Introduction to Anatomy

1st Year Medical Students

2025-2026
Second Semester

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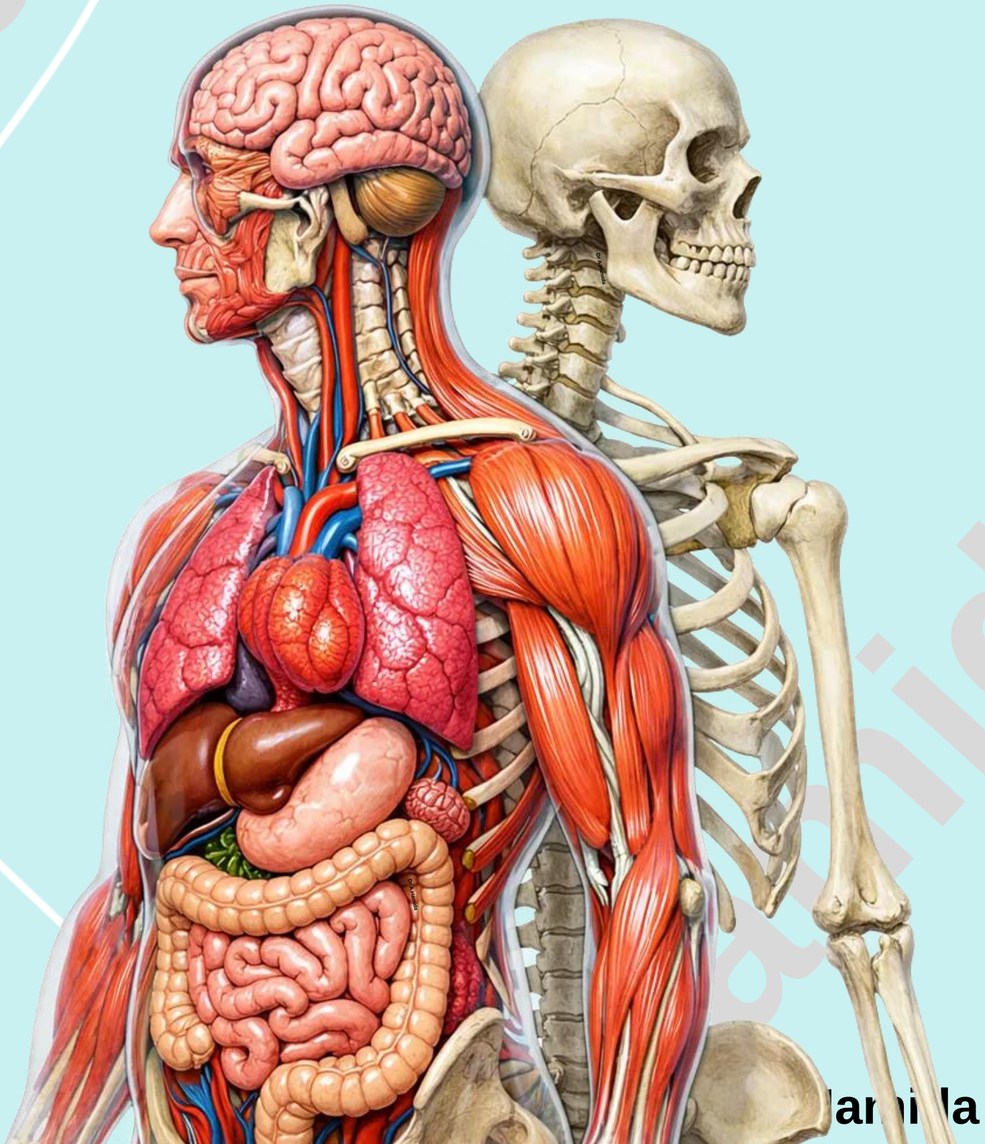
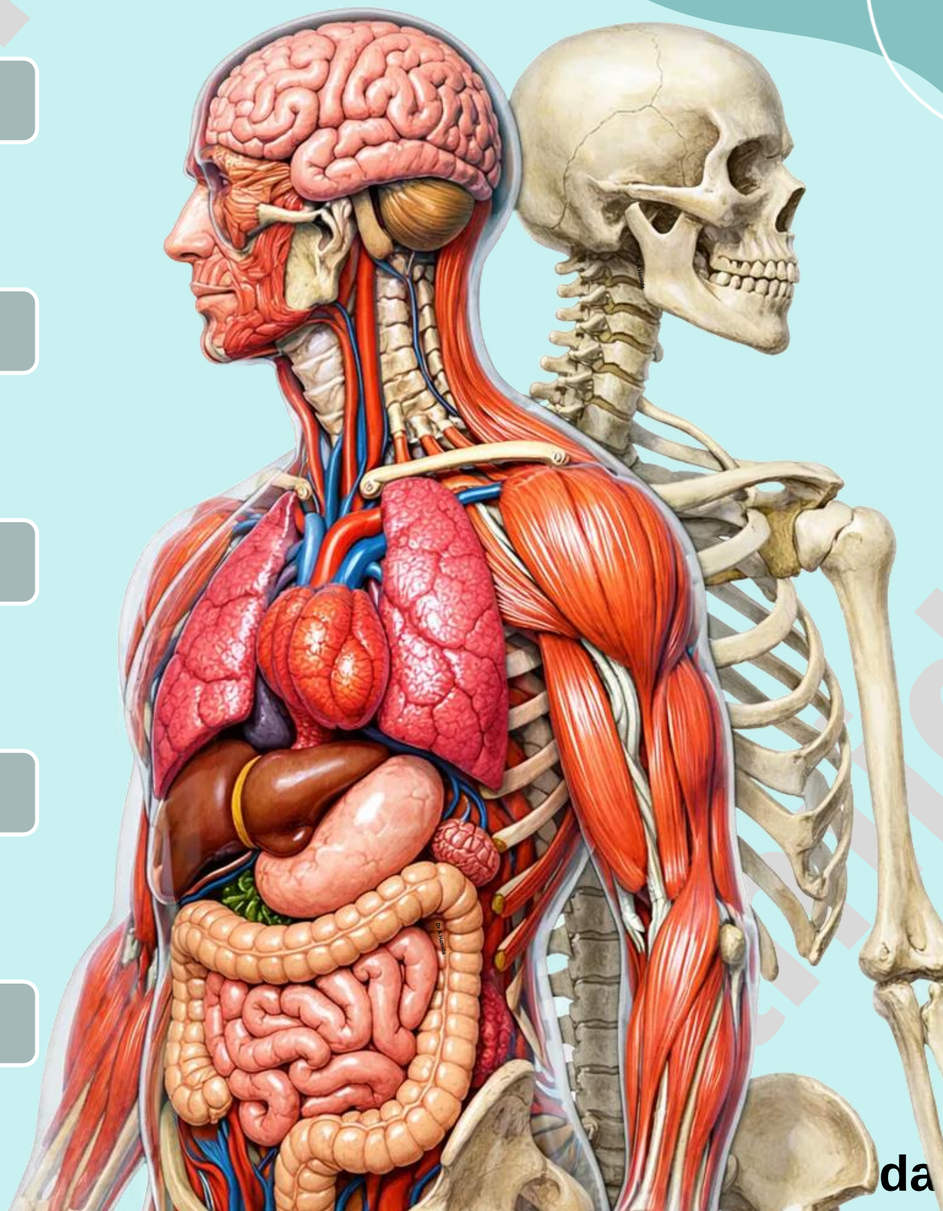


Course Outline:

Gross lecture-3

1. Introduction and Terminology
2. Skeletal System
3. Cardiovascular System
4. Lymphatic System
5. Nervous System
6. Muscular System
7. Respiratory System
8. Digestive System
9. Urinary System
10. Endocrine System



2 Skeletal System

Gross lecture-3

System Outline:

2.1 Axial Skeleton

2.2 Appendicular Skeleton

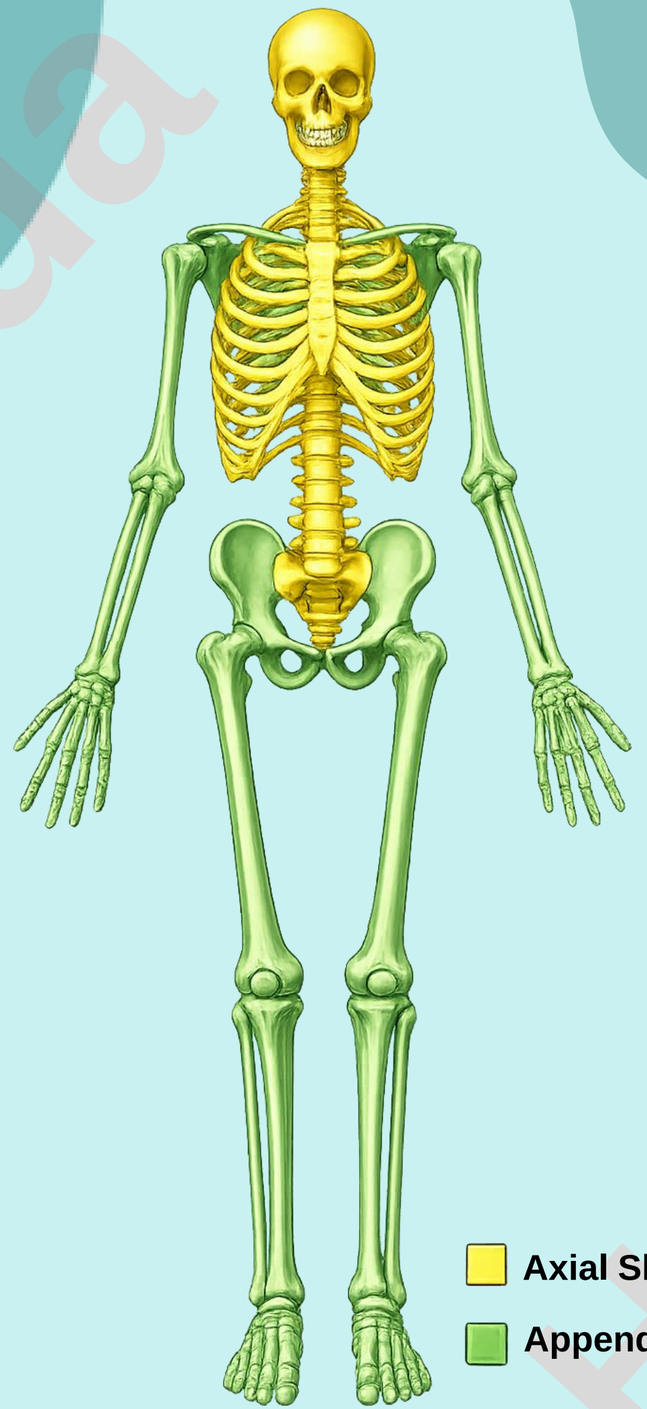
2.3 Joints

2

Gross lecture-3

Skeletal system

1. Axial Skeleton-2



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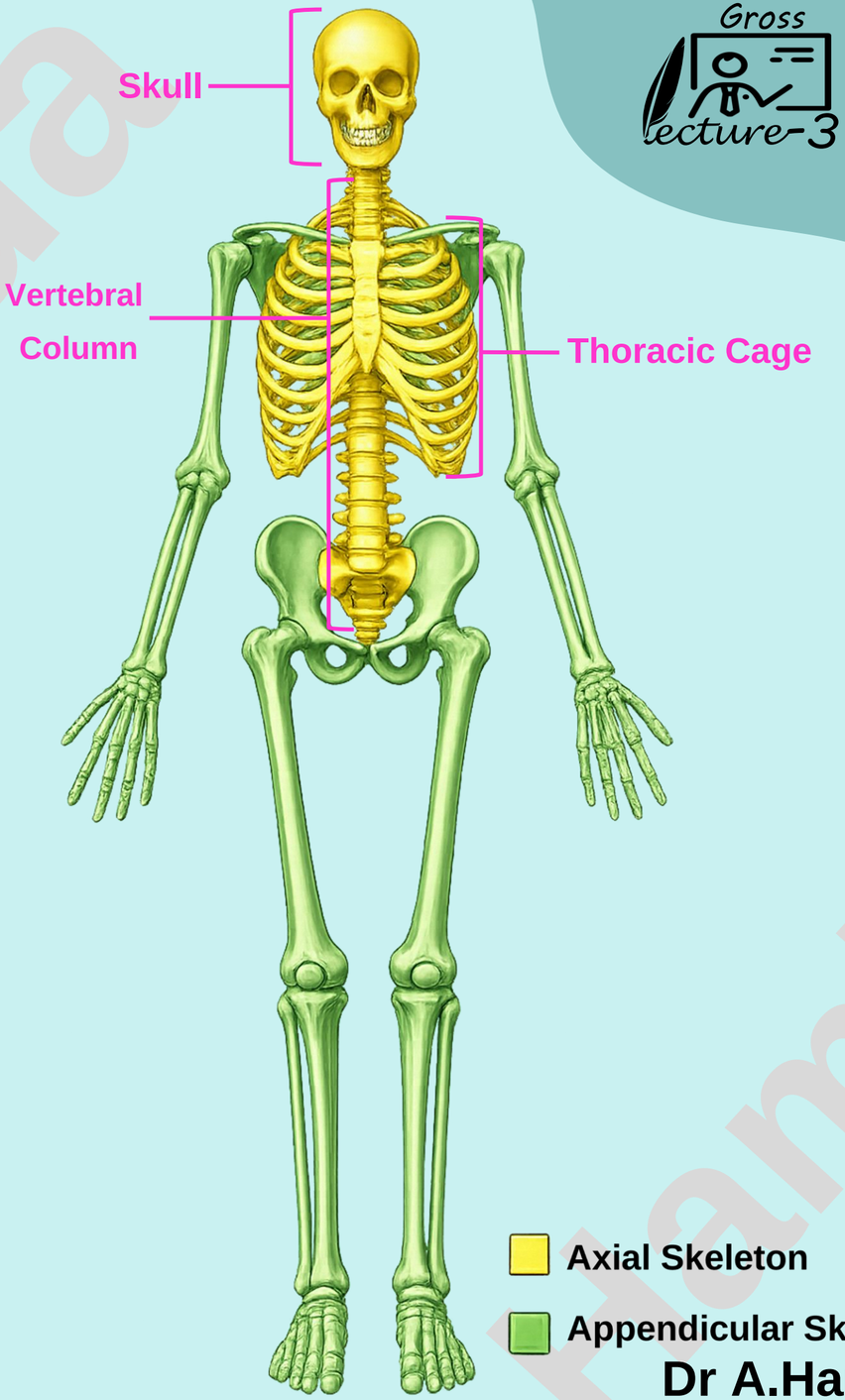
2 Skeletal System

