SAWA UNIVERSITY

RADIOGRAPHIC TECHNIQUE-2

CERVICAL SPINE

Sawa University

College of health and medical techniques

Department of Radiology Tech.

3rd Academic year

LEC.7

THEORETICAL

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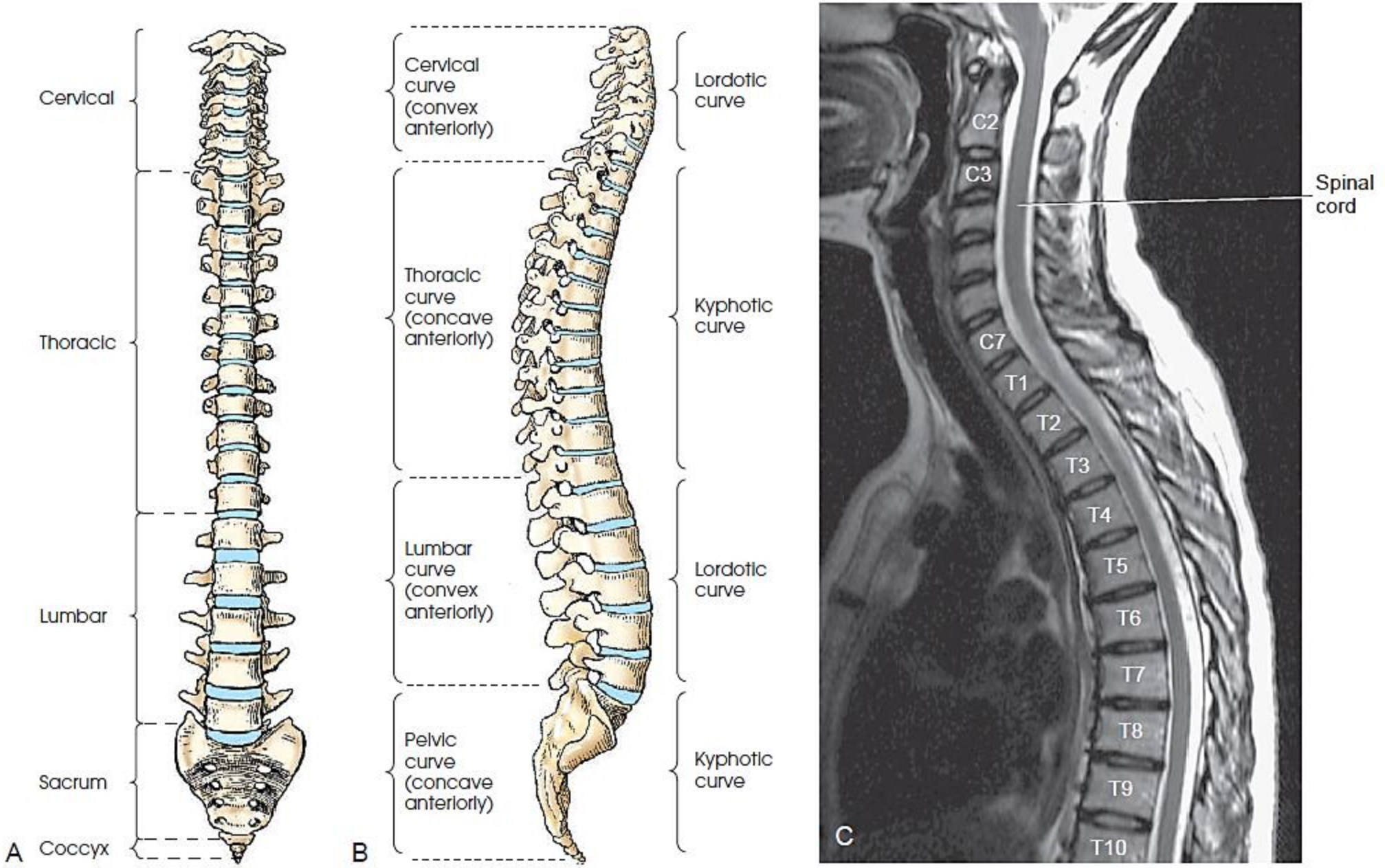
M.Sc Radiology Technology


Cervical
Thoracic
Lumbar
Sacrum
Coccyx
A
Cervical curve (convex anteriorly)
Thoracic curve (concave anteriorly)
Lumbar curve (convex anteriorly)
Pelvic curve (concave anteriorly)
Lordotic curve
Kyphotic curve
Lordotic curve
Kyphotic curve
B
C2
C3
C7
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
Spinal cord
C

The vertebral column

The vertebral column: "spine", forms the central axis of the skeleton and is centered in the midsagittal plane of the posterior part of the trunk.

The vertebral column functions

- It encloses and protects the spinal cord.
- It provides a flexible supporting column for the trunk and head.
- Transmits the weight of the trunk and upper body to the lower limbs.

The vertebral column is composed of

- Small segments of bone called vertebrae.
- Disks of fibrocartilage
- Ligaments

The vertebral column

Sections of Vertebral Column

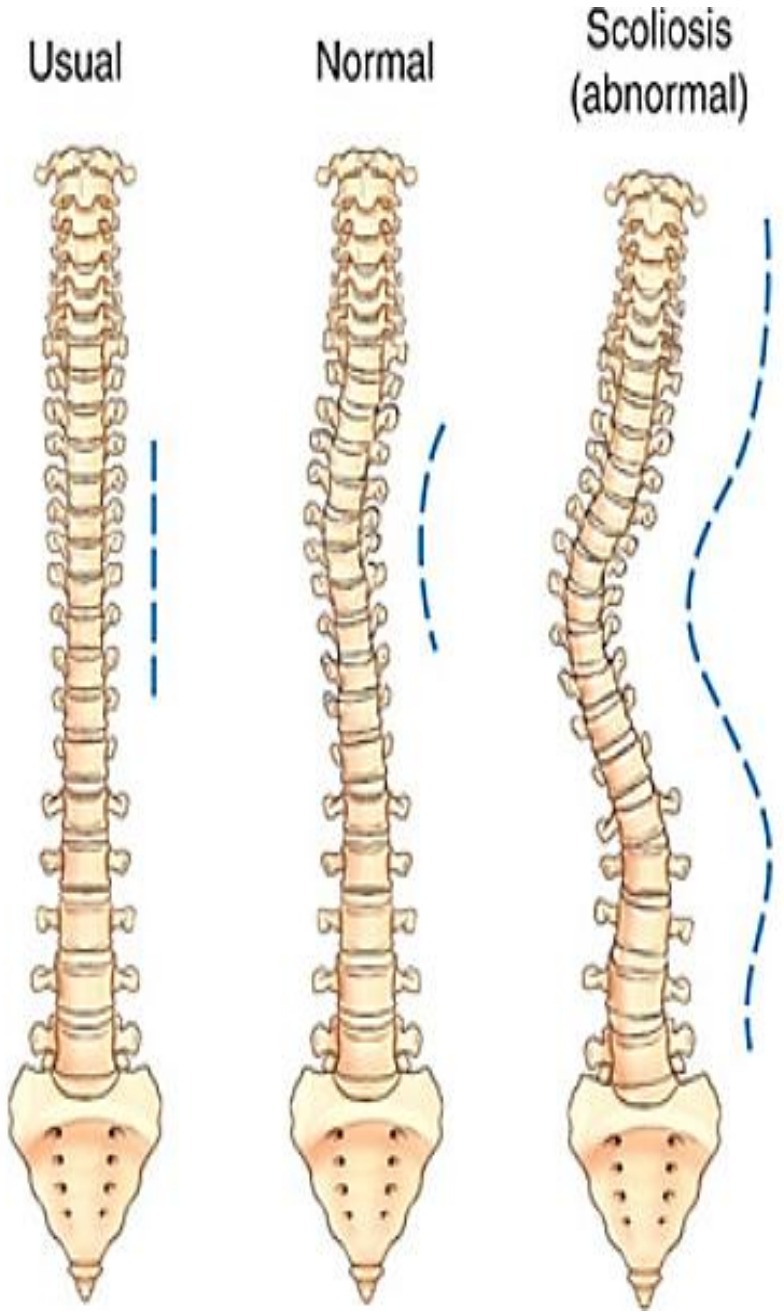
- Cervical vertebrae (7)
- Thoracic vertebrae (12) each of these connects to a pair of ribs.
- Lumbar vertebrae (5) The largest and strongest.
- Sacrum newborn has five sacral segments ⟹ fused into one distinct bone (single sacrum)
- Coccyx newborn has four segments ⟹ fused into one distinct bone single coccyx (single coccygeal)

Terms of abnormal curvatures

- Lordosis: abnormal anterior concavity of the lumbar spine
- Kyphosis: increased convexity of the thoracic spine curvature
- Scoliosis: exaggerated lateral curvature of the spine (convex to the right in a right-handed person and convex to the left in a left-handed person).

