

Thoracolumbar Spine

By :

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OBJECTIVES

At the end of the lecture, students should be able to:

- *Distinguish the thoracic and lumbar vertebrae from each other and from vertebrae of the cervical region*
- *Describe the characteristic features of a thoracic and a lumbar vertebra.*
- *Describe the joints between the vertebral bodies and the vertebral arches.*
- *List and identify the ligaments of the intervertebral joints.*
- *Compare the movements occurring in thoracic and lumbar regions.*
- *Knew the normal & abnormal Curvatures of spine.*

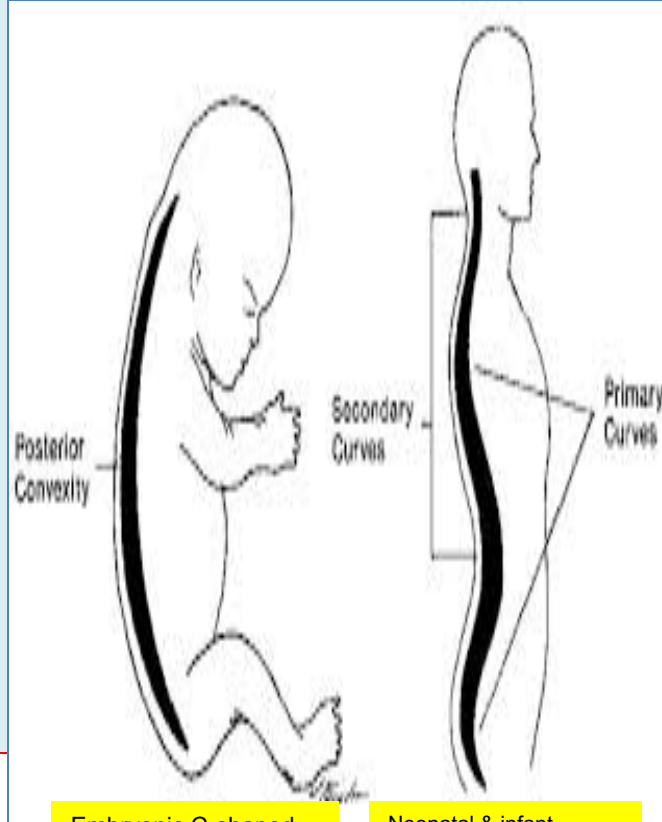
Normal curvatures of the human's vertebral column

➤ Note the curvatures in thoracic and lumbar spine.

➤ Curves of vertebral column can be divided into :

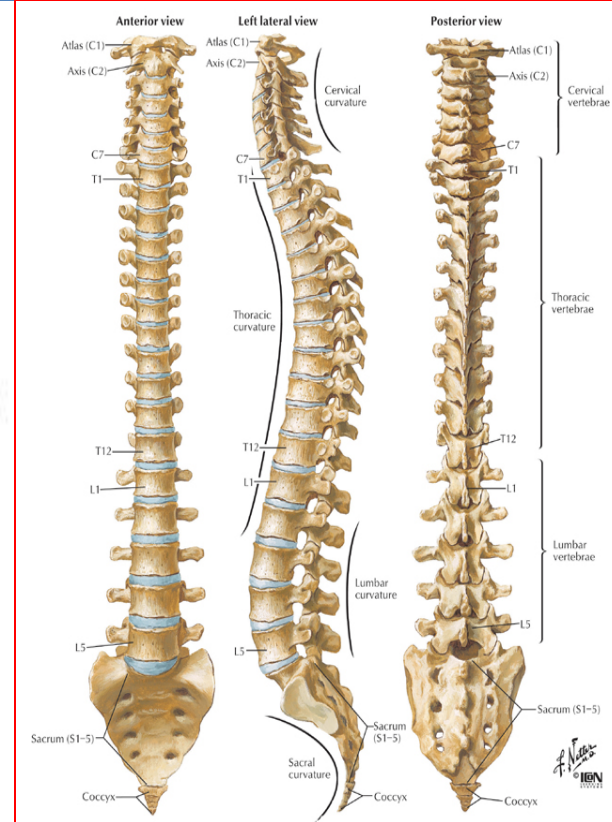
➤ Primary curves : Thoracic & pelvic.

➤ Secondary curves : Cervical & lumbar.