- The human skeletal system consists of **206 bones**
- The skeletal system is classified functionally into:

1. **Axial Skeleton :**
   - Consists of the bones and cartilages that lie close to the central axis of the body.
   - It includes the bones of the
     1. Skull
     2. Vertebral Column
     3. Thoracic Cage

2. **Appendicular Skeleton :**
   - It is bilaterally symmetrical and consist of the bones and cartilages of the:
     1. Upper Limb
     2. Lower Limb



2.1 Skeletal System–Axial Skeleton

Gross lecture-3

Lecture Outline:

- 2.1.1 Skull
- 2.1.2 Vertebral Column
- 2.1.3 Thoracic Cage

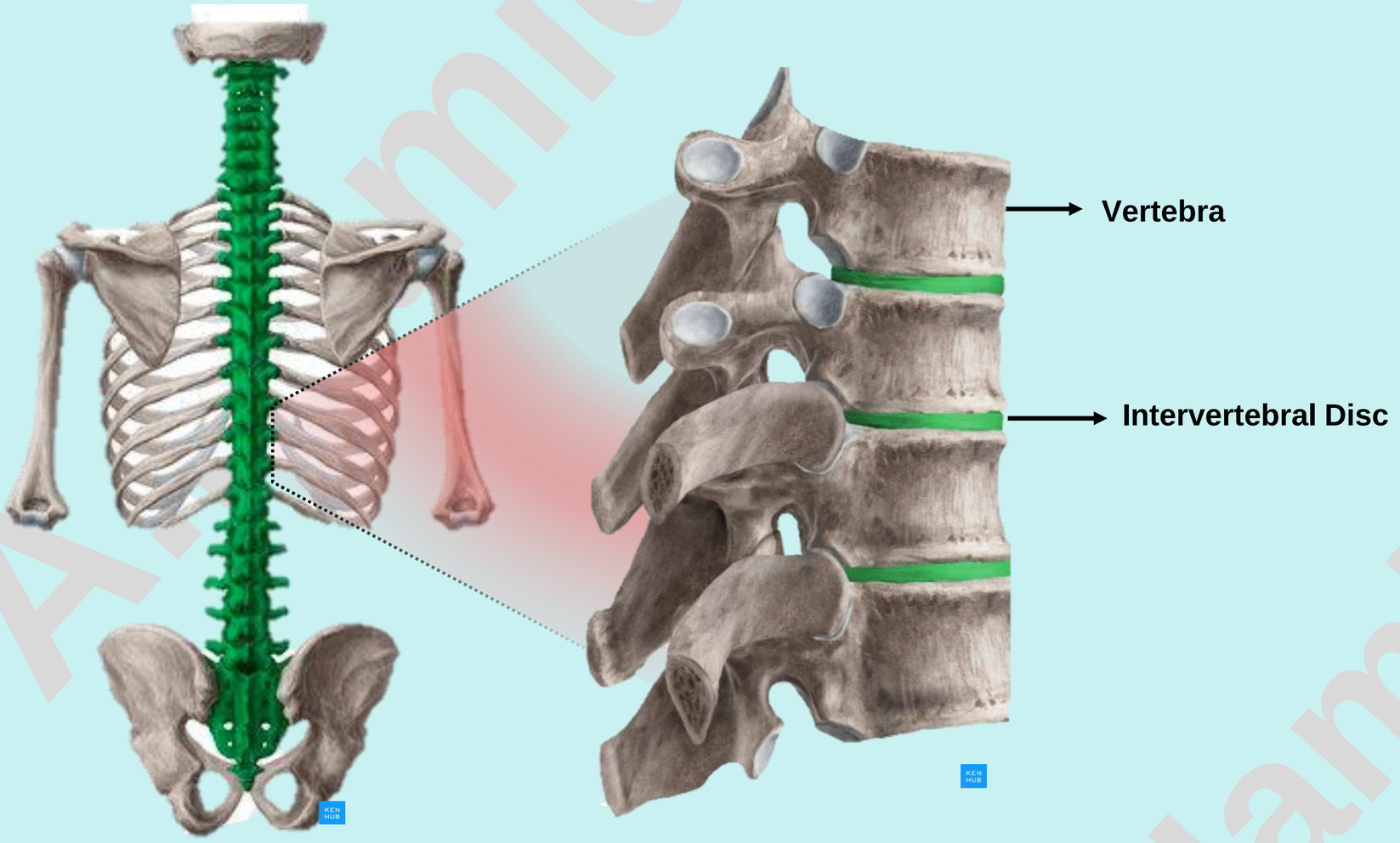
2.1.2

Vertebral Column

Gross lecture-3

➢ **The Vertebral Column consist of:**

1. Vertebrae
2. Intervertebral Discs



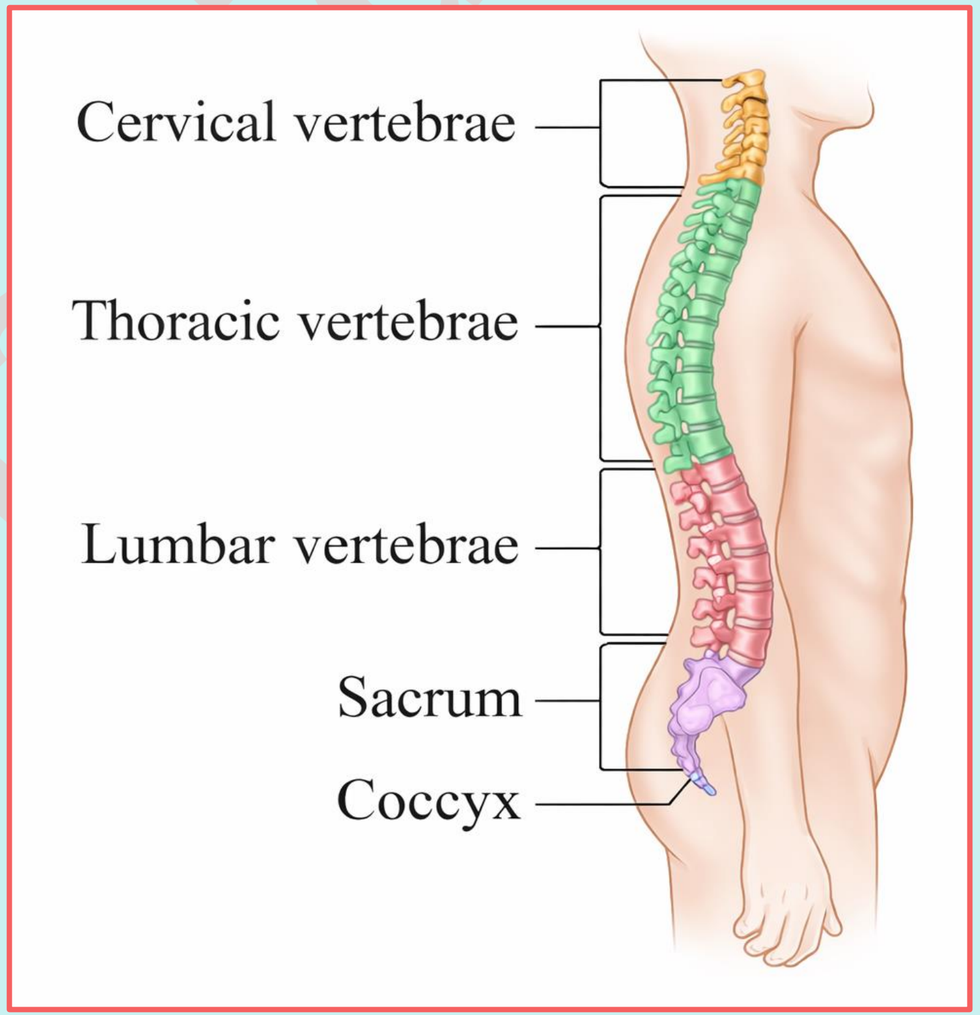
2.1.2

Vertebral Column

1. Vertebrae

Gross lecture-3

- **The vertebral column consists of 33 vertebrae:**
  - 7 Cervical Vertebrae
  - 12 Thoracic Vertebrae
  - 5 Lumbar Vertebrae
  - 5 Sacral Vertebrae (fused)
  - 4 Coccygeal Vertebrae (fused)



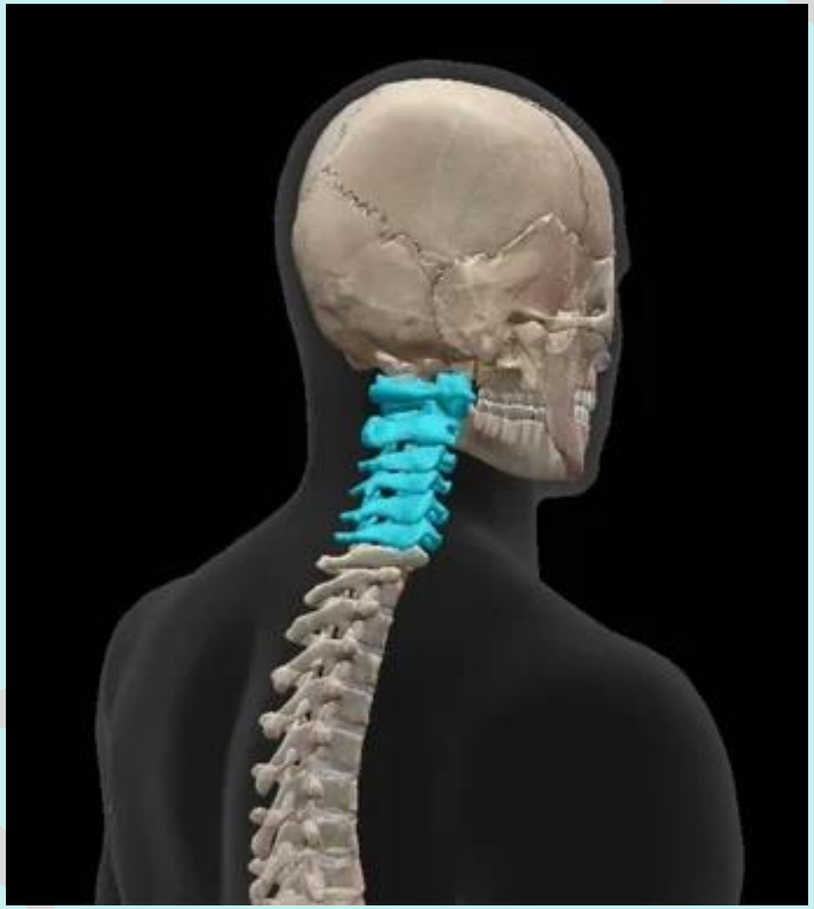
2.1.2

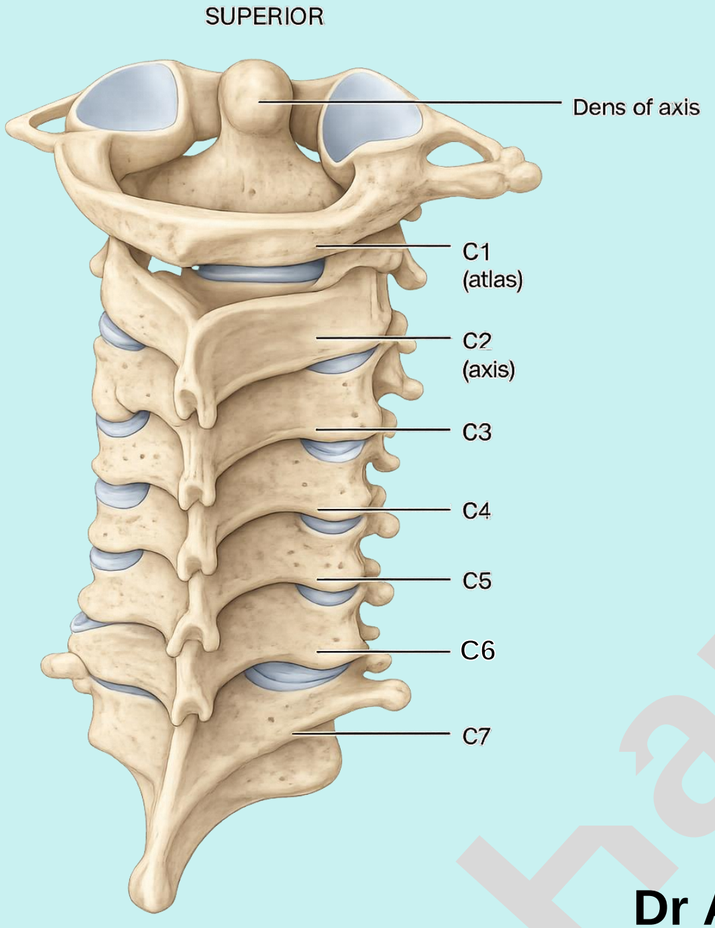
Vertebral Column

1. Vertebrae

1. Cervical Vertebrae (7)

- Found in the neck region.
- Have intervertebral discs between every two vertebrae.
- The 1st cervical vertebra (atlas) articulates with the base of skull.