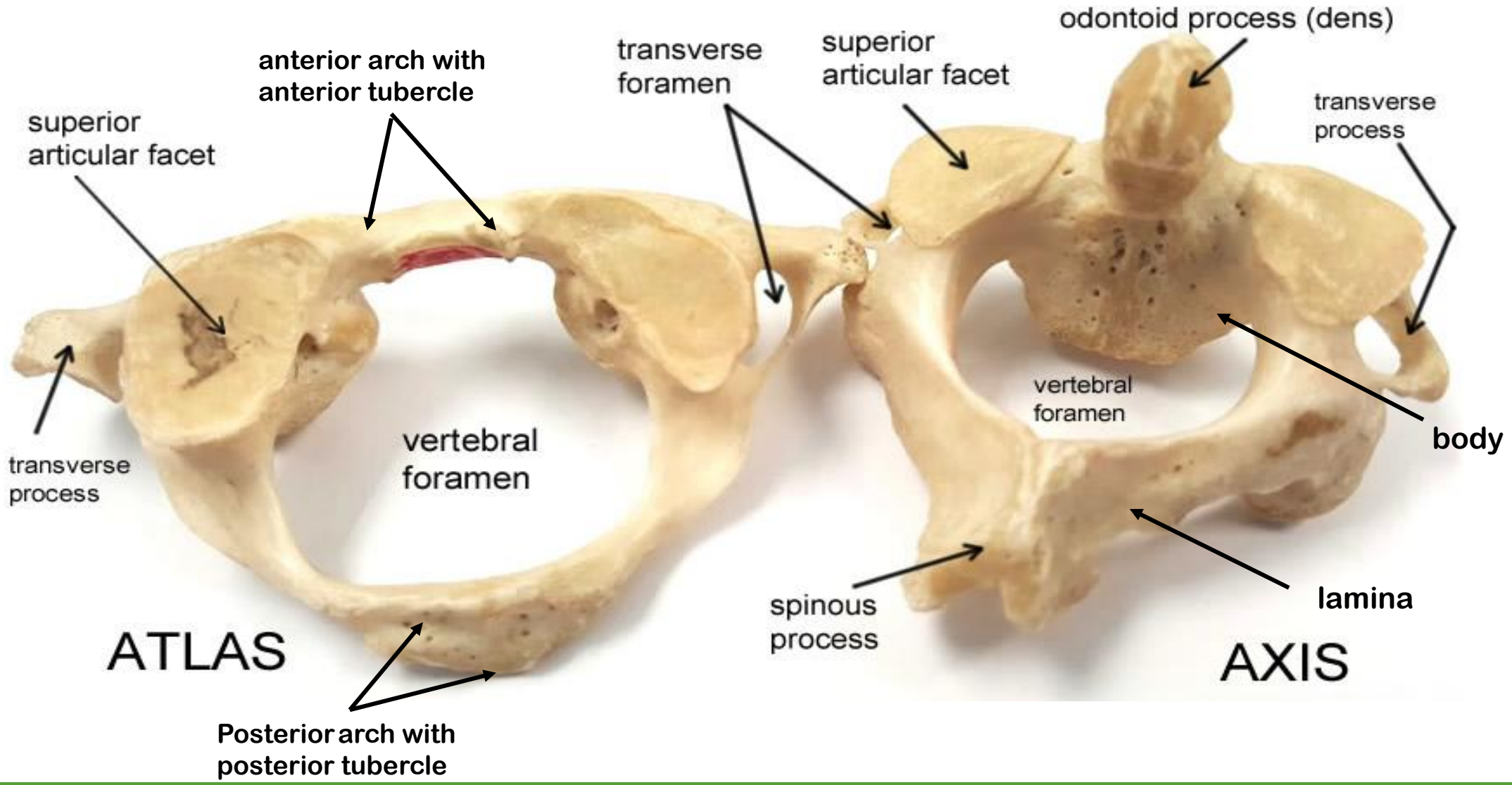
Kyphosis
(exaggerated thoracic curvature—"humpback"):
Increased convexity

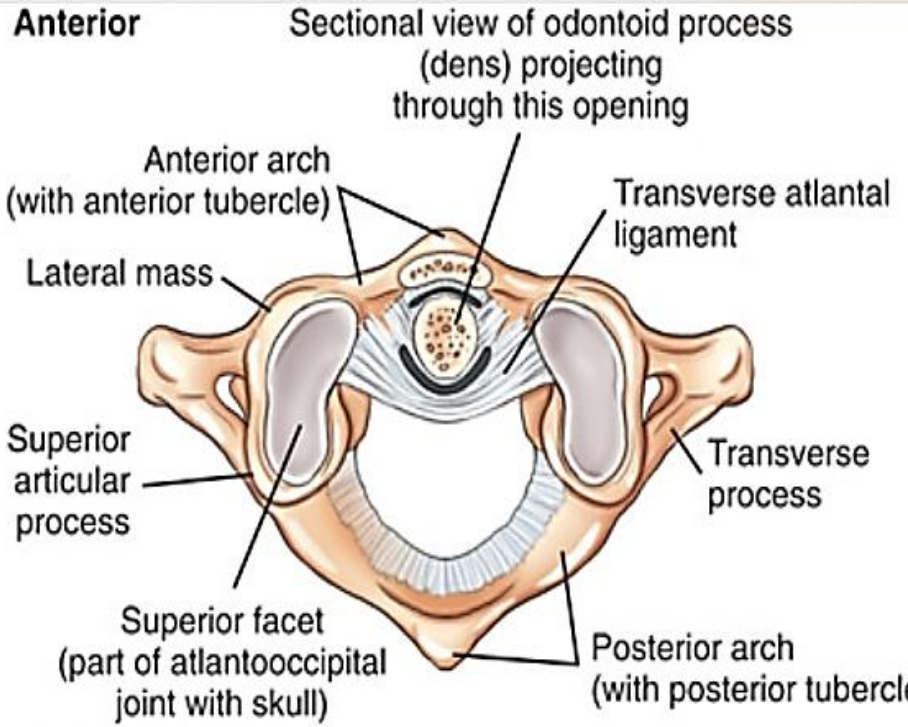
Lordosis
(exaggerated lumbar curvature—"swayback"):
Increased concavity