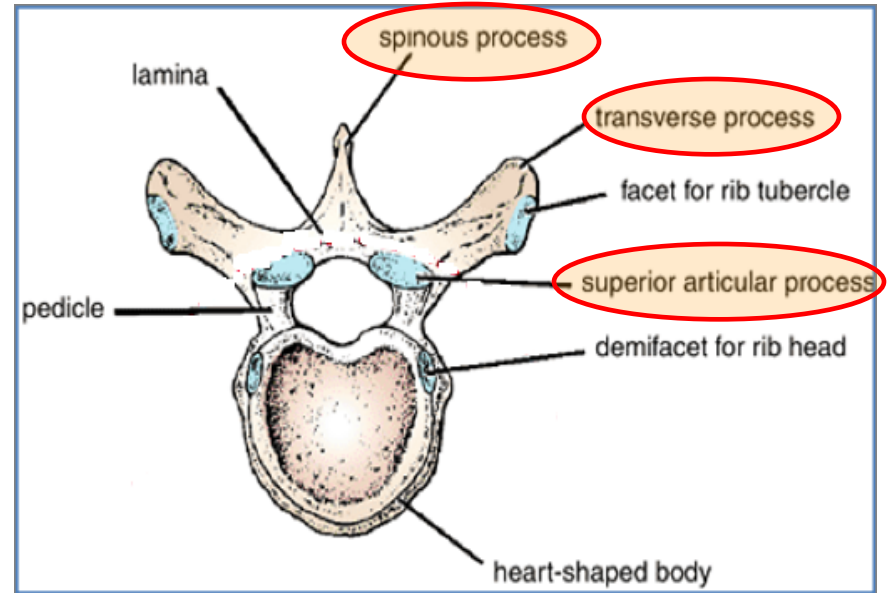
Embryonic C-shaped vertebral column.

Neonatal & infant starting development of 2nd curvature.



THORACIC VERTEBRAE

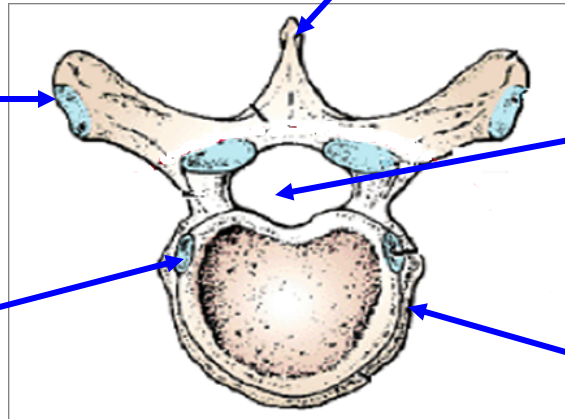
- Most thoracic vertebrae are typical,
- have bodies, vertebral arches, and 7 processes for muscular and articular connections.



CHARACTERISTICS OF TYPICAL THORACIC VERTEBRA

Costal facets are present on the **transverse processes** for articulation with the **tubercles** of the **ribs** (T11 and 12 have no facets on the transverse processes).

Costal facets are present on the **sides of the bodies** for articulation with the **heads** of the **ribs**.



The **spines** are **long** and **inclined downward**.

The **vertebral foramen** is **small** and **circular**

The **body** is **medium** size and **heart shaped**.

The **superior articular processes** bear **facets** that face **backward** and **laterally**, whereas the facets on the **inferior articular processes** face **forward** and **medially**. The **inferior articular processes** of the **12th vertebra** face **laterally**, as those of the **lumbar vertebrae**.

CHARACTERISTICS OF TYPICAL LUMBAR VERTEBRA

The **spinous processes** are short, flat, & quadrangular and project backward.

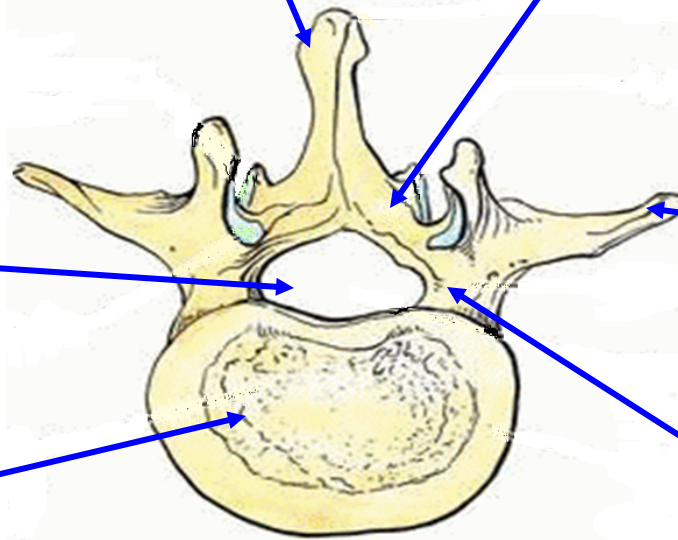
The **laminae** are thick.

