vertebrae.
- Appropriate 45-degree rotation of body and neck
  - Open intervertebral foramina closest to the IR, from C2-3 to C7-T1
  - Uniform size and contour of the foramina
- Appropriately elevated chin
  - Mandible not overlapping the atlas and axis
  - Occipital bone not overlapping the atlas and axis
- Open intervertebral disk spaces
- Soft tissue and bony trabecular detail.



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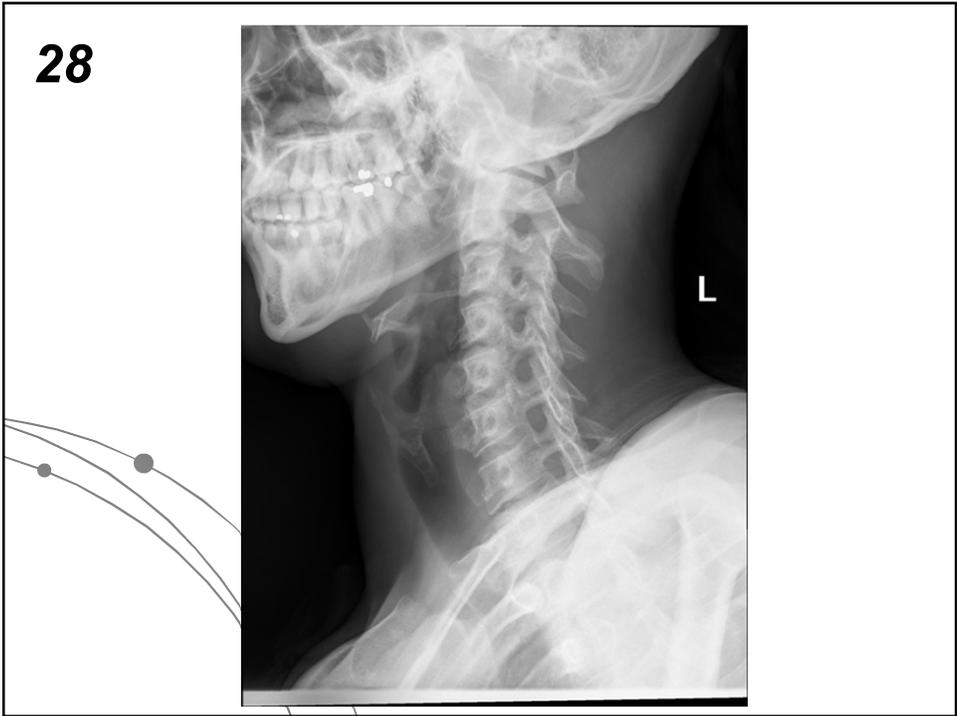