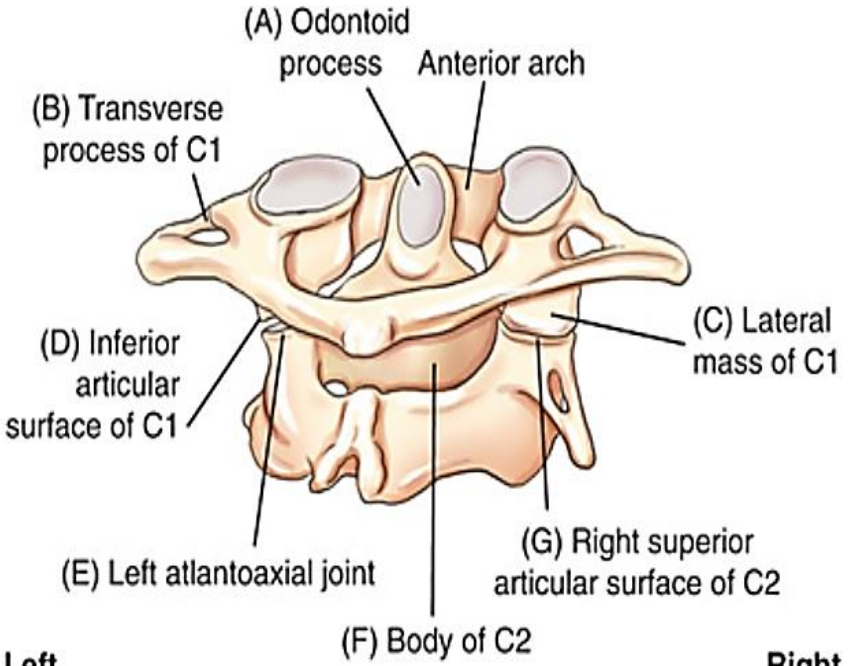


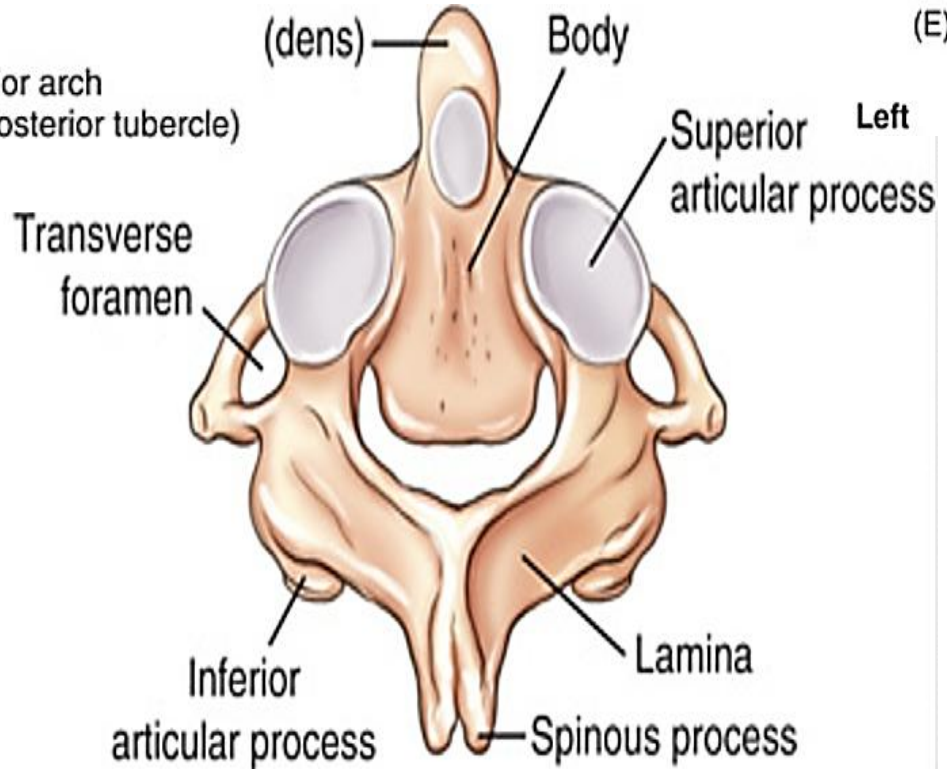
severe scoliosis

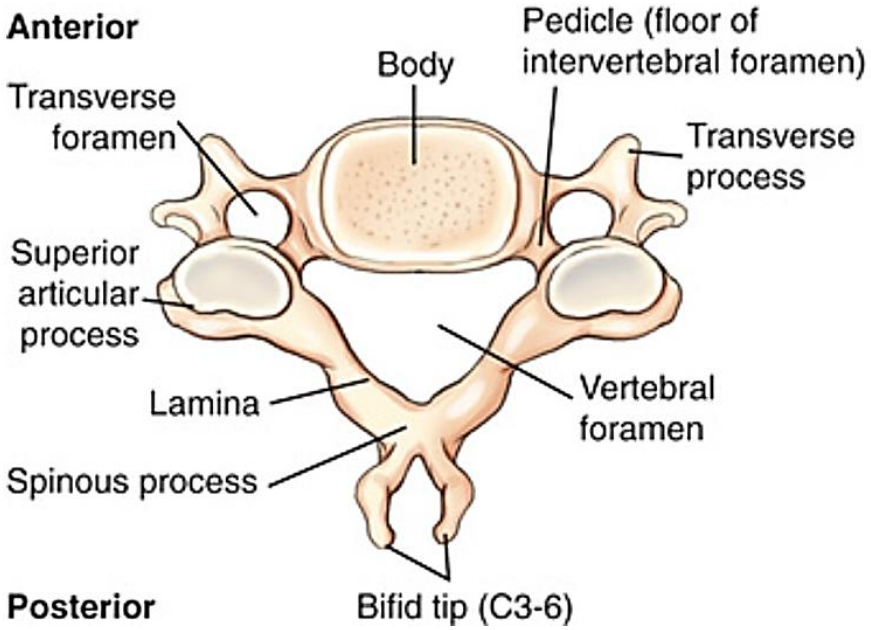
Characteristics of Cervical Vertebrae



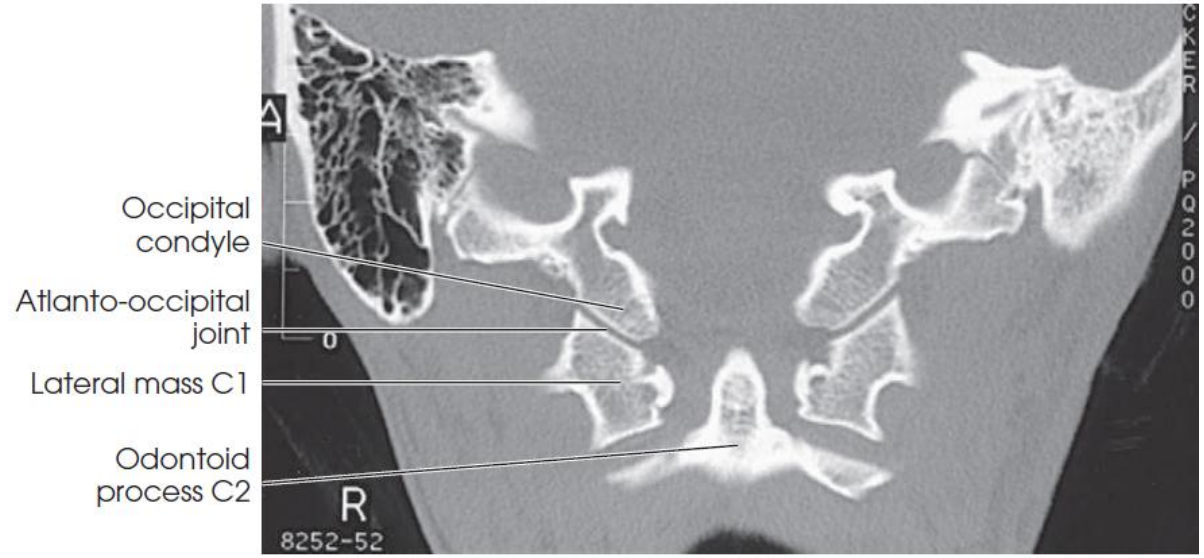

Anterior
Sectional view of odontoid process (dens) projecting through this opening
Anterior arch (with anterior tubercle)
Transverse atlantal ligament
Lateral mass
Superior articular process
Transverse process
Superior facet (part of atlantooccipital joint with skull)
Posterior arch (with posterior tubercle)
Posterior


(A) Odontoid process
Anterior arch
(B) Transverse process of C1
(C) Lateral mass of C1
(D) Inferior articular surface of C1
(E) Left atlantoaxial joint
(F) Body of C2
(G) Right superior articular surface of C2
Left
Right

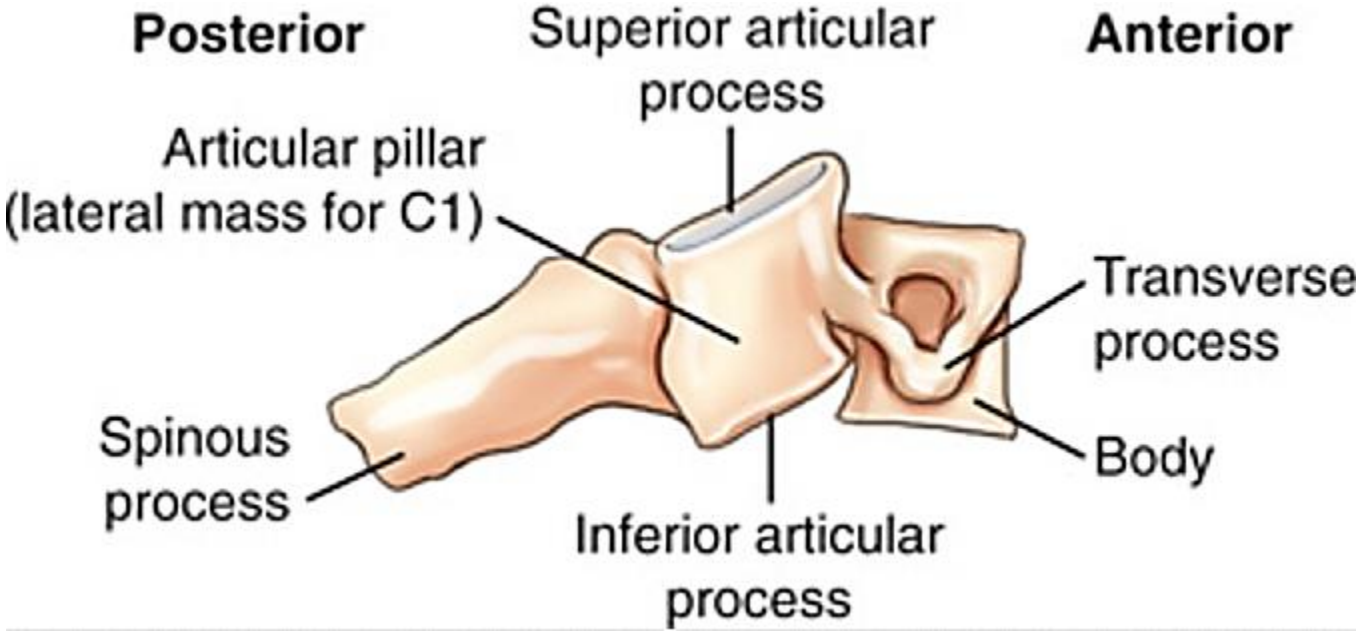

(dens)
Body
Superior articular process
Transverse foramen
Inferior articular process
Lamina
Spinous process



Typical (C3-C6) cervical vertebra

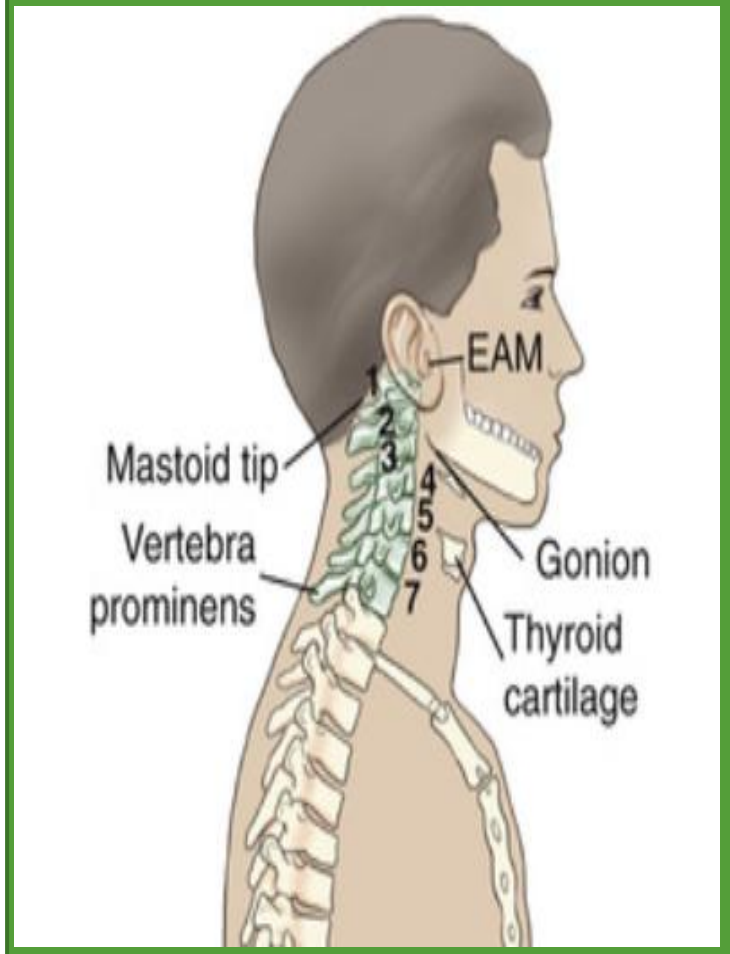


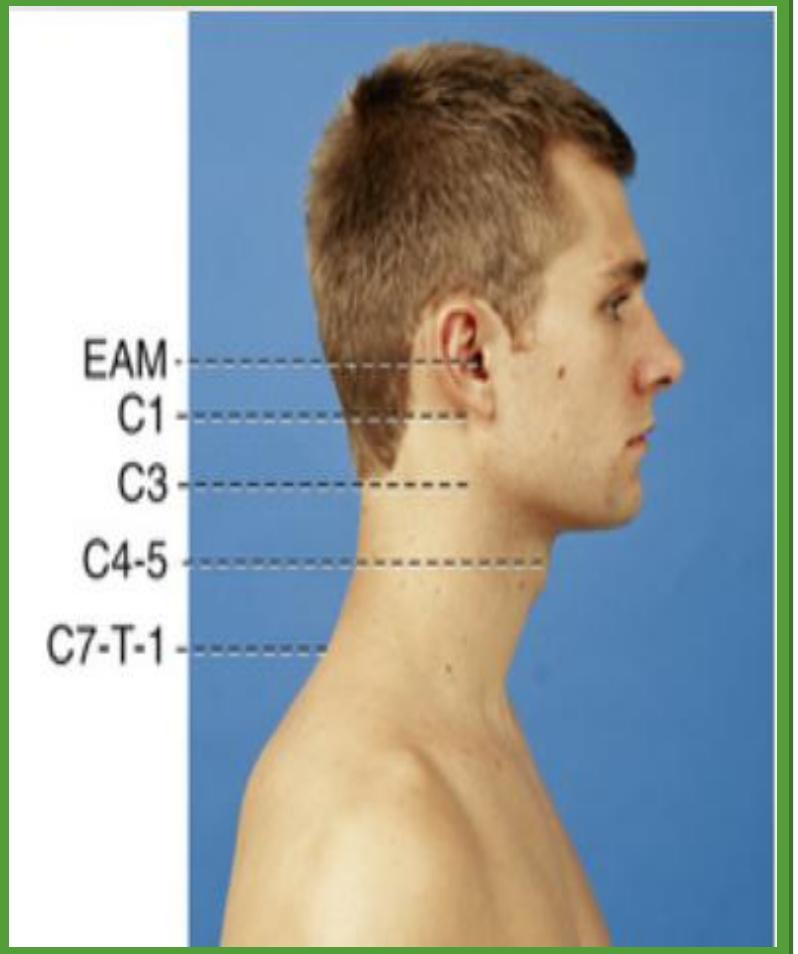
Coronal CT shows atlas, axis, and occipital bone of skull and their relationship.



Cervical Landmarks

- Level of C1 is to go about (2.5 cm) below the level of the EAM
- Angle of the jaw, or gonion, is at the same level as C3.
- Adam's apple is at the approximate level of C5.
- C7 vertebra prominens, is at about the same level as the body of T1.