The **vertebral foramina** are triangular.

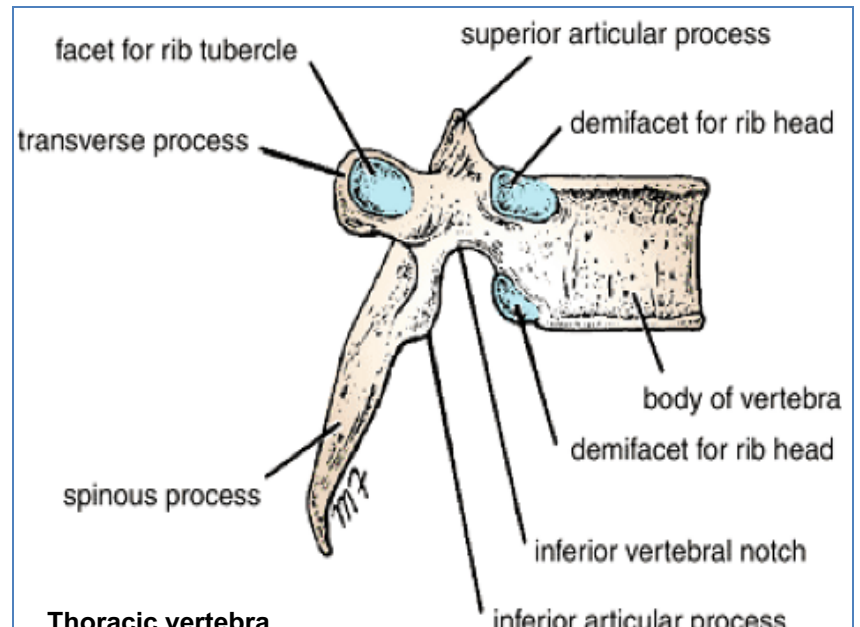
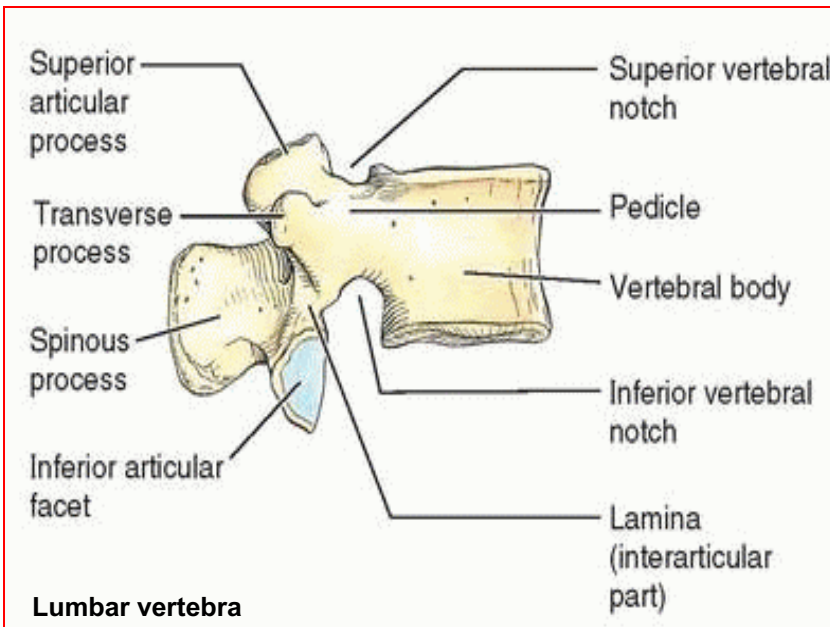