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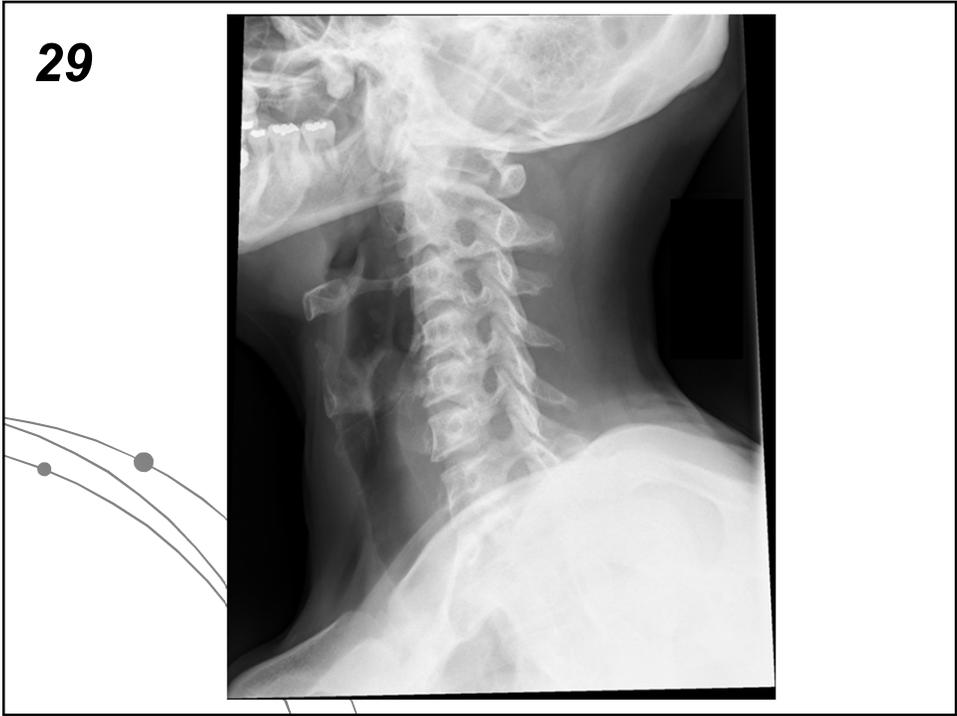
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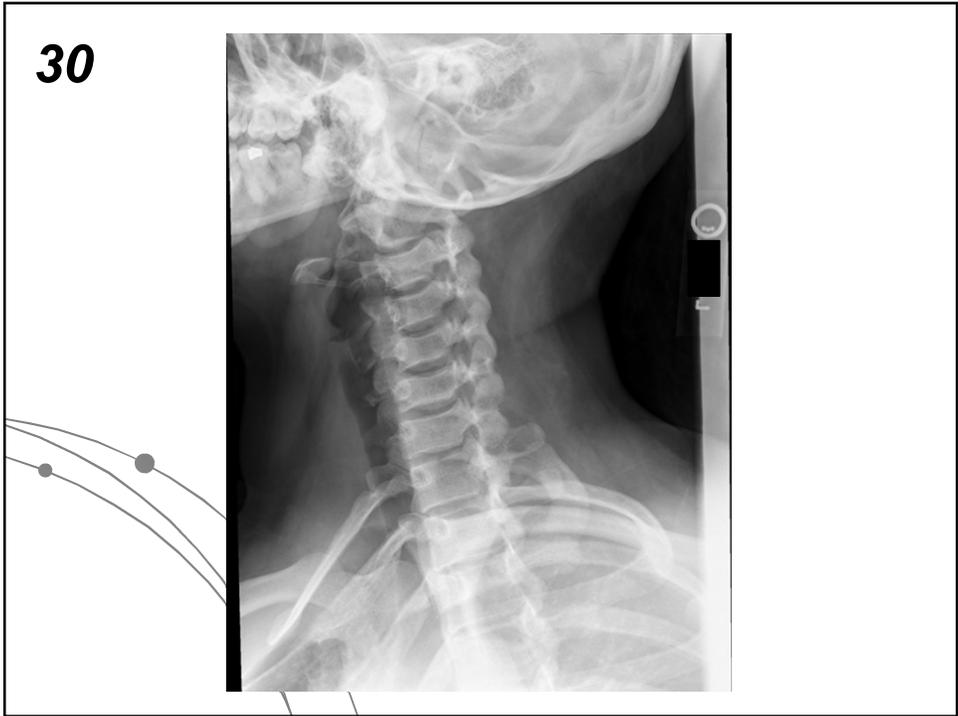
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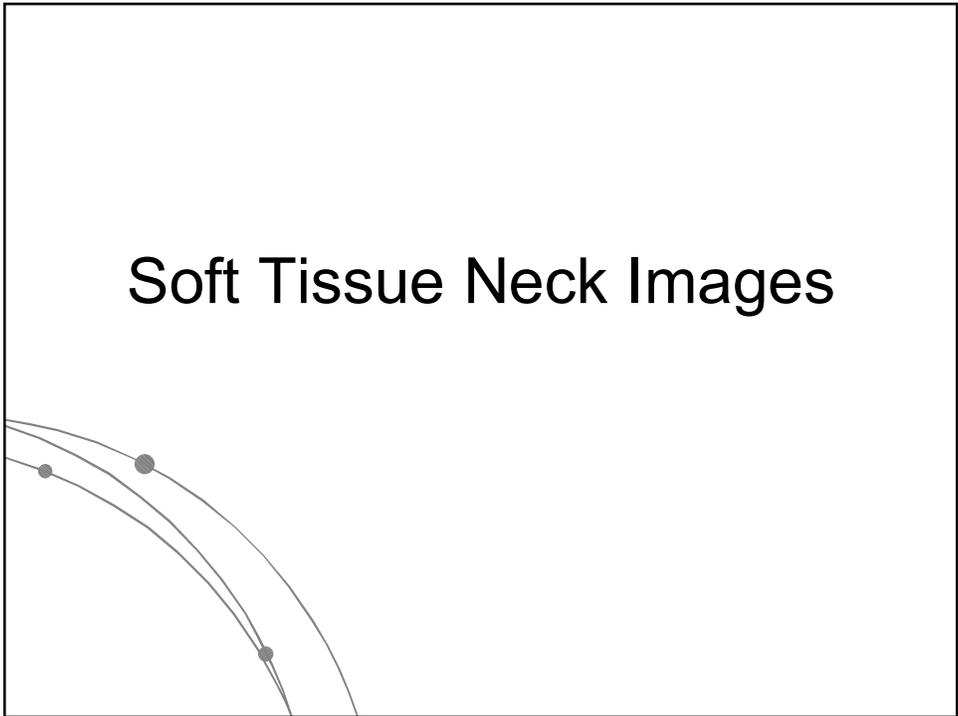
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## Lateral STN

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest.