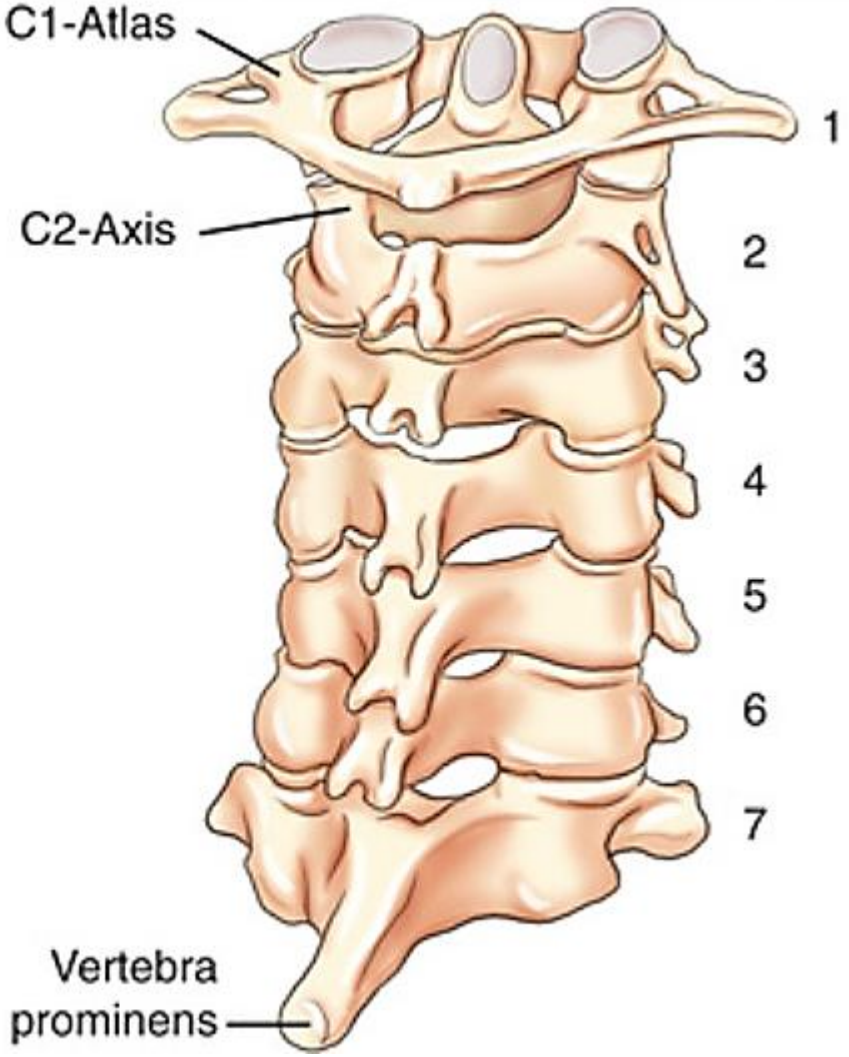


Cervical spine landmarks

Cervical Spine

Routine

1. AP open mouth (C1 and C2)
2. AP axial
3. Lateral
4. AP, PA Axial Oblique Projection



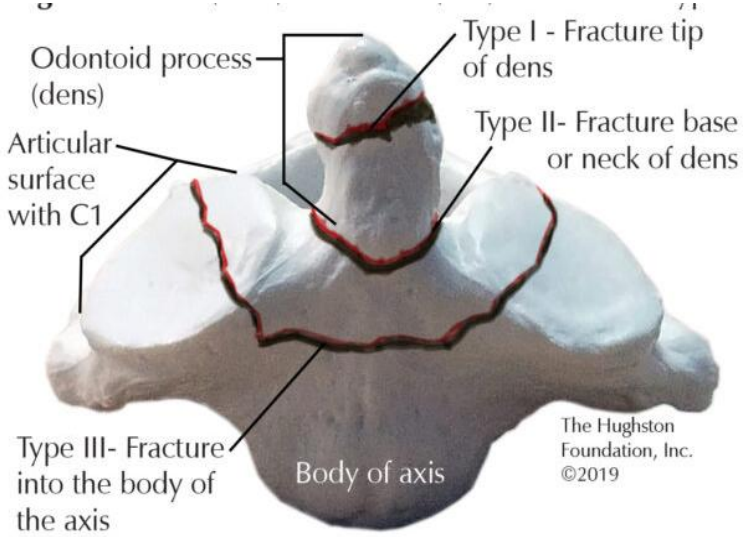
AP open mouth (C1 and C2)

Clinical Indications

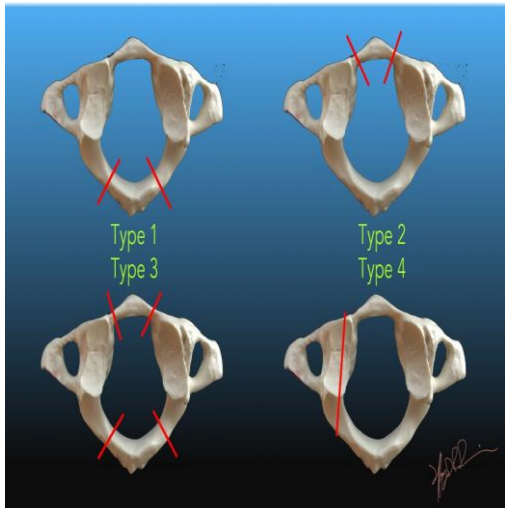
- Pathology (particularly fractures) involving C1 and C2 and adjacent soft tissue structures
- Demonstrates odontoid and Jefferson fractures

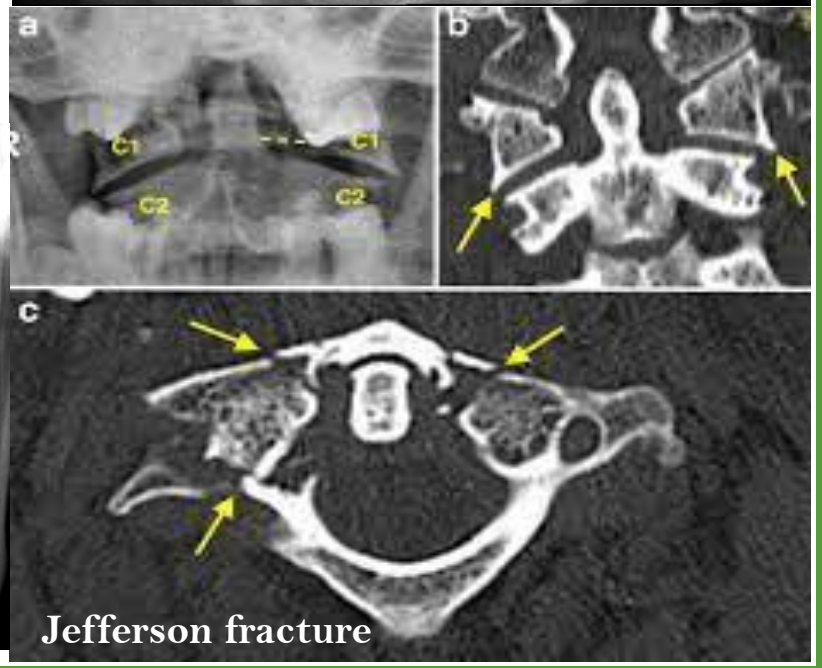
Cervical Spine

Odontoid fracture: fracture involves the dens and can extend into the lateral masses or arches of C1.

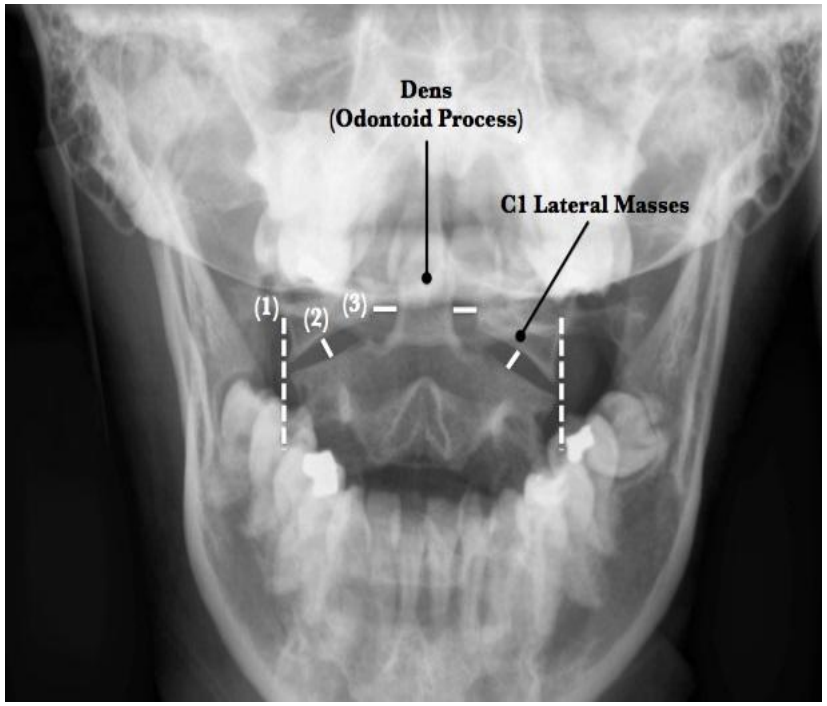


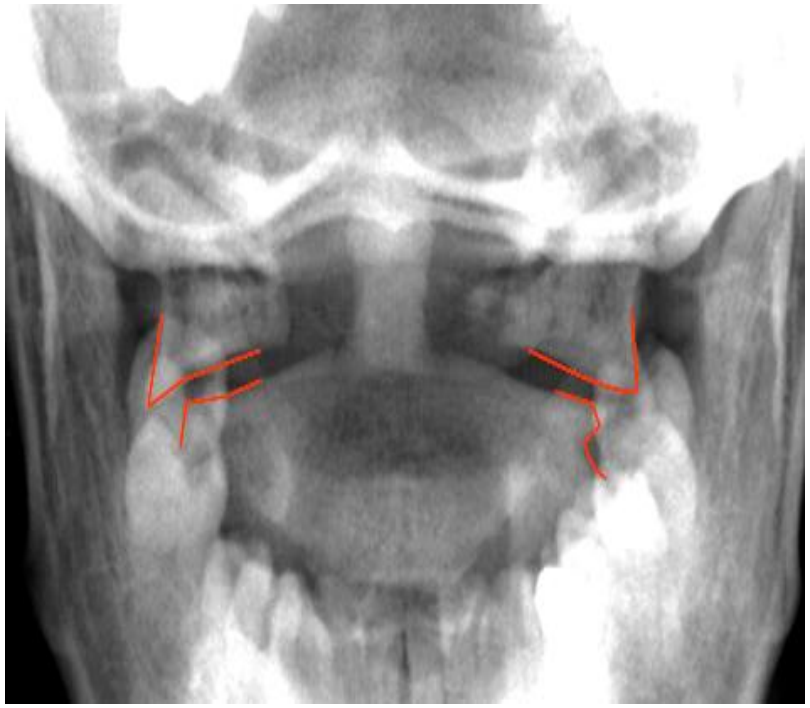
Jefferson fracture: Comminuted fracture occurs as a result of axial loading, such as that produced by landing on one's head or abruptly on one's feet.