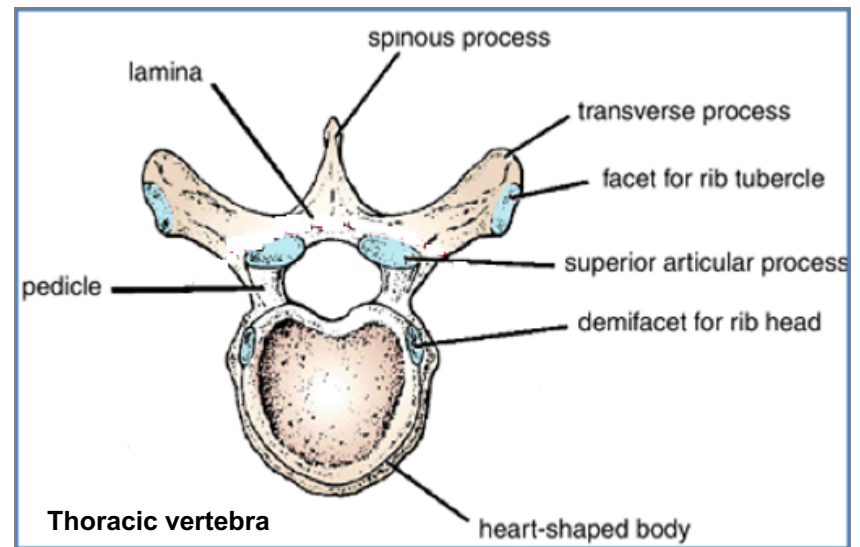
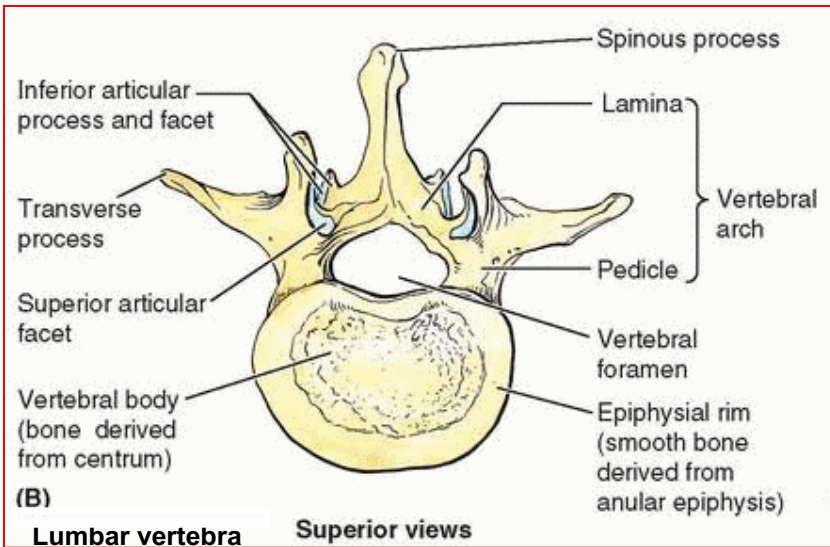
The **transverse processes** are long and slender.