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2.1.2

Vertebral Column

1. Vertebrae

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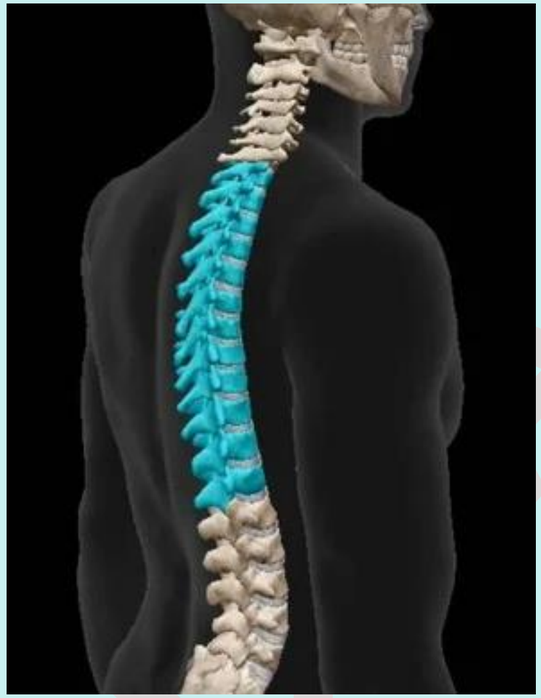
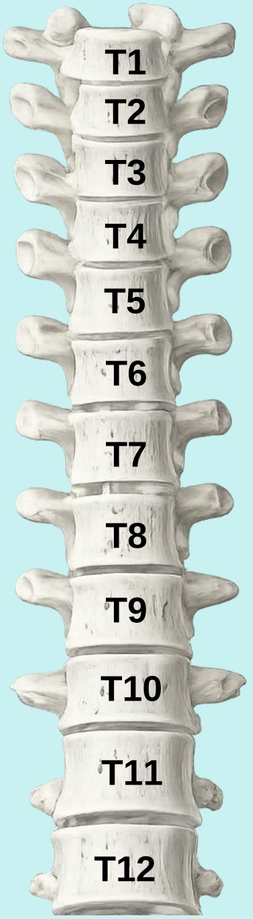
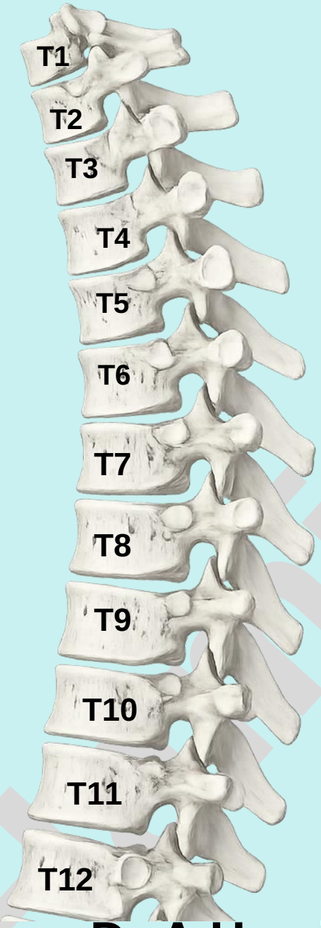
2. Thoracic Vertebrae (12)

- Found in the thoracic region (posterior to the thoracic cavity).
- Have intervertebral discs between every two vertebrae.
- Articulates with the ribs.



Posterior





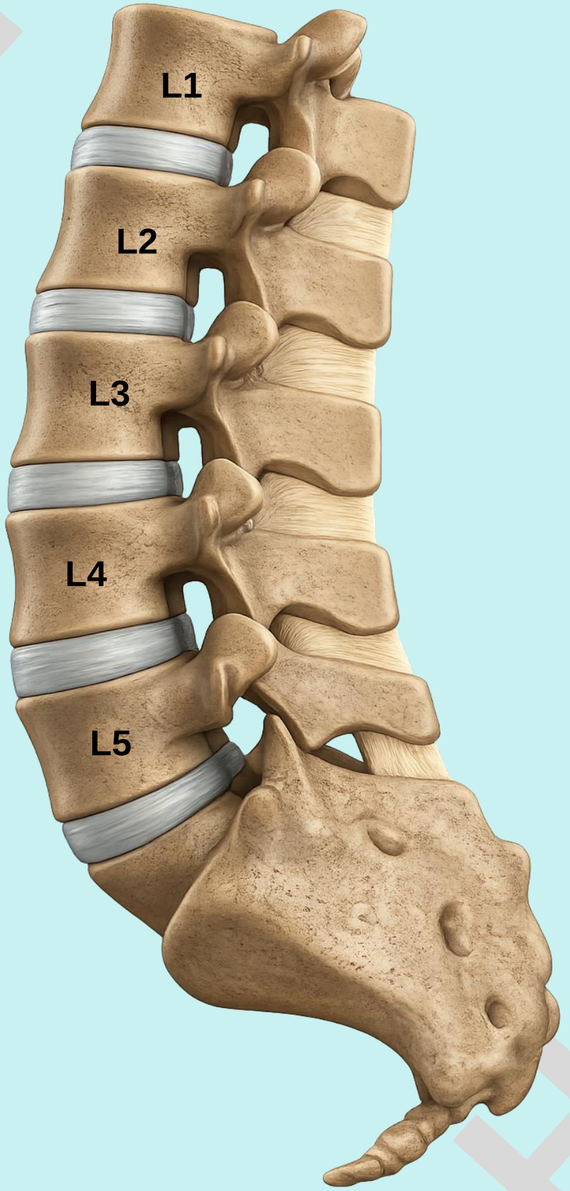
2.1.2

Vertebral Column

1. Vertebrae

3. Lumbar Vertebrae (5)

- Found posterior to the abdomen.
- Have intervertebral discs between every two vertebrae.



Gross lecture-3

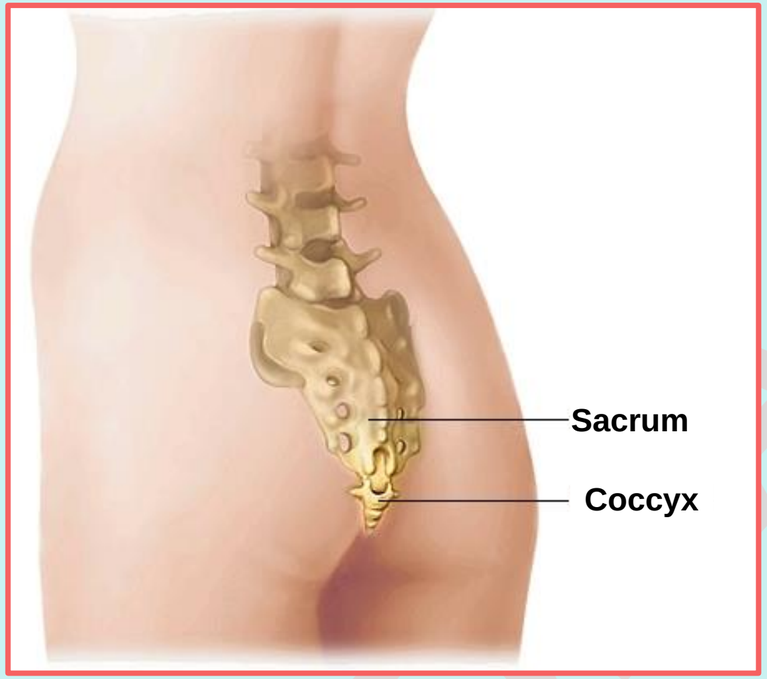
2.1.2

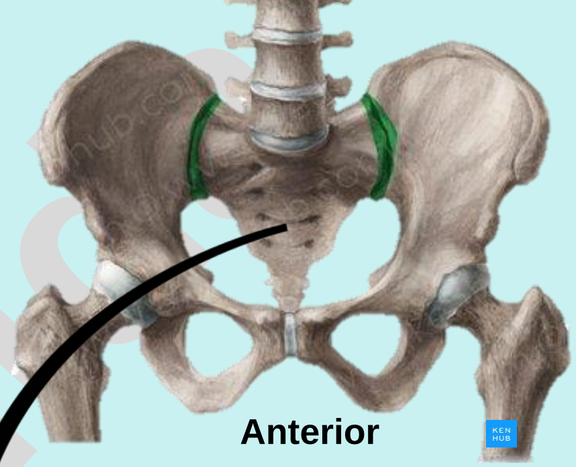
Vertebral Column

1. Vertebrae

4. Sacral Vertebrae (5)

- Found in the posterior portion of the pelvic cavity.
- Fused vertebrae, have no intervertebral discs.
- Articulates with the hip bones (sacroiliac joint)





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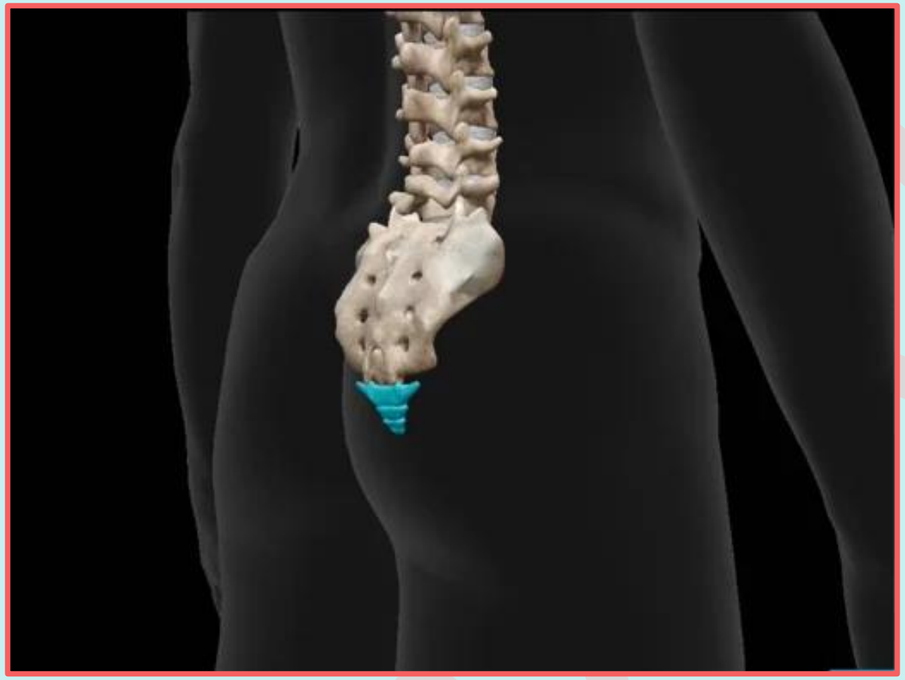
Vertebral Column

1. Vertebrae

5. Coccygeal Vertebrae (4)

- Found at the lower end of the vertebral column.
- Fused vertebrae, have no intervertebral discs.
- Articulates with the sacrum.



Anterior

Posterior

2.1.2

Vertebral Column

1. Vertebrae

Gross lecture-3

➢ Structure of a Typical Vertebra:

1. **Body:** Thick, disc-shaped anterior portion.
2. **Vertebral Arch:** Extends posteriorly from the body of the vertebra.
3. **Processes (7):**
   i. Two transverse Processes: Extend laterally on each side.
   ii. Spinous Process: Spin-like structure projecting posteriorly.
   iii. Two superior articular processes: Project superiorly and articulate with the two inferior articular processes of the vertebra immediately above them.
   iv. Two inferior articular processes: Project inferiorly and articulate with the two superior articular processes of the vertebra immediately below them.
4. **Vertebral Foramen**
   - Central space.
   - The vertebral foramina of all vertebrae form the vertebral (spinal) canal, which houses the spinal cord.