Cervical Spine





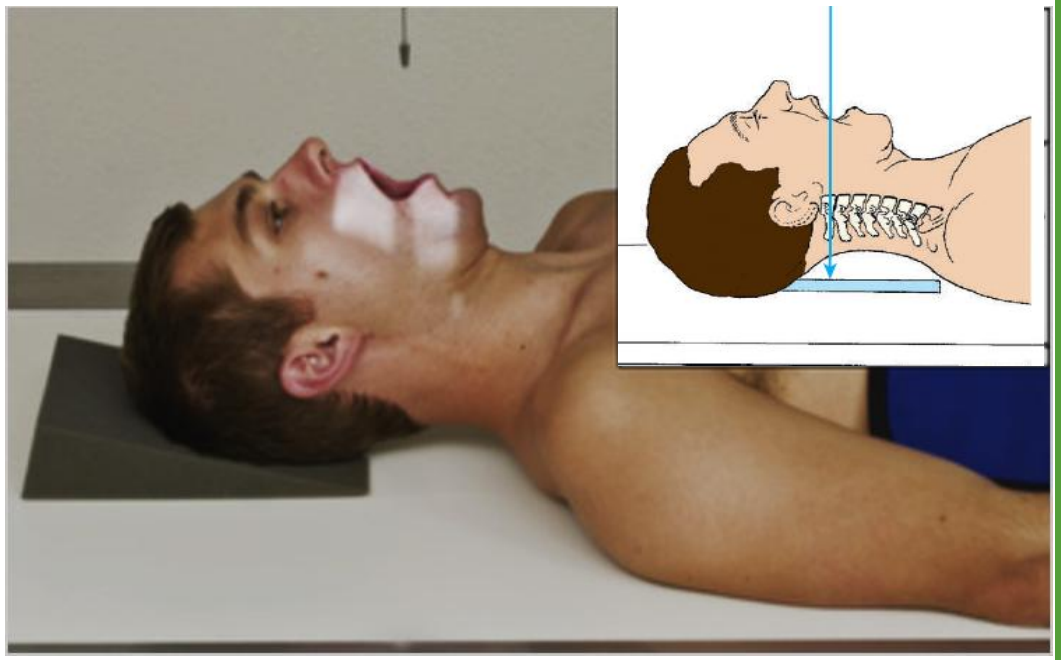
Jefferson fracture

AP open mouth (C1 and C2)

Patient Position

- Patient in supine or erect.
- Align midsagittal plane to CR and midline IR.
- Adjust head so that a line from lower margin of upper incisors (junction of lips) to the base of the skull (mastoid tips) is perpendicular to IR.
- As a last step before making exposure—open mouth wide without moving head (only the lower jaw moves).

Central Ray: perpendicular through midportion of open mouth (to C1-C2).



AP open mouth (C1 and C2)

- **Note** Instruct the patient to keep the mouth wide open and to phonate "ah" during the exposure. This places the tongue on the floor of the mouth (not projected on the atlas and axis and prevents movement of the mandible.

Collimation: Tightly on four sides to anatomy of interest.

Technical Factors

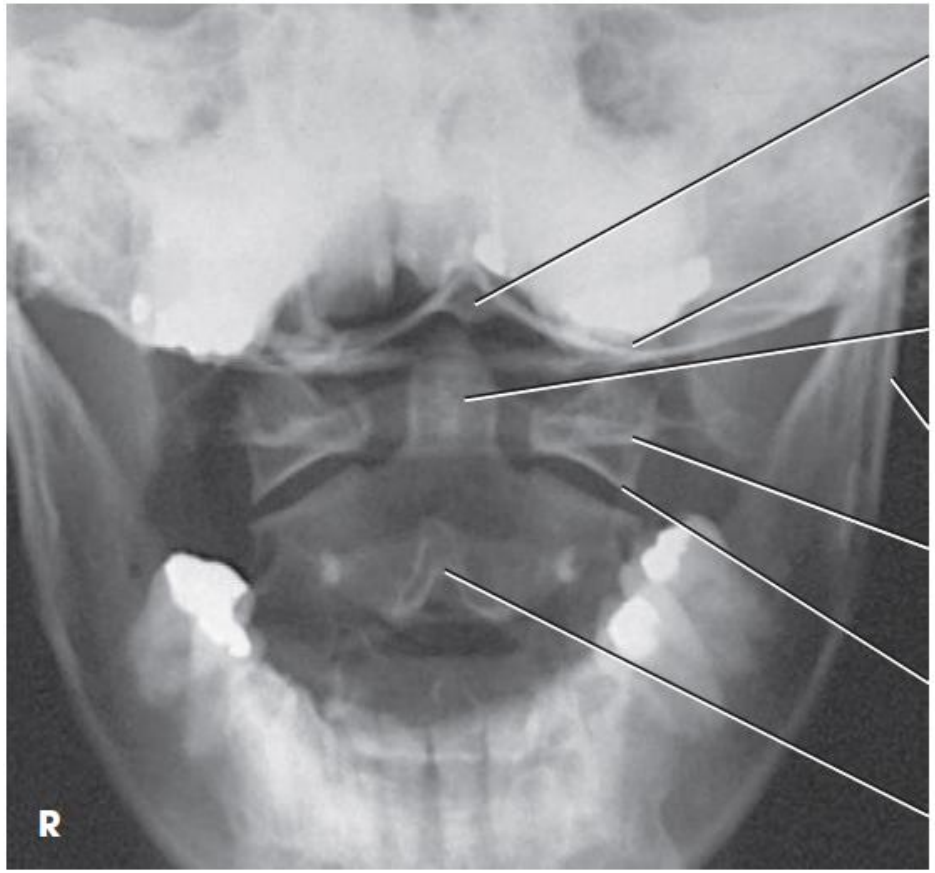
SID: 102 cm	Grid:Yes	IR size: (12 × 10 inches)L.W
kV: 85	mAs: 8	Respiration: Suspended

Note SID: 76 cm may be used for this projection to increase the field of view of the odontoid area.

Evaluation Criteria

- Odontoid process (Dens) and vertebral body of C2, lateral masses and transverse processes of C1, and atlantoaxial joints demonstrated through the open mouth.
- No rotation, no motion.

AP open mouth (C1 and C2)



Occipital base

Occlusal surface of teeth

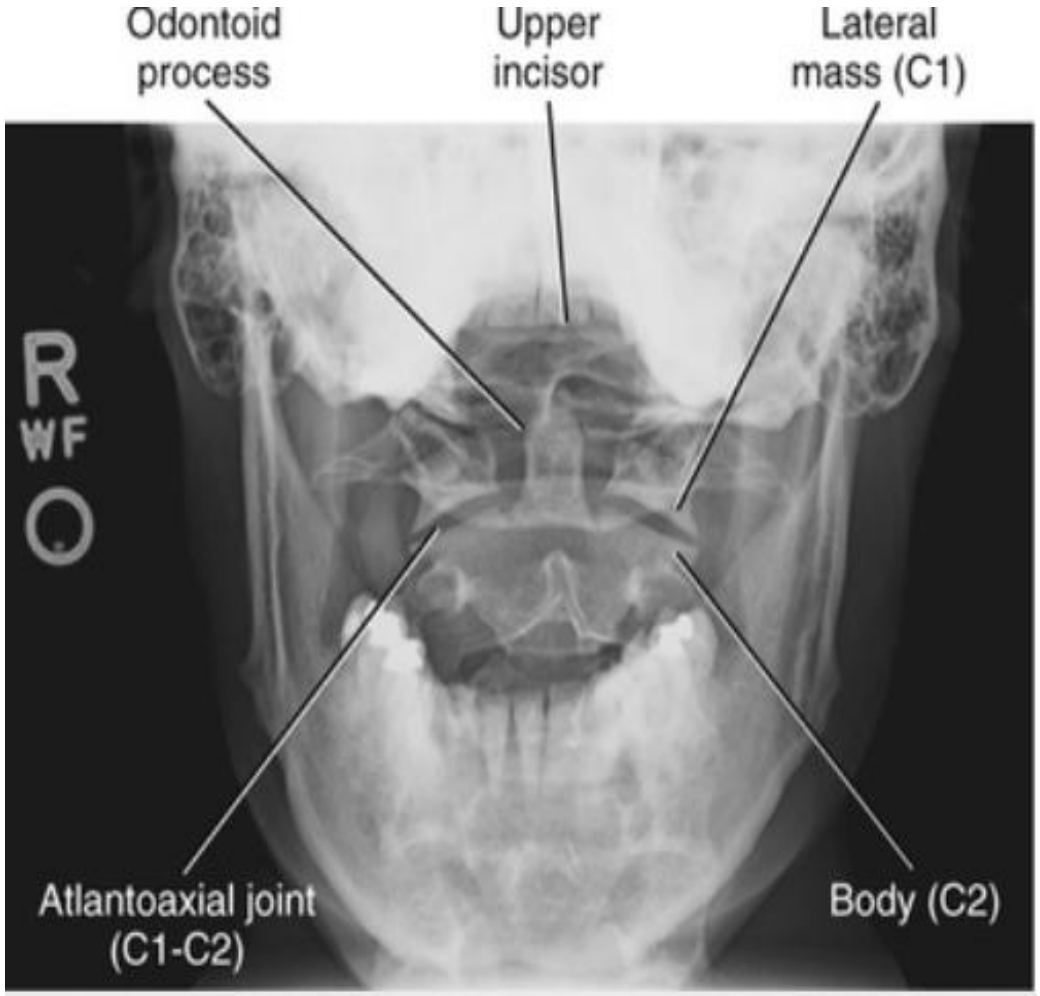
Dens (odontoid process)

Mandibular ramus

Lateral mass of atlas

Inferior articular process of atlas

Spinous process of axis



AP Axial Projection

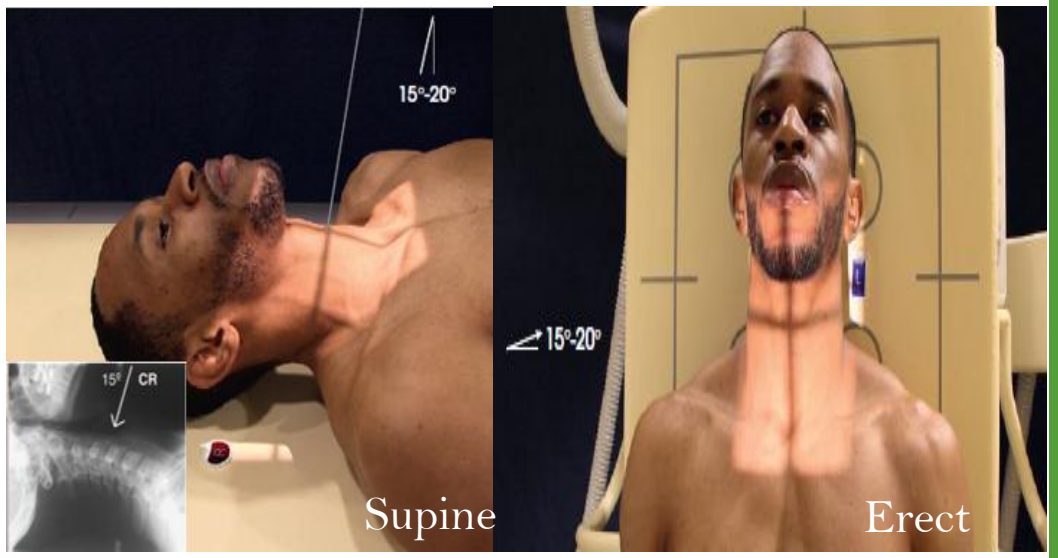
Clinical Indications

- Pathology involving the mid and lower cervical spine (C3 to C7)
- Demonstrates clay shoveler's fracture, compression fractures, and herniated nucleus pulposus (HNP)

Patient Position

- Supine or erect, center midsagittal plane to CR (and to centerline of IR)
- Raise head so that a line from lower margin of upper incisors to the base of the skull (mastoid tips) is perpendicular to IR.
- Line from tip of mandible to base of skull should be parallel to angled CR, center IR to projected CR.