The **body** is large and kidney shaped.

The **pedicles** are strong and directed backward.

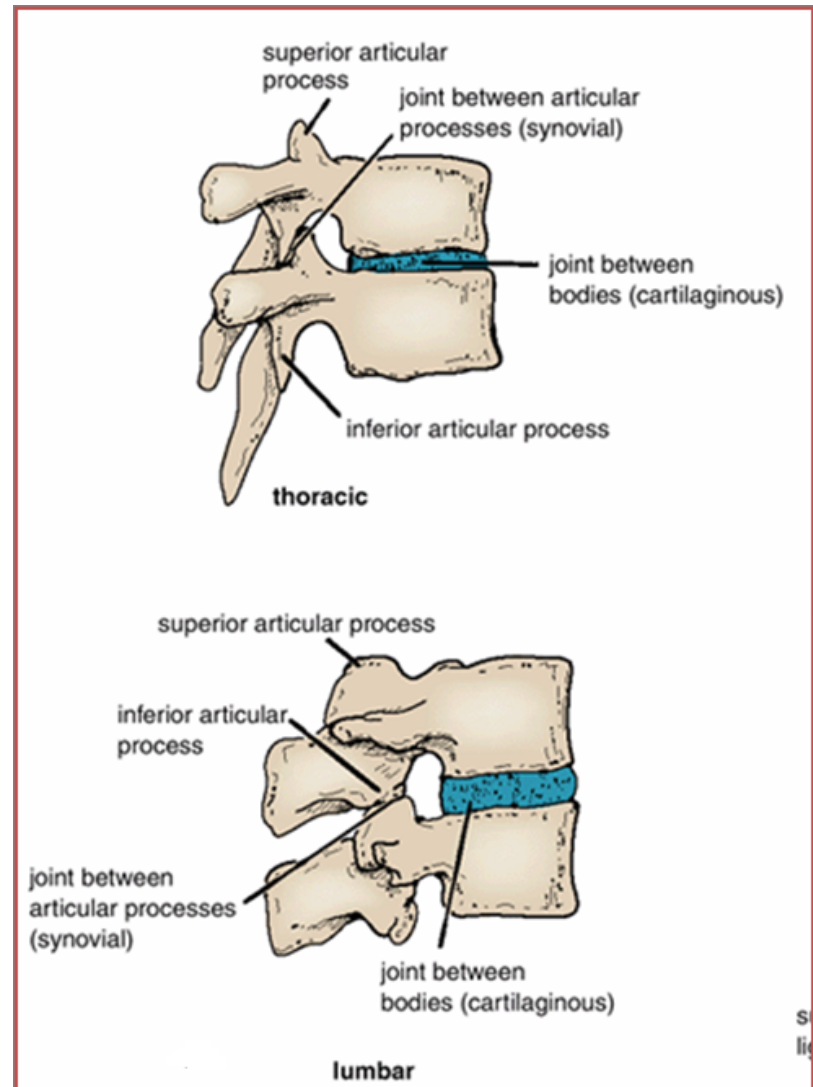


The articular surfaces of the **superior articular processes** face **medially**, and those of the **inferior articular processes** face **laterally**.



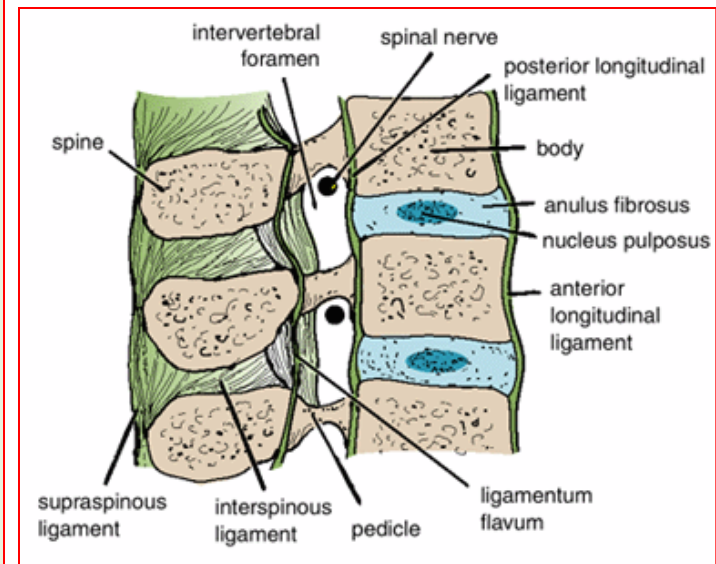
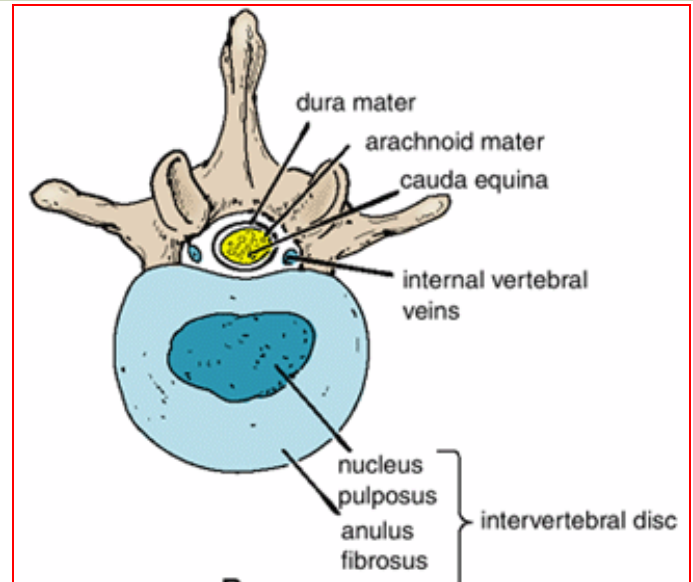
JOINTS BETWEEN TWO VERTEBRAL BODIES

- It is a **cartilagenous** joint.
- The **upper** and **lower** surfaces of the **bodies** of adjacent vertebrae are covered by **thin plates** of **hyaline cartilage**.
- Sandwiched between the plates of hyaline cartilage is an **intervertebral disc of fibrocartilage**
- The **collagen fibers** of the disc strongly unite the bodies of the two vertebrae.



INTERVERTEBRAL DISCS