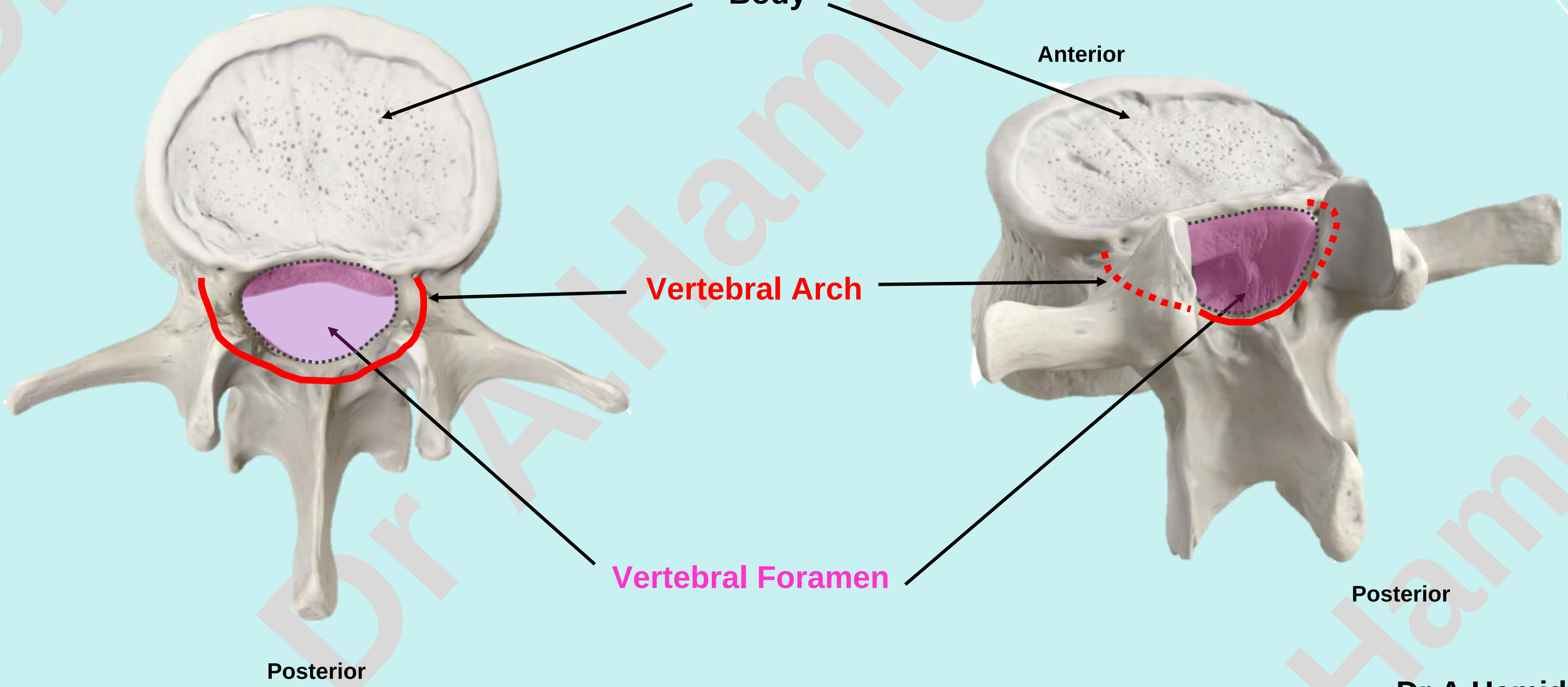
2.1.2

Vertebral Column

1. Vertebrae

Gross lecture-3

➢ Structure of Typical Vertebra



Vertebral Column

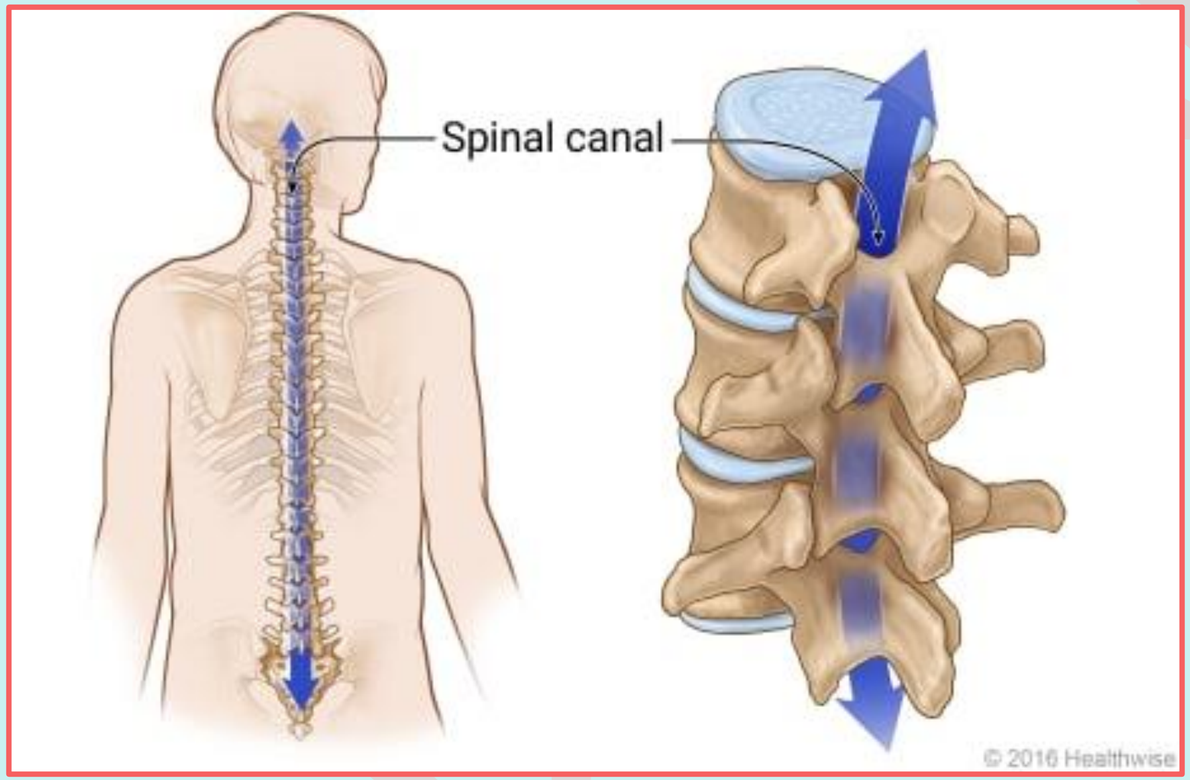
1. Vertebrae

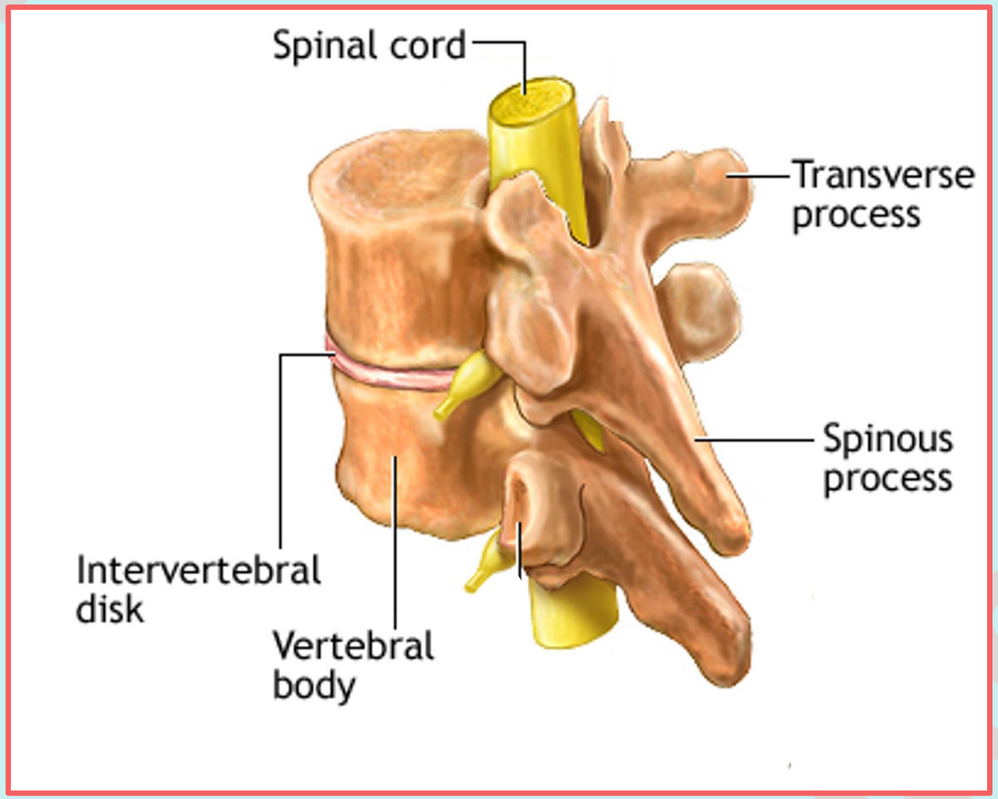
Gross lecture-3

➢ Structure of Typical Vertebra

Spinal Canal

- **Vertebral foramina of all vertebrae form the vertebral (spinal) canal, which houses the spinal cord.**