Central Ray: CR 15°-20° cephalad, to enter at C4 (inferior border of thyroid cartilage).



AP Axial Projection

Collimation: Tightly on four sides to anatomy of interest

Technical Factors

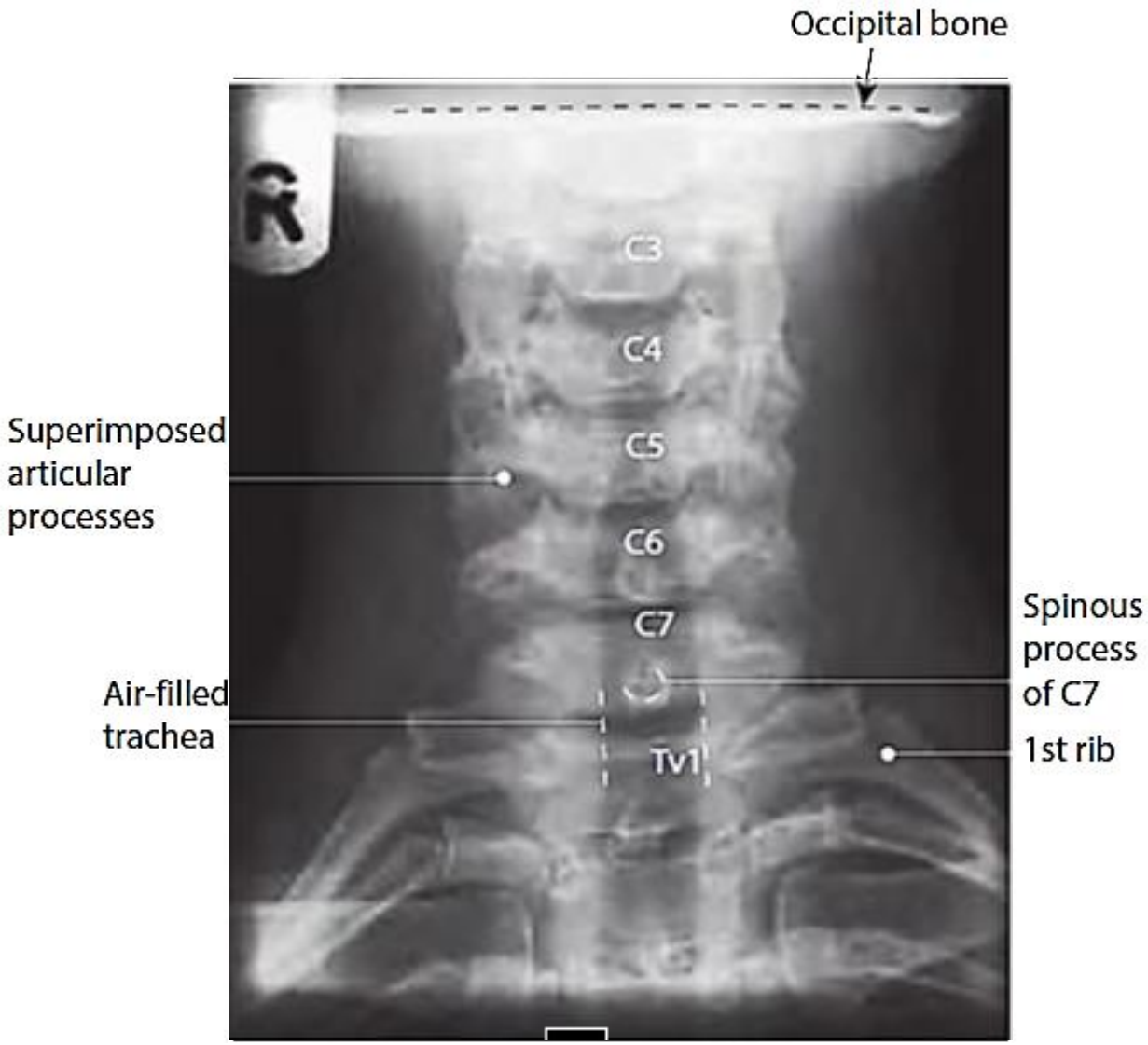
SID: 102 cm	Grid:Yes	IR size: (12 × 10 inches)L.W
kV: 85	mAs: 6.3	Respiration: Suspended

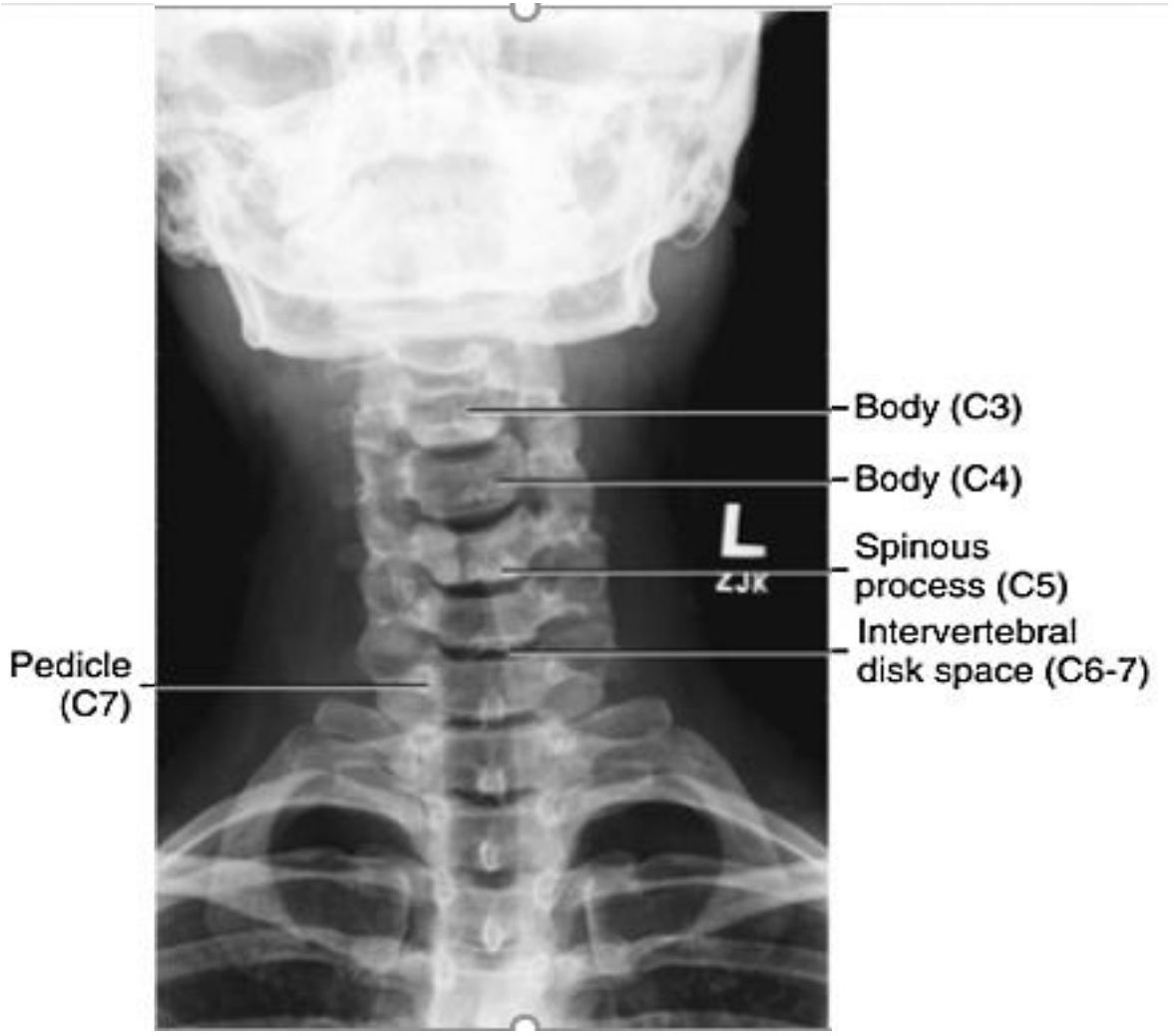
Note Patient should not swallow during exposure.

Evaluation Criteria

- C3 to T2 vertebral bodies; space between pedicles and intervertebral disk spaces clearly seen
- No rotation, no motion.

AP Axial Projection





Lateral (R or L)

Clinical Indications

Pathology involving the cervical spine and adjacent soft tissue structures, including spondylosis and osteoarthritis.

Patient Position

- patient in erect lateral position, shoulder against vertical IR.
- Align midcoronal plane to CR and midline of IR.
- place top of IR about 3-5 cm above the external auditory meatus (EAM)
- Raise chin slightly (to remove mandible angles from spine).
- Relax and depress both shoulders evenly (weights in each hand may be necessary to visualize C7.

Lateral (R or L)

Central Ray: CR perpendicular to IR. Direct CR horizontally to C4 (level of upper margin of thyroid cartilage). Center IR to CR.

Collimation: On four sides to anatomy of interest.