- Area of the nasopharynx, down to T-1 should be included
- Should be free of superimposition by the shoulders
- Air-filled trachea
- No rotation as indicated by mandibular rami and cervical vertebrae

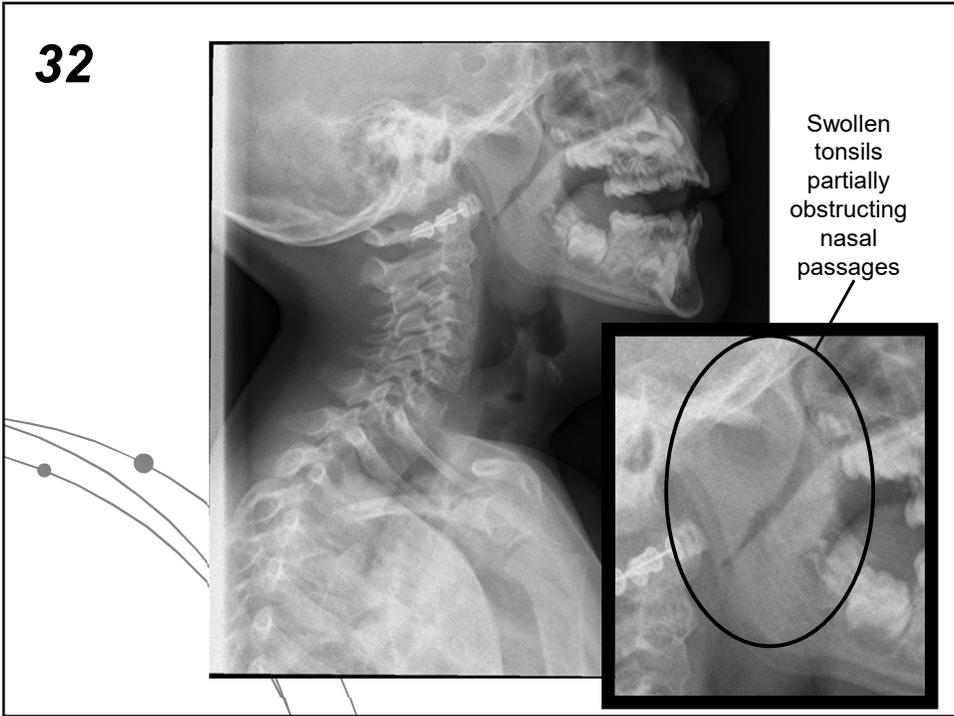


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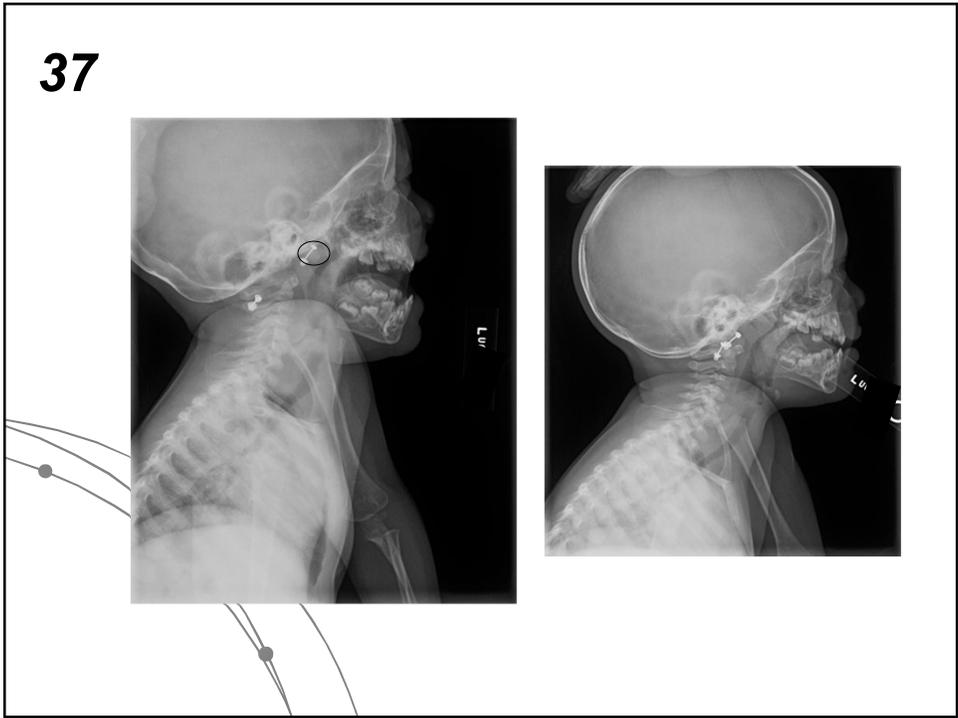
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