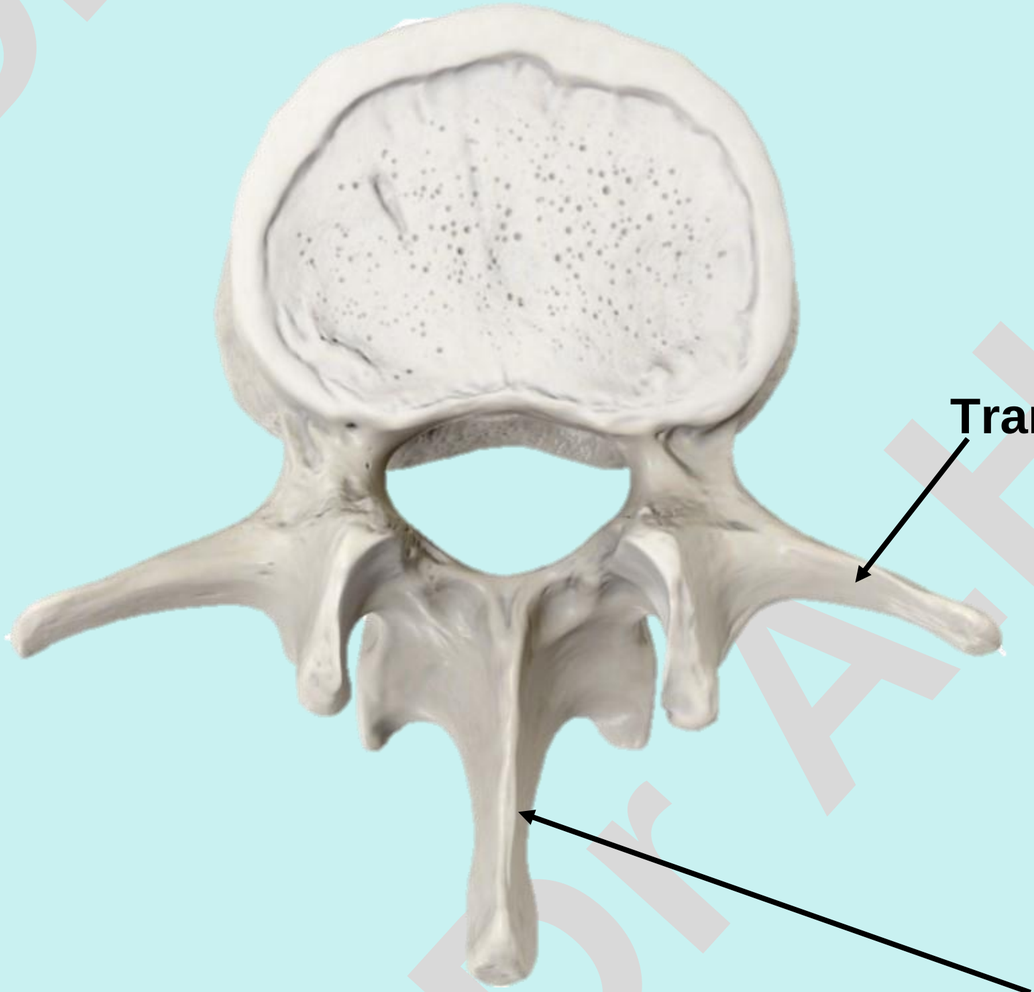
2.1.2

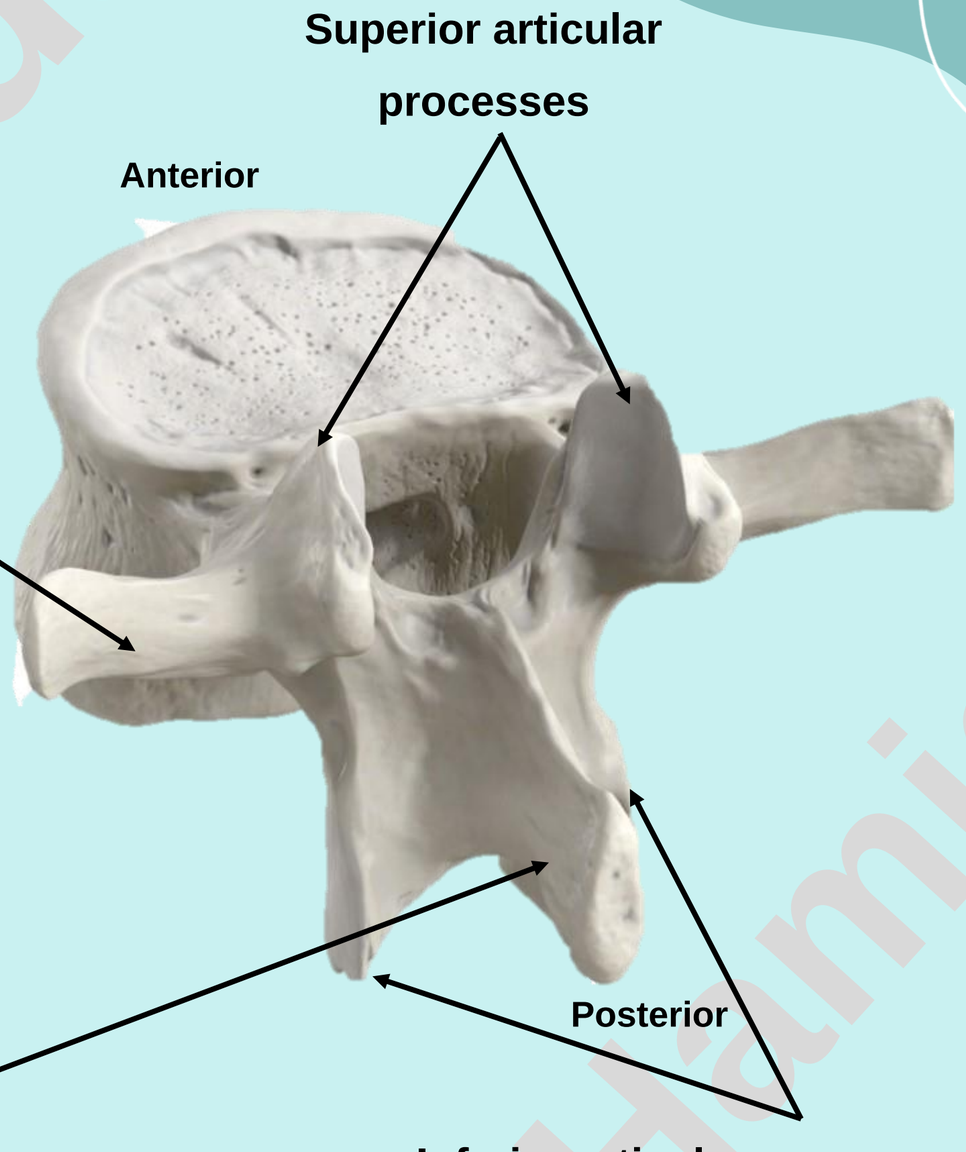
Vertebral Column

1. Vertebrae

Gross lecture-3

➢ Structure of Typical Vertebra





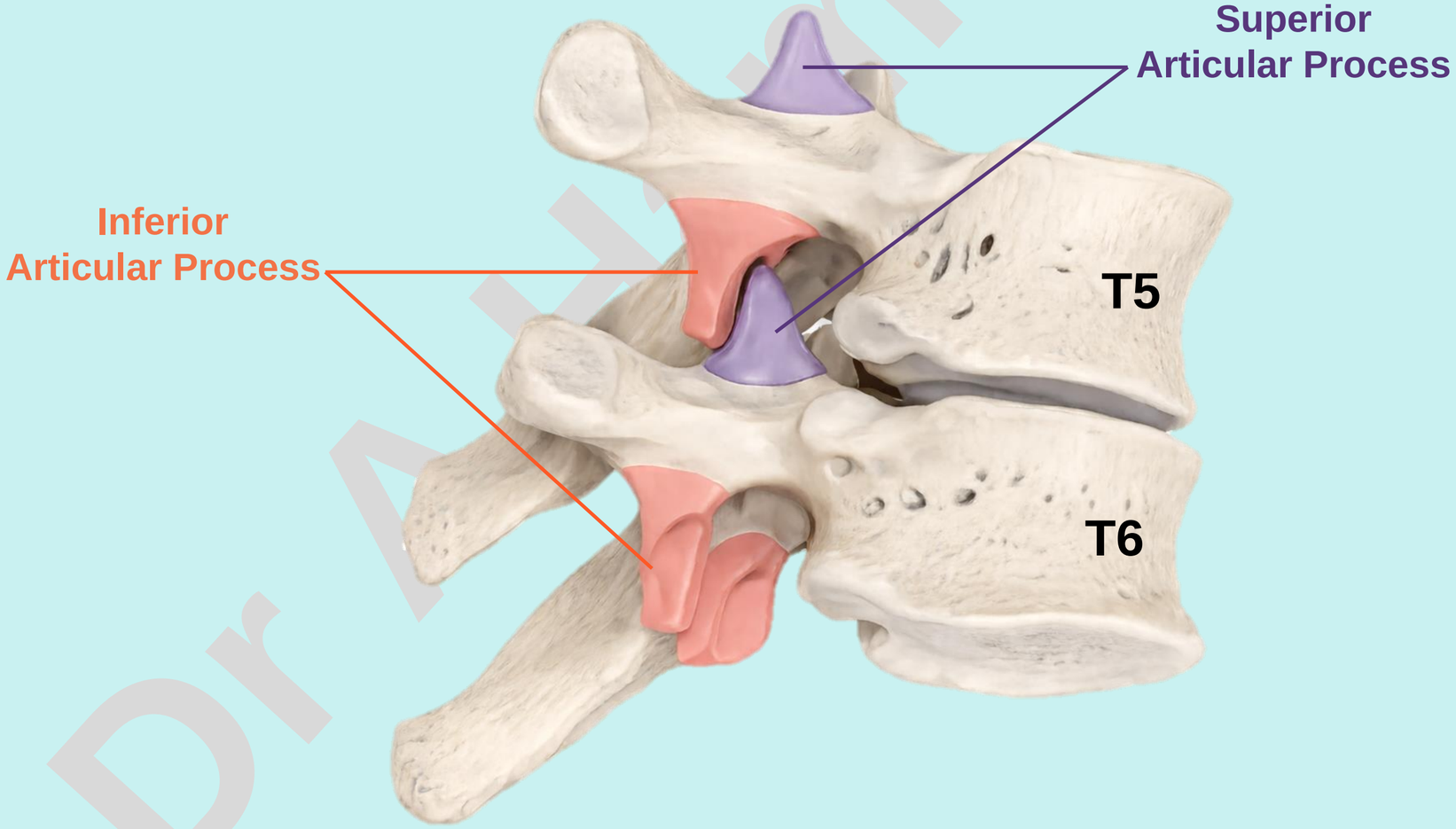
2.1.2

Vertebral Column

1. Vertebrae

➢ **Structure of Typical Vertebra**

- **Superior articular processes**
- **Inferior articular processes**



Gross lecture-3

2.1.2

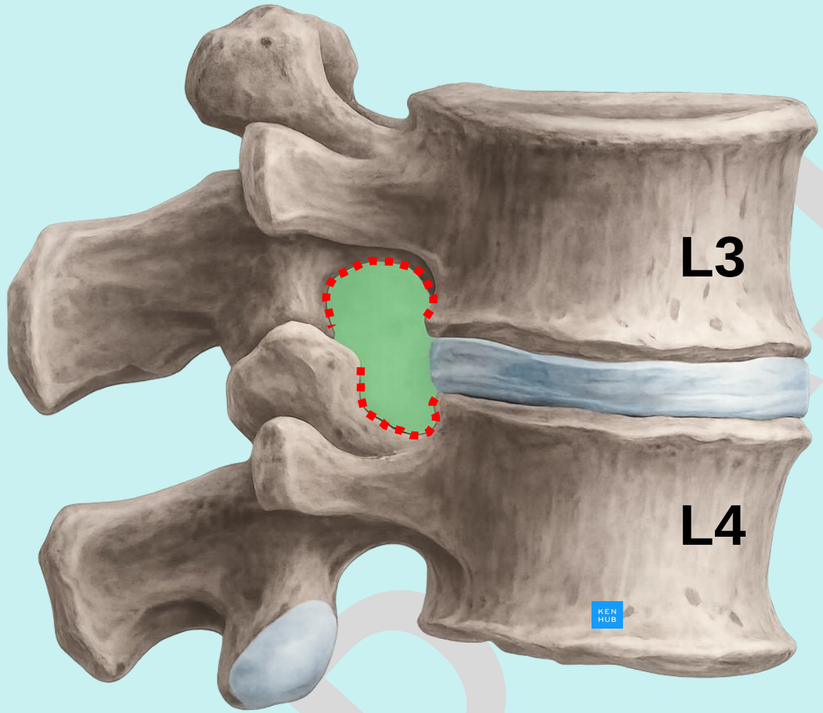
Vertebral Column

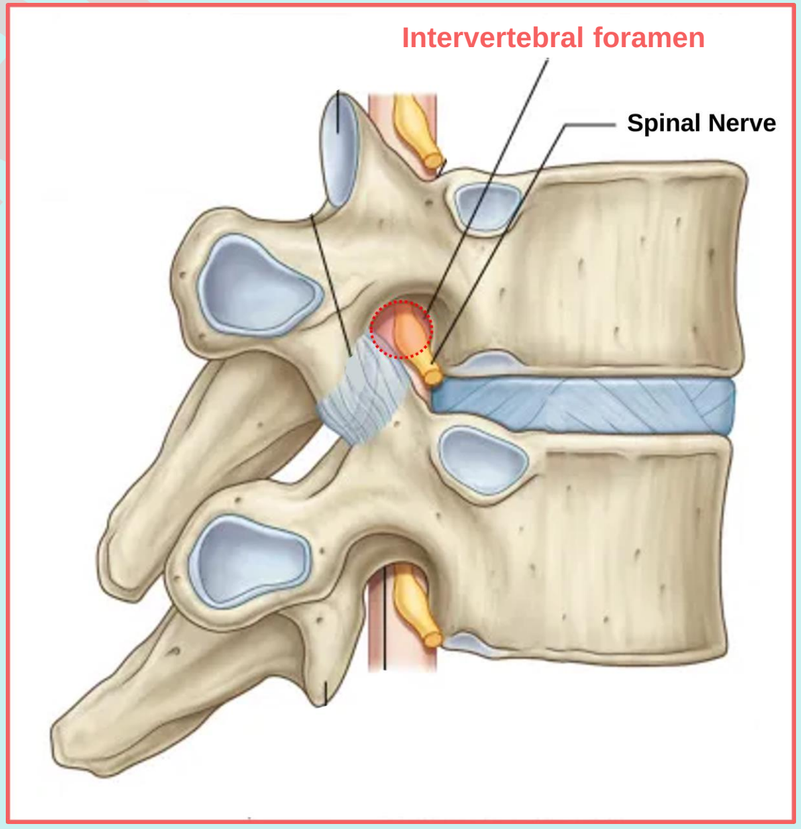
1. Vertebrae

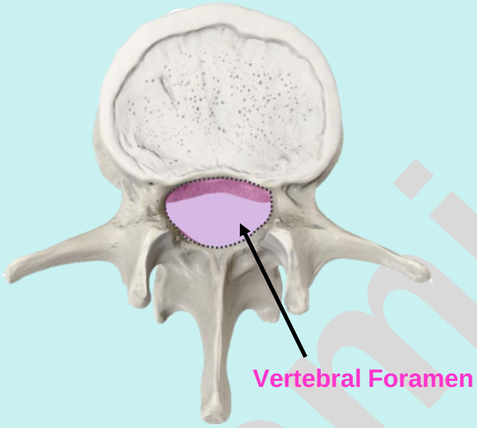
Gross lecture-3

➢ Intervertebral Foramen:

- It is a lateral opening between adjacent vertebrae formed by the superior and inferior notches.
- The foramina allow structures, such as spinal nerves and blood vessels, to pass in and out of the vertebral canal.







2.1.2

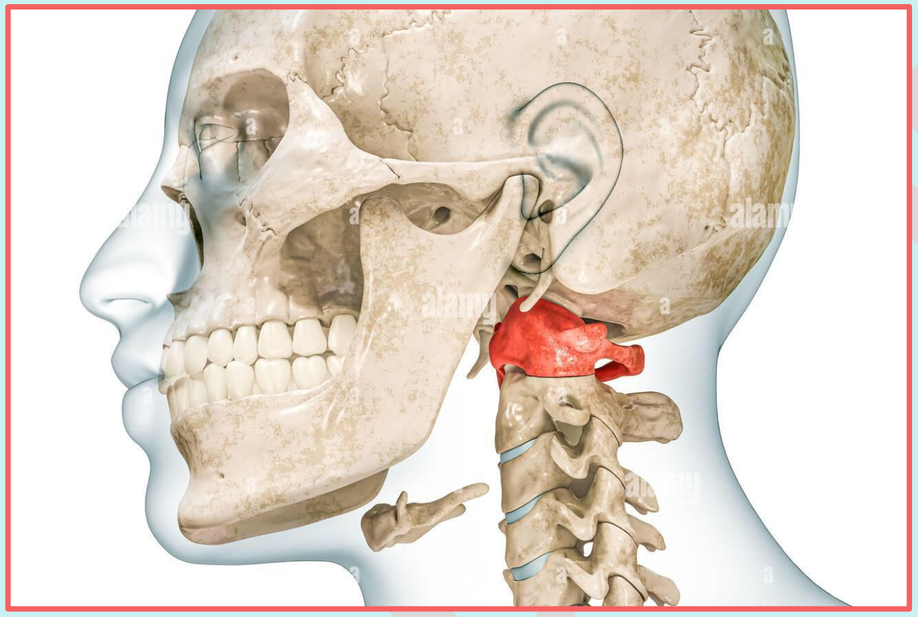
Vertebral Column

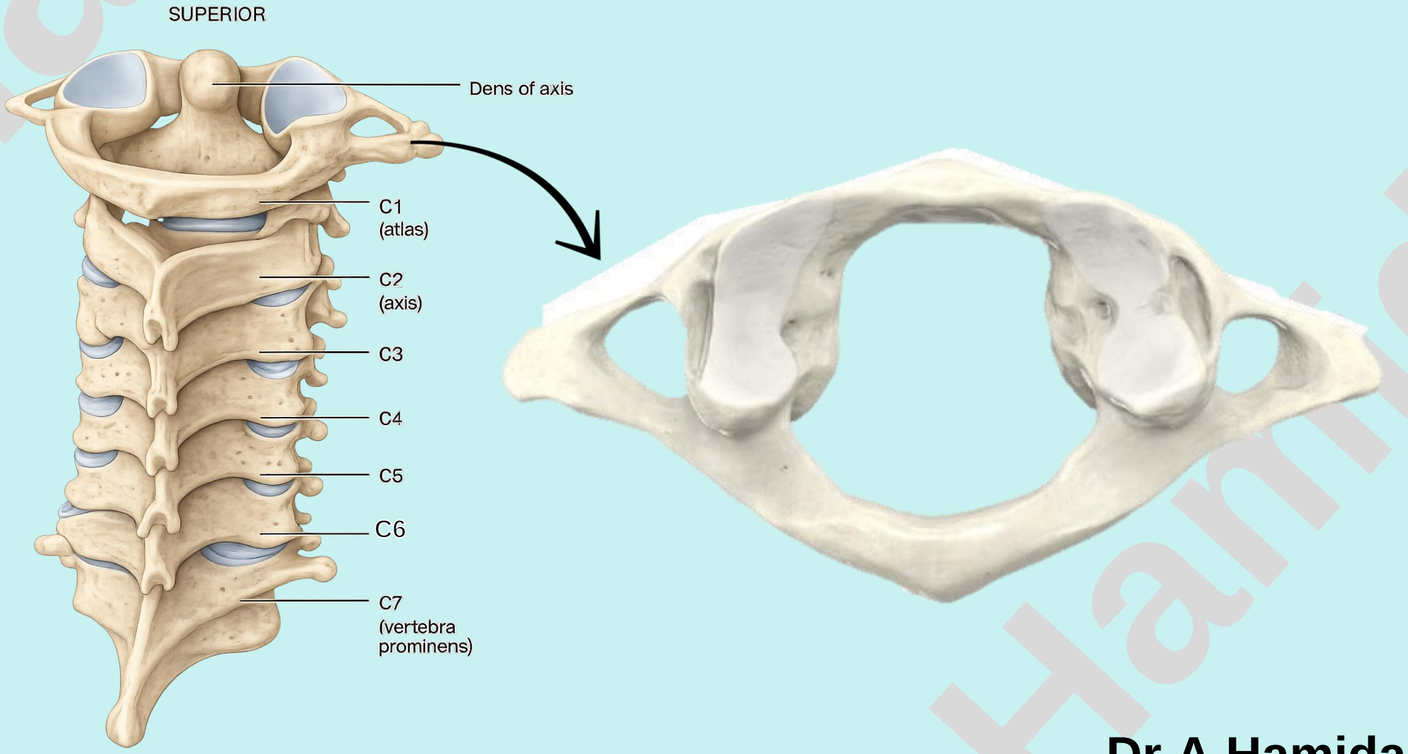
1. Vertebrae

Gross lecture-3

➢ Structure of Atypical Vertebra

- **1st Cervical Vertebra (Atlas)**
  - Named after the mythological Atlas who supported the world.
  - Ring-shaped vertebra with no body or spinous process.
  - Articulates with the base of the skull.
  - Function: Allows nodding movement of the head, as when you move your head to signify **''yes''**.