Technical Factors

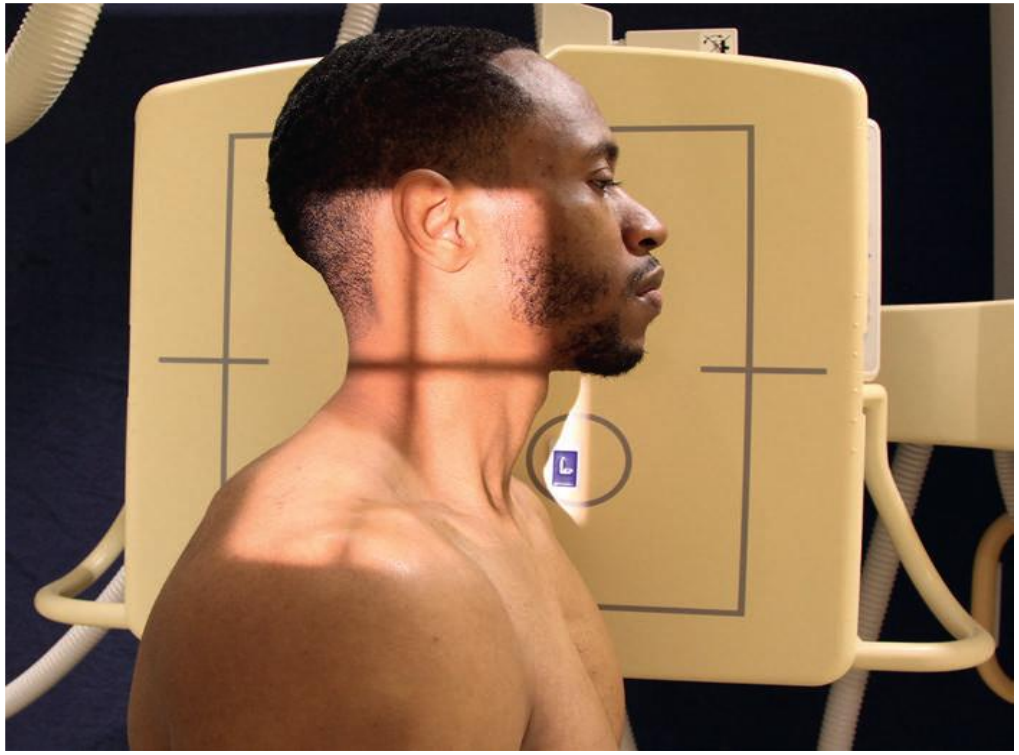
SID: 152- to 183-cm

Grid: optional

kV: 85

mAs: 16

IR size: (12 × 10 inches) L.W



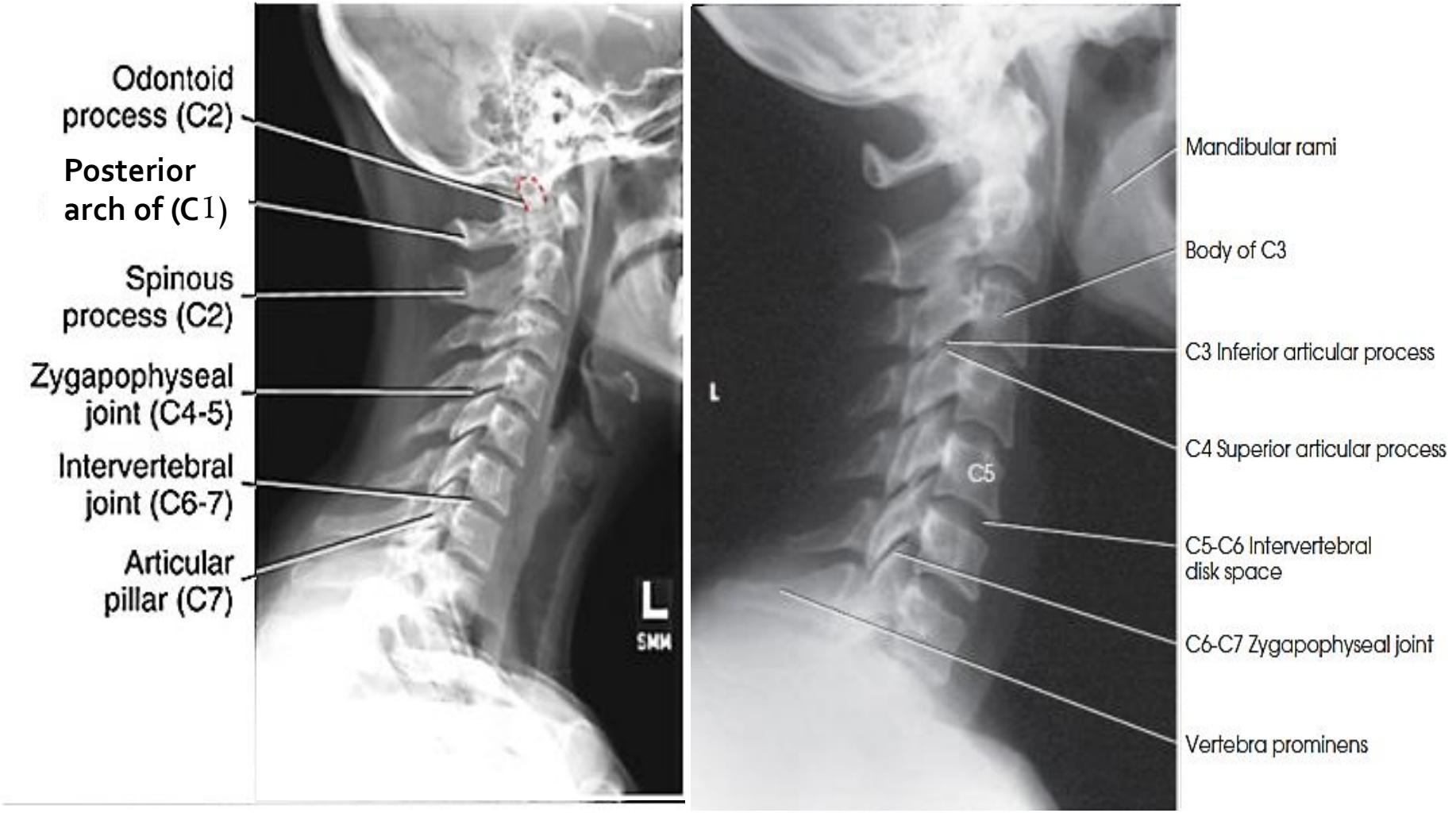
NOTE: Respiration suspended on full expiration (for maximum shoulder depression)

NOTE: SID is recommended because of the increased object-to-IR distanc (OID). A longer distance helps show C7.

Lateral (R or L)

Evaluation Criteria

- Cervical vertebral bodies, intervertebral joint spaces, articular pillars, spinous processes, and zygapophyseal joints



- Clear demonstration of soft tissue margins, including margins of the trachea, and of bony margins and trabecular markings of cervical vertebrae.
- No motion.

AP, PA Axial Oblique Projection

Anterior and Posterior Oblique Positions

Clinical Indications

Pathology involving the cervical spine and adjacent soft tissue structures, including *stenosis involving the intervertebral foramen*

Note Both right and left oblique projections should be taken for comparison purposes.

Anterior oblique positions—RAO, LAO—are preferred because of reduced thyroid doses.

Patient Position

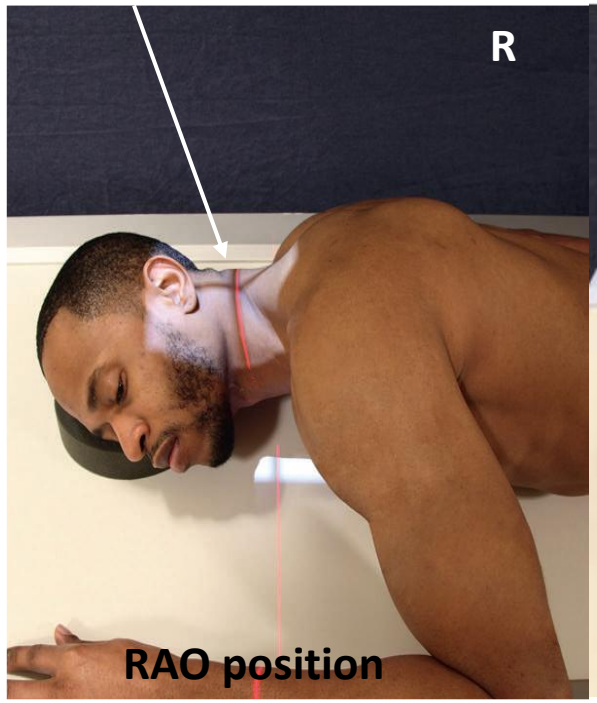
- The erect position preferred (sitting or standing).
- Align midsagittal plane to CR and midline of IR.
- Rotate body and head into 45° oblique position.
- Protract chin to prevent mandible from superimposing vertebrae.
- Elevate chin to place acanthiomeatal line (AML) parallel with floor. Elevating chin too much will superimpose base of skull over C1.

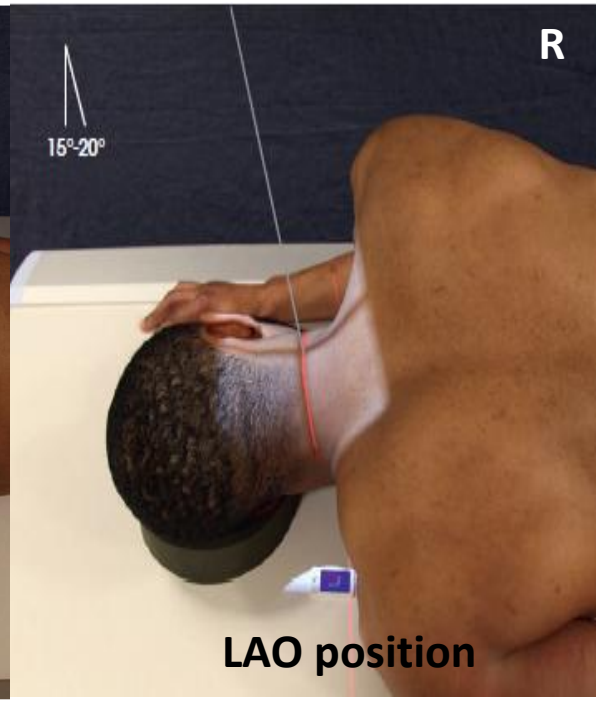
AP, PA Axial Oblique Projection

Anterior and Posterior Oblique Positions

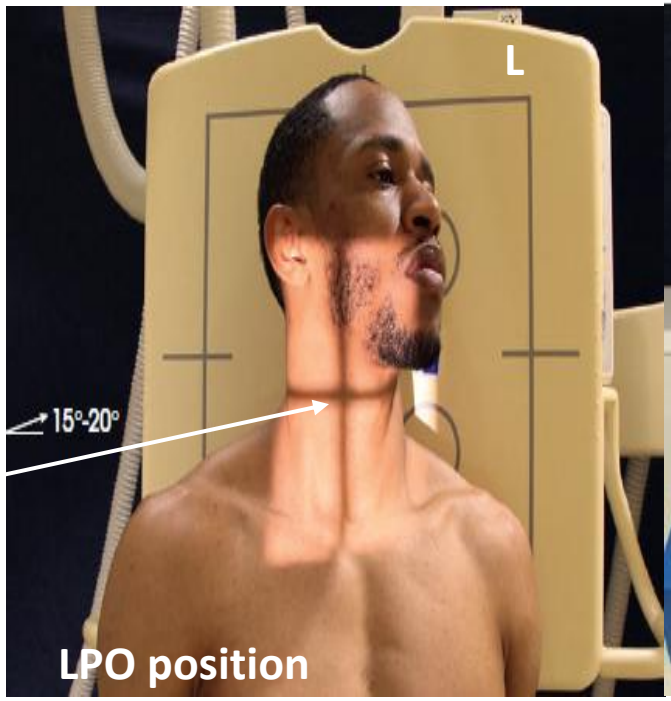
Central Ray

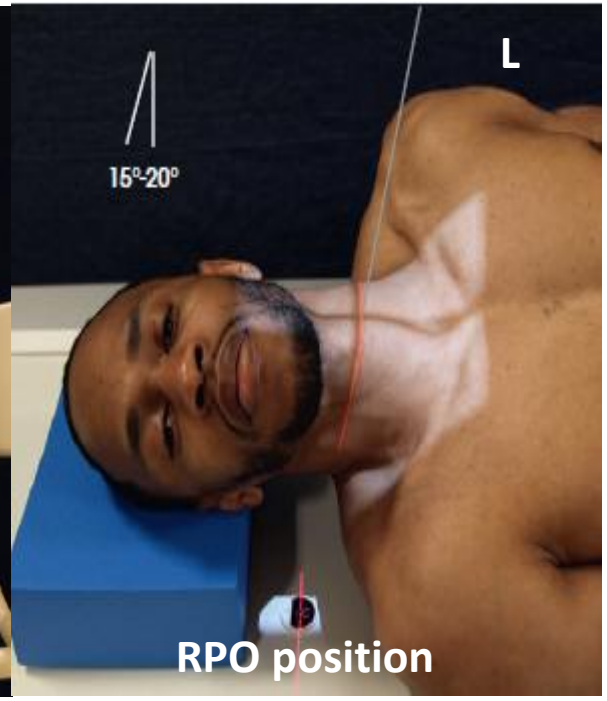
- **Anterior Oblique (RAO, LAO)** Direct CR 15° to 20° caudad to C4 (level of upper margin of thyroid cartilage).
- **Posterior Oblique (RPO, LPO)** Direct CR 15° to 20° cephalad to C4. Center IR to CR.





PA axial oblique /CR 15° caudad





AP axial oblique /CR 15°cephalad

AP, PA Axial Oblique Projection

Anterior and Posterior Oblique Positions

Collimation:

Tightly on four sides to anatomy of interest

Technical Factors

SID: 102 cm	Grid: optional	IR size: (12 × 10 inches)L.W
kV: 85	mAs: 22	Respiration: Suspended

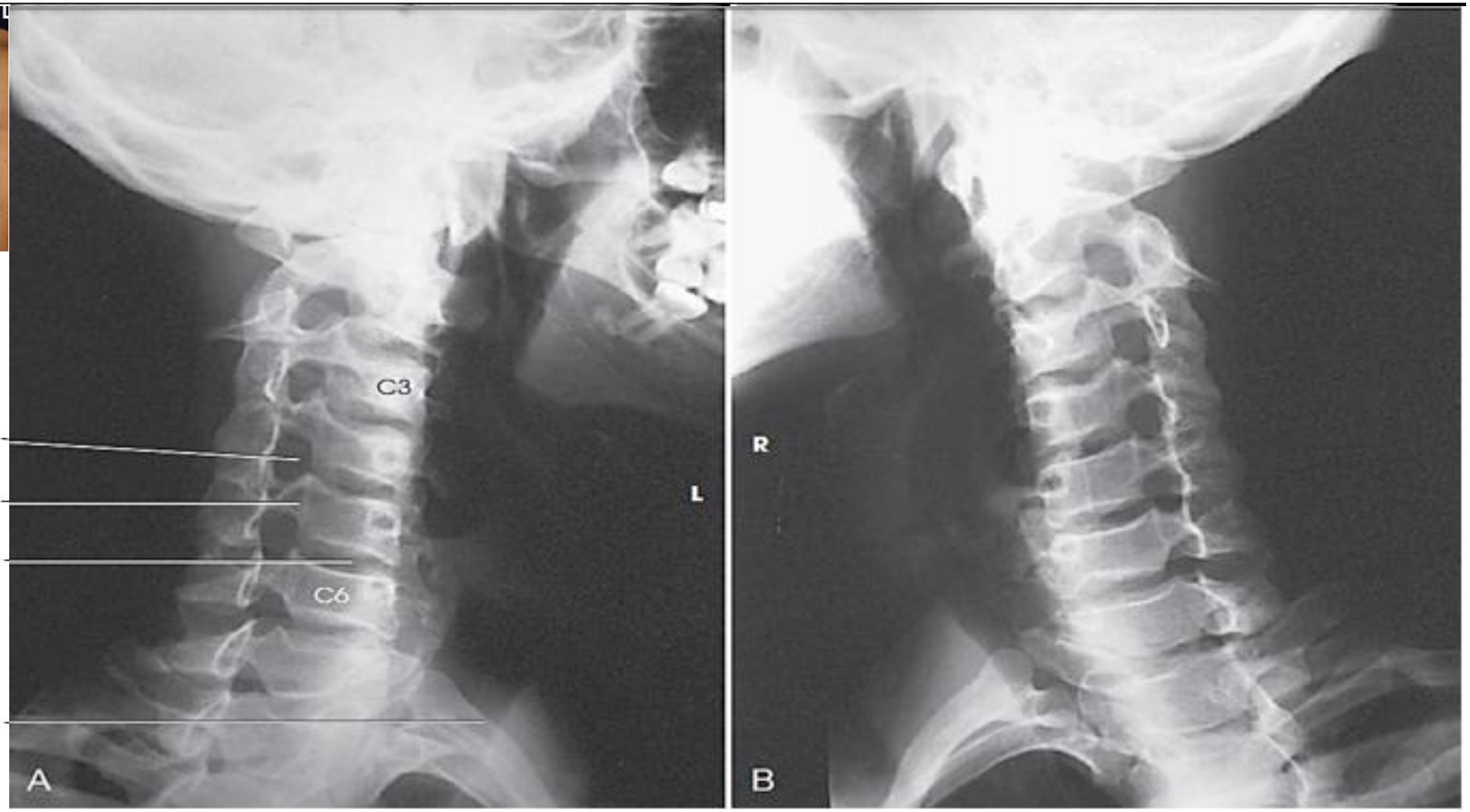
Evaluation Criteria

Anterior Oblique (RAO and LAO): Intervertebral foramina and pedicles on the side of the patient closest to the IR (right and left pedicles respectively).

Posterior Oblique (RPO and LPO): Intervertebral foramina and pedicles on the side of the patient farthest from the IR (left and right pedicles, respectively)

AP, PA Axial Oblique Projection

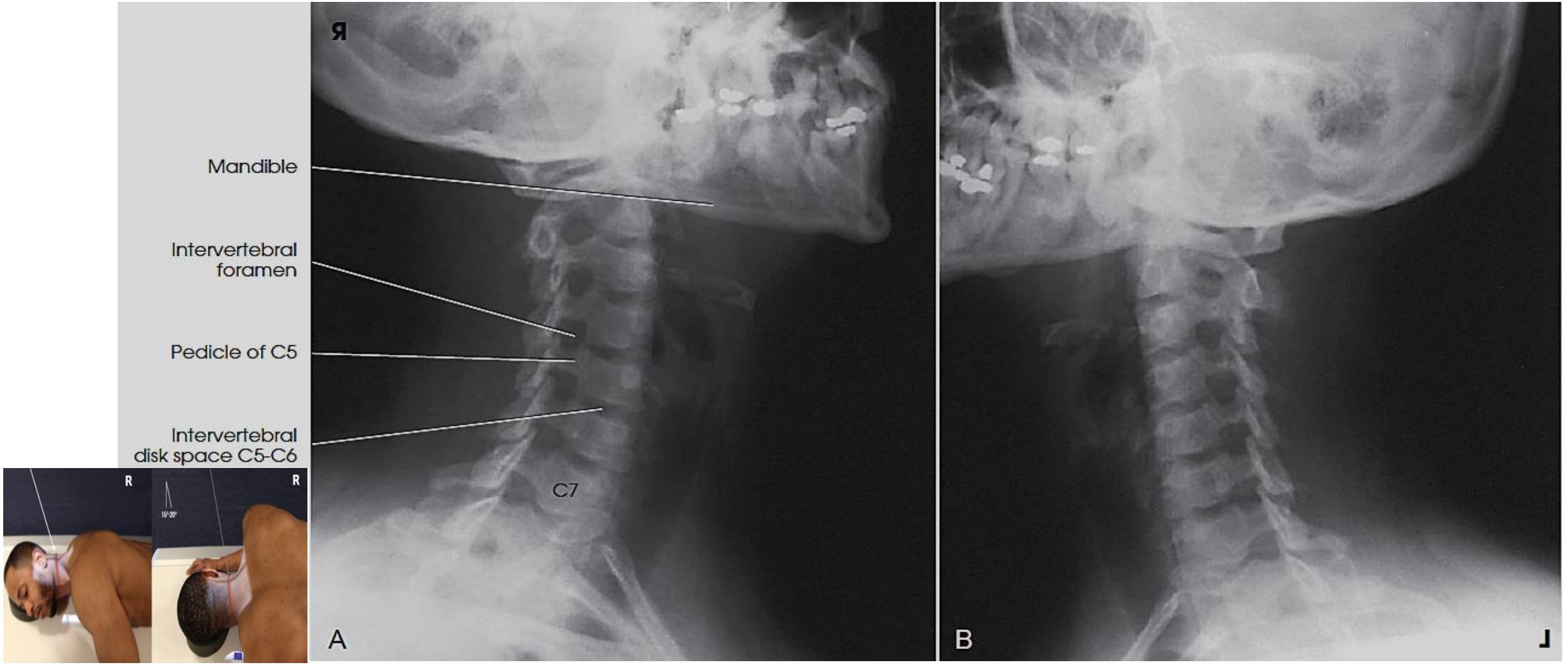
Anterior and Posterior Oblique Positions



AP axial oblique intervertebral foramina. A, LPO position showing right side. B, RPO position showing left side

AP, PA Axial Oblique Projection

Anterior and Posterior Oblique Positions



PA axial oblique intervertebral foramina. A, RAO position showing right side. B, LAO position showing left side


THANK YOU