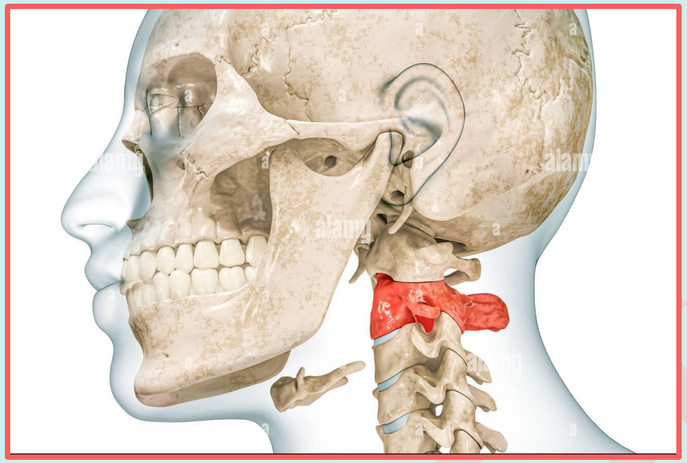
Vertebral Column

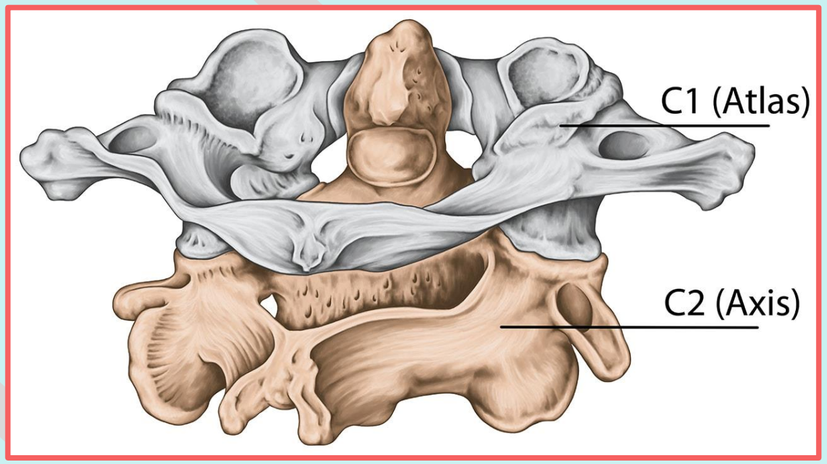
1. Vertebrae

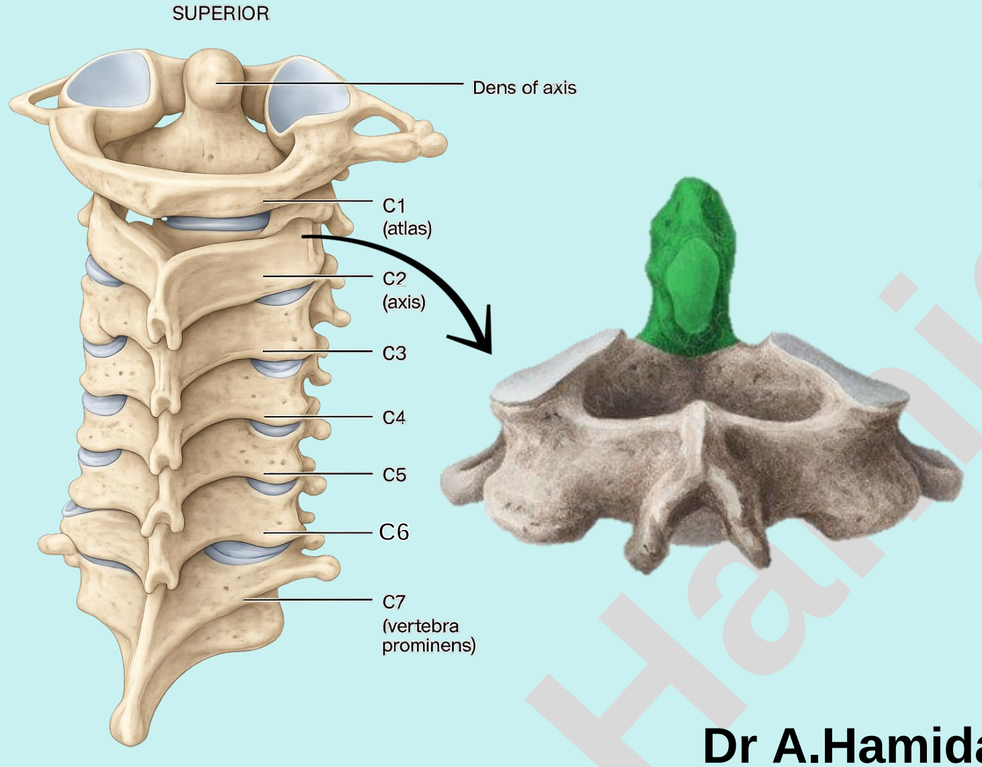
Gross lecture-3

➢ Structure of Atypical Vertebra

- **2nd Cervical Vertebra (Axis)**
  - Features a peg-like projection called the dens (= tooth) or odontoid process, which projects superiorly through the anterior portion of the vertebral foramen of the atlas.
  - The dens acts as a pivot on which the atlas and head rotate.
  - Function: Allows side-to-side movement of the head, as when you move your head to signify **''no''**.







Vertebral Column

2. Intervertebral Discs

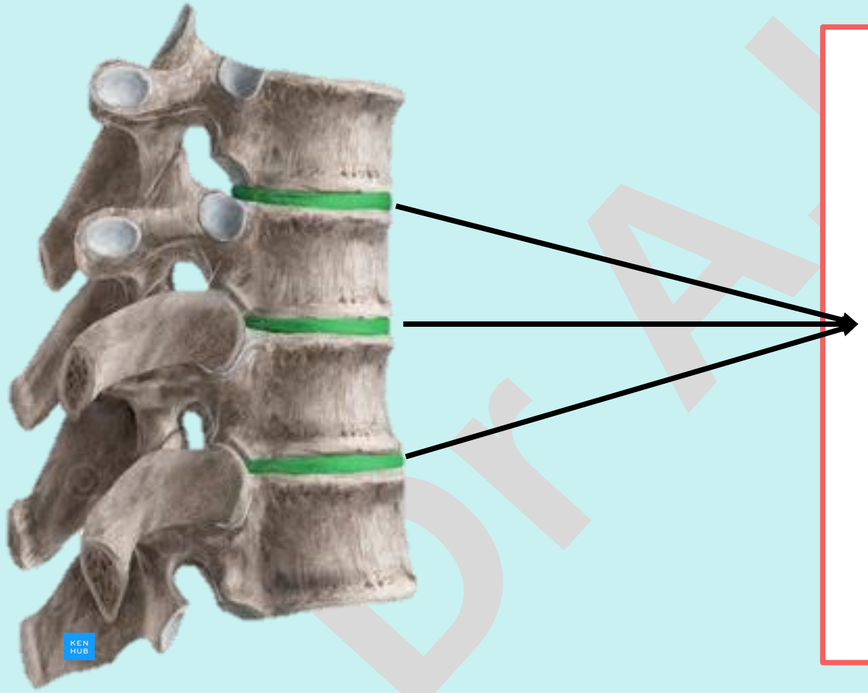
- The bodies of adjacent vertebrae are united by intervertebral discs.
- The disc consists of two parts:

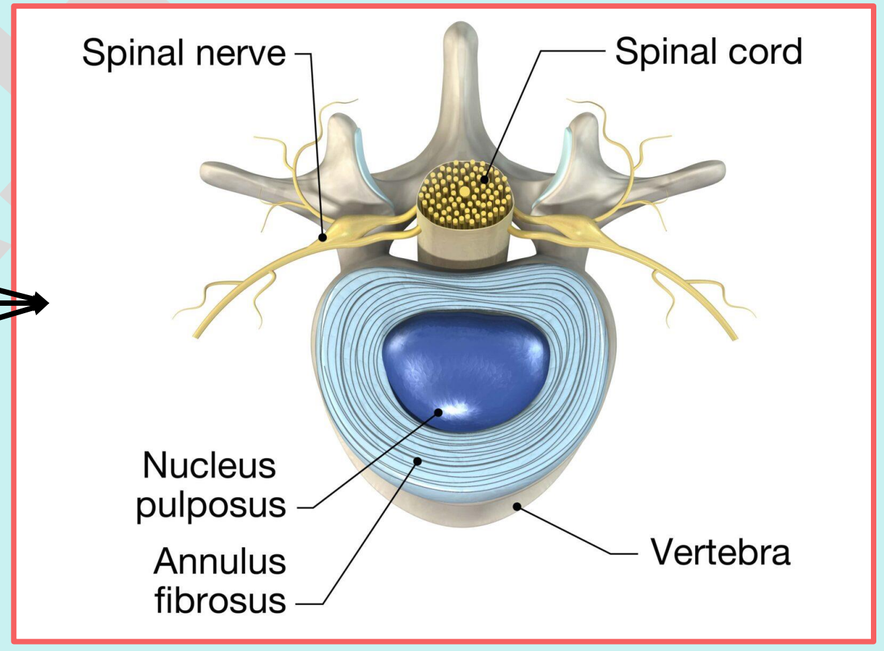
- **Annulus Fibrosus**

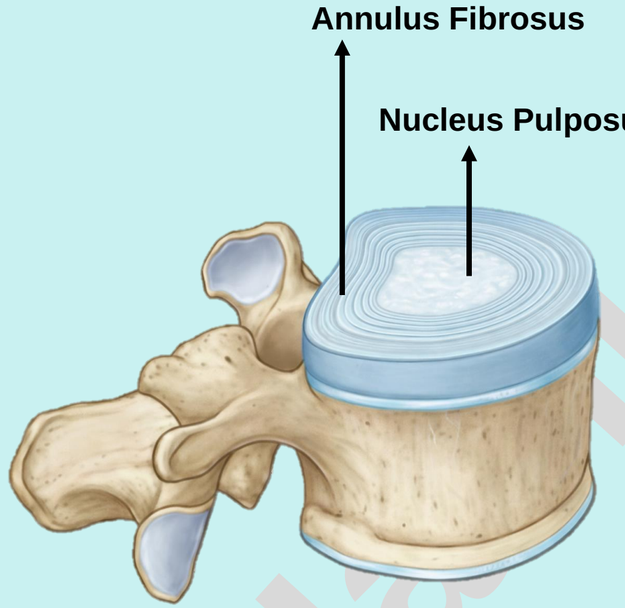
  Outer fibrocartilage ring that protects the central part.

- **Nucleus Pulposus**

  Inner gelatinous core (jelly-like material) acting as a cushion or shock absorber.





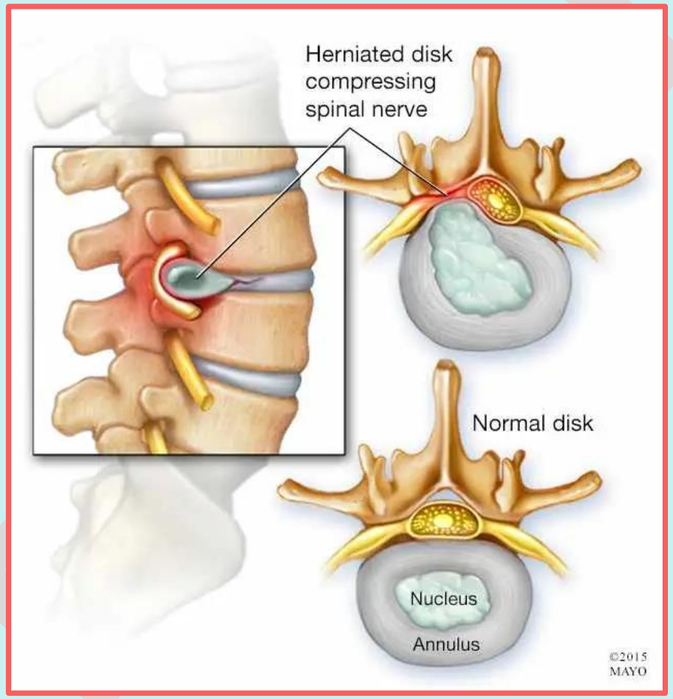


Gross lecture-3

Clinical Correlation

Herniated (Slipped) Disc

- Excessive pressure on the nucleus pulposus can rupture the annulus fibrosus, causing the nucleus to herniate posteriorly or into adjacent vertebrae.
- This movement exerts pressure on spinal nerves, causing acute pain and weakness.
- Most common in the lumbar region due to high weight-bearing and mobility.



2.1.2 Vertebral Column

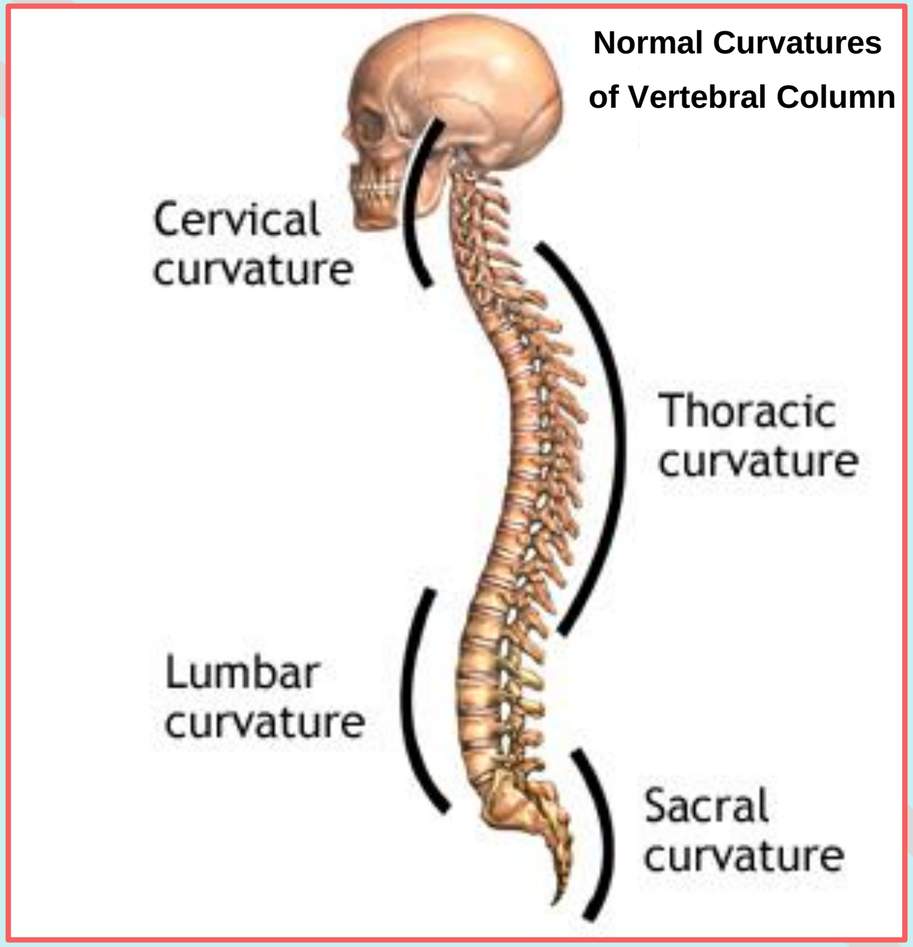
Gross lecture-3

➢ Curvatures of Vertebral Column

- When vertebral column viewed from the anterior or posterior, a normal adult vertebral column appears straight.
- When vertebral column viewed from the side, the adult vertebral column has four normal curvatures:

1. Cervical curvature -- (convex forward)
2. Thoracic curvature - (concave forward)
3. Lumbar curvature --- (convex forward)
4. Sacral curvature ----- (concave forward)

- The curves of the vertebral column increase its strength, help maintain balance in the upright position, absorb shocks during walking.

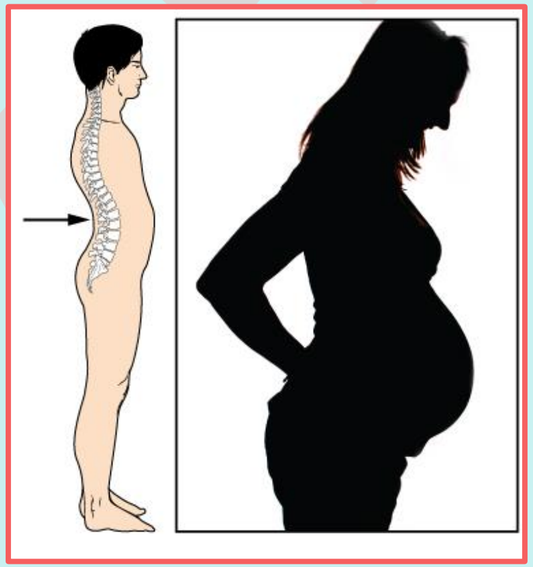


Clinical Correlation

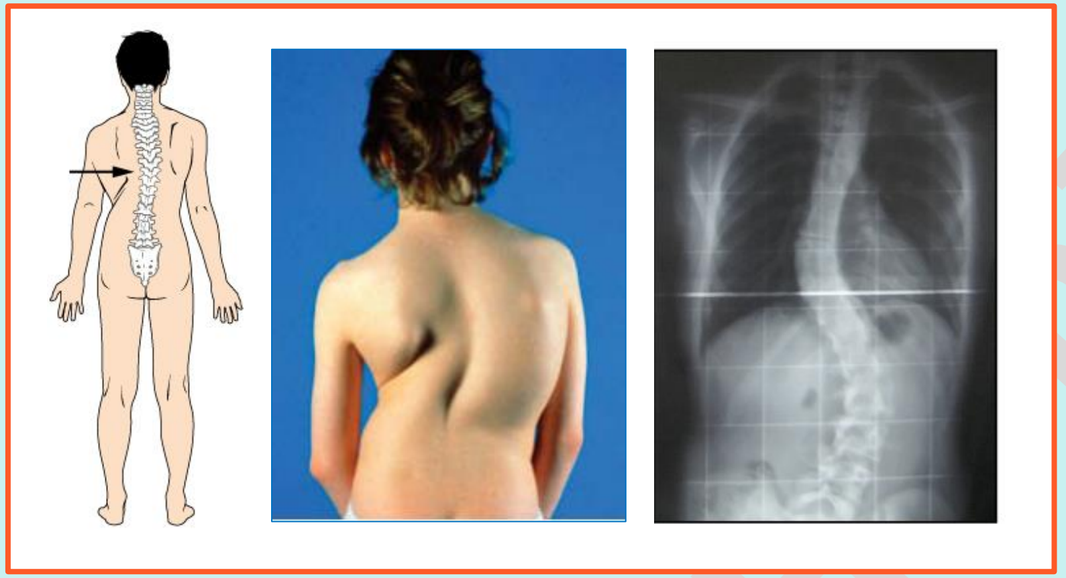
Abnormal Curvatures

1. Kyphosis: Increased thoracic curve; may occur with age due to osteoporosis or disc degeneration.
2. Lordosis: Increased lumbar curve; may result from pregnancy or obesity.
3. Scoliosis: Abnormal lateral curvature either to the right or to the left, often in the thoracic region; may be caused by poliomyelitis, leg length discrepancy, or hip disease.

Kyphosis



Lordosis



Scoliosis

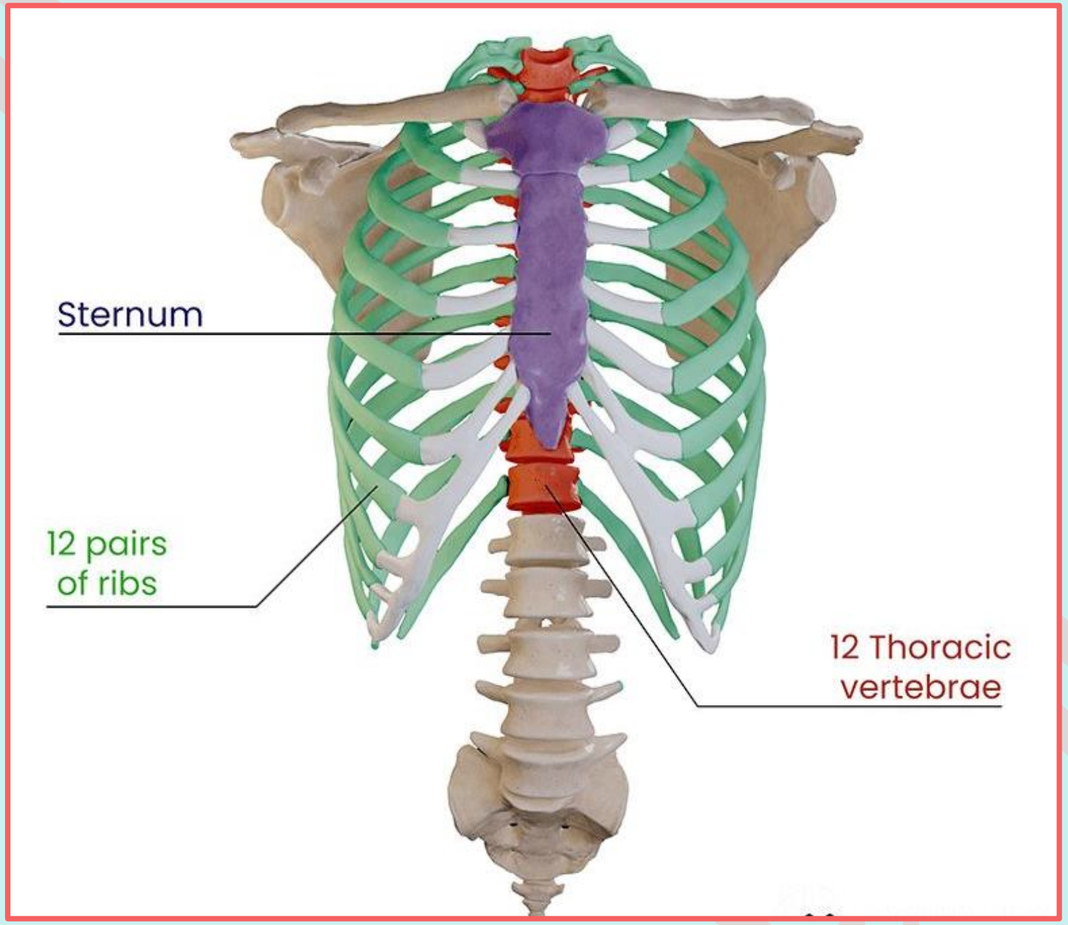
2.1.3

Thoracic Cage

Gross lecture-3

➢ The thoracic cage consists of:

1. Sternum (anteriorly).
2. 12 pairs of ribs & costal cartilages (laterally).
3. 12 thoracic vertebrae (posteriorly).



2.1.3

Thoracic Cage

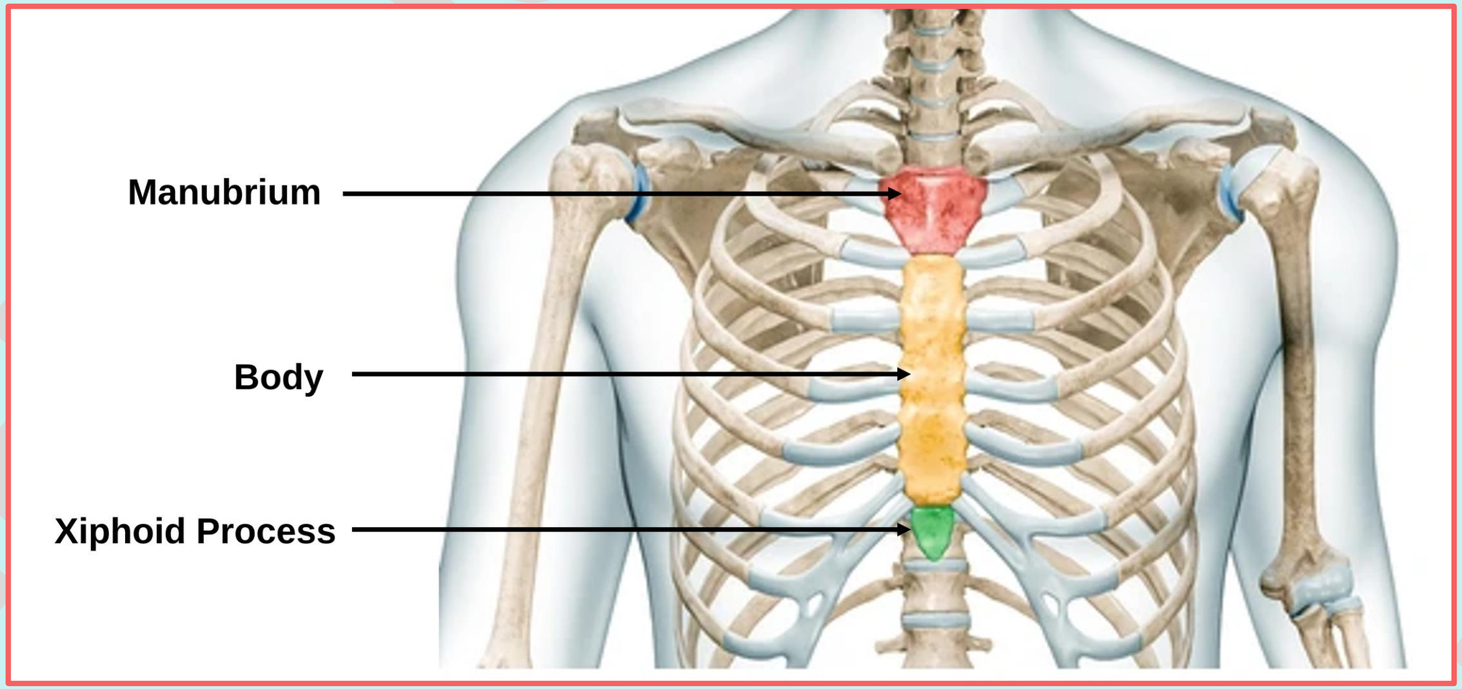
1. Sternum

Gross lecture-3

➢ Sternum

- **It is a flat bone located in the center, consists of the following three parts:**

1. **Manubrium.**
2. **Body.**
3. **Xiphoid Process.**



2.1.3

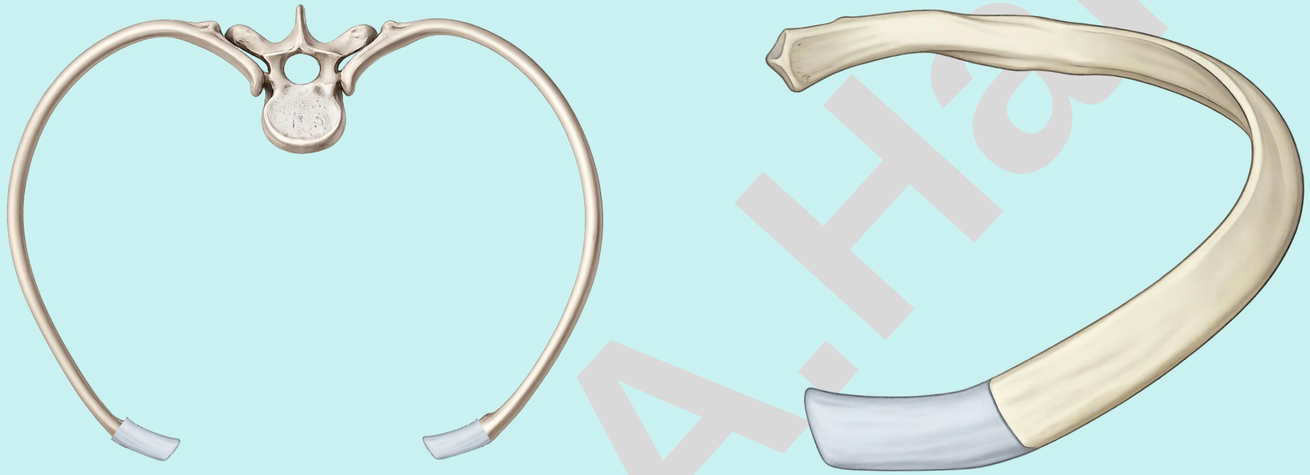
Thoracic Cage

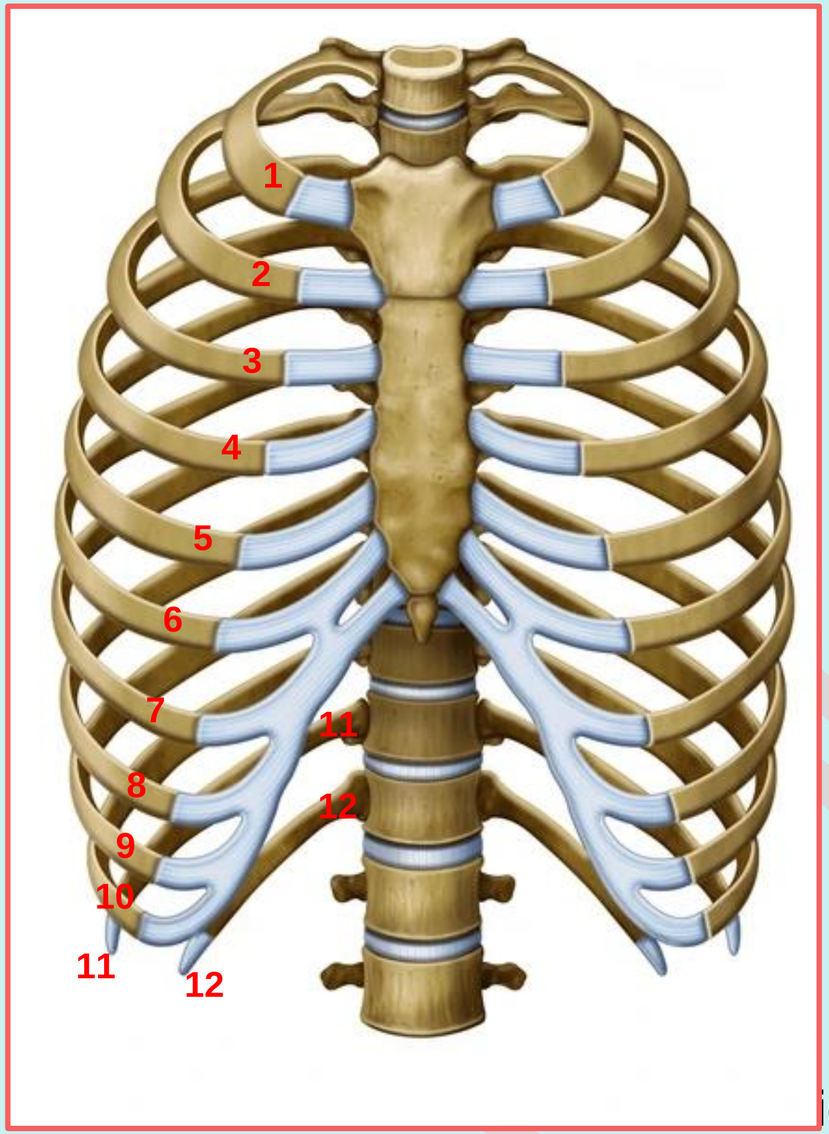
2. Ribs & Costal Cartilages

Gross lecture-3

➢ Ribs

- Elastic bony arches, there are 12 pairs of ribs.
- Extend from thoracic vertebrae posteriorly to the lateral borders of the sternum anteriorly.





➢ Costal Cartilages

- Each rib continues anteriorly as a costal cartilage, which mostly articulates directly or indirectly with the sternum.
- The costal cartilages contribute to the elasticity of the thoracic cage.

2.1.3

Thoracic Cage

2. Ribs & Costal Cartilages

Gross lecture-3

➢ There are three types of ribs based on their anterior articulation:

- **True Ribs (1st–7th ribs):**

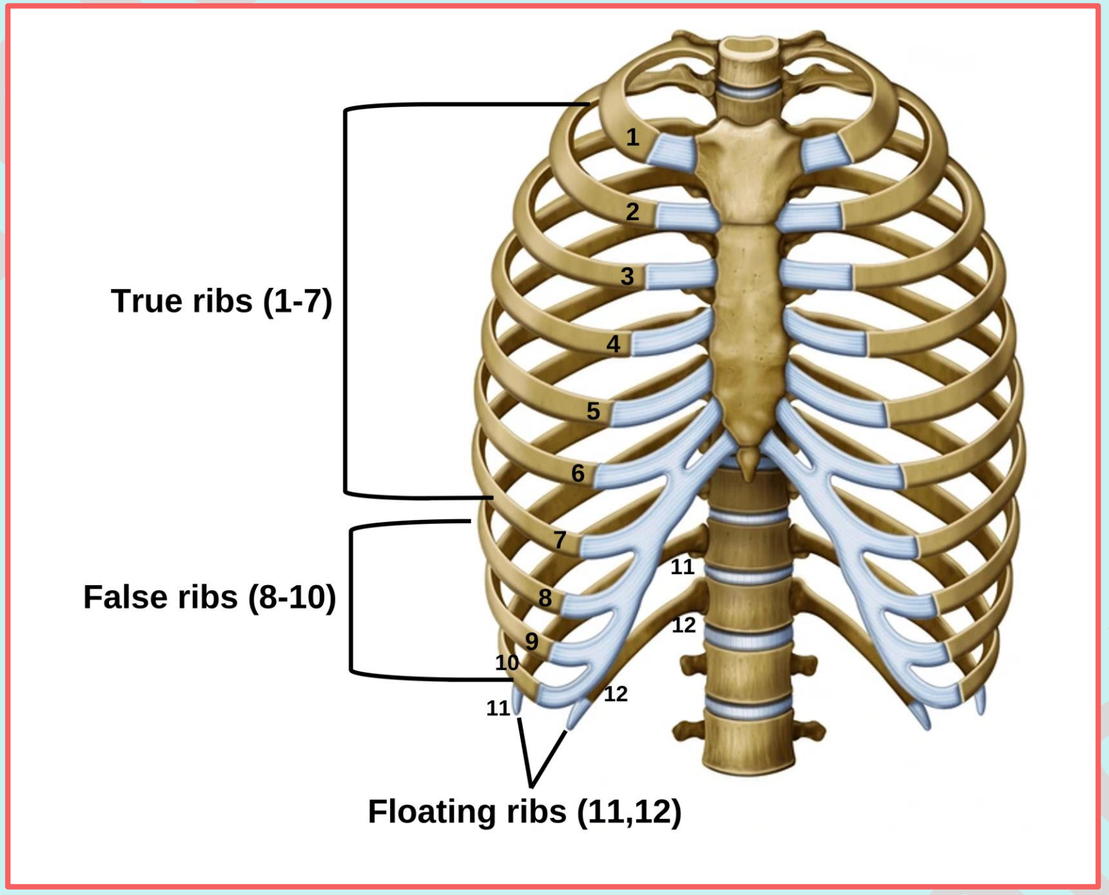
  They are attached directly to the sternum by their own costal cartilage.

- **False Ribs (8th -10th ribs):**

  They are attached indirectly to the sternum.
  Their costal cartilages join together and then connect to the cartilage of the 7th rib.

- **Floating Ribs (11th - 12th ribs):**

  They are smaller than the others and do not reach the front of the body.
  They do not articulate with the sternum, and the anterior ends of their costal cartilages are free.



➢ The posterior ends of all ribs articulate with the thoracic vertebrae.

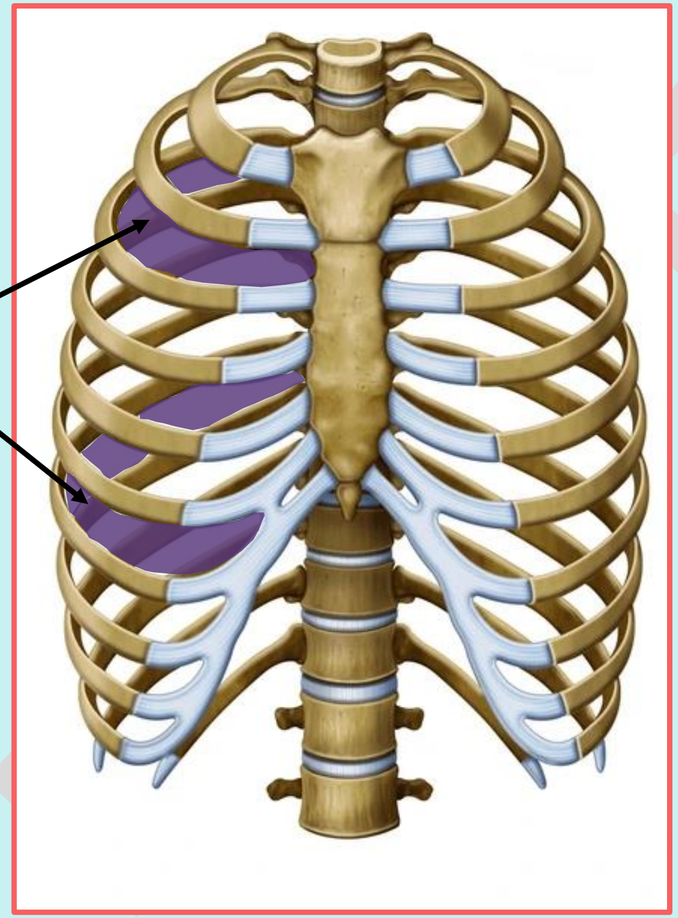
Thoracic Cage

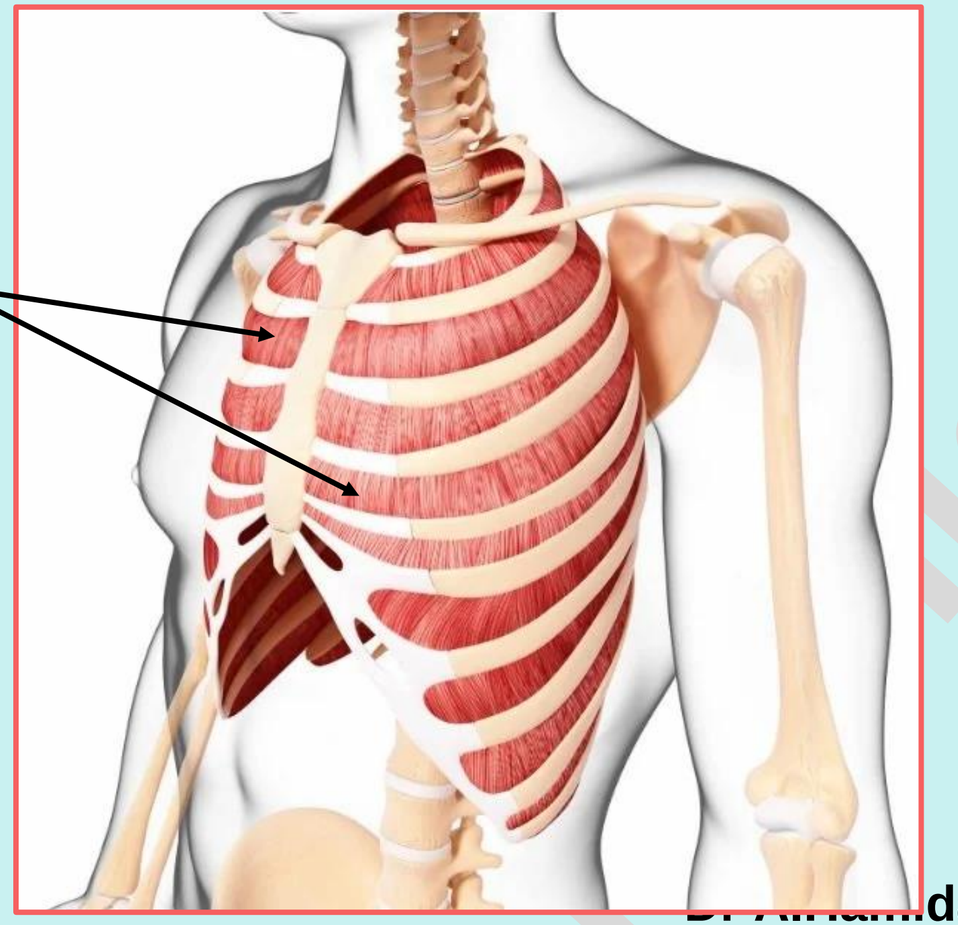
2. Ribs & Costal Cartilages

Gross lecture-3

➢ Intercostal Spaces:

- The gaps between the adjacent ribs are called **Intercostal Spaces**.
- Intercostal spaces filled by **Intercostal Muscles.**





2.1.3

Thoracic Cage

3. Thoracic vertebrae

Gross lecture-3

➢ Thoracic vertebrae

- **The 12 thoracic vertebrae, along with their intervertebral discs, form the posterior part of the thoracic cage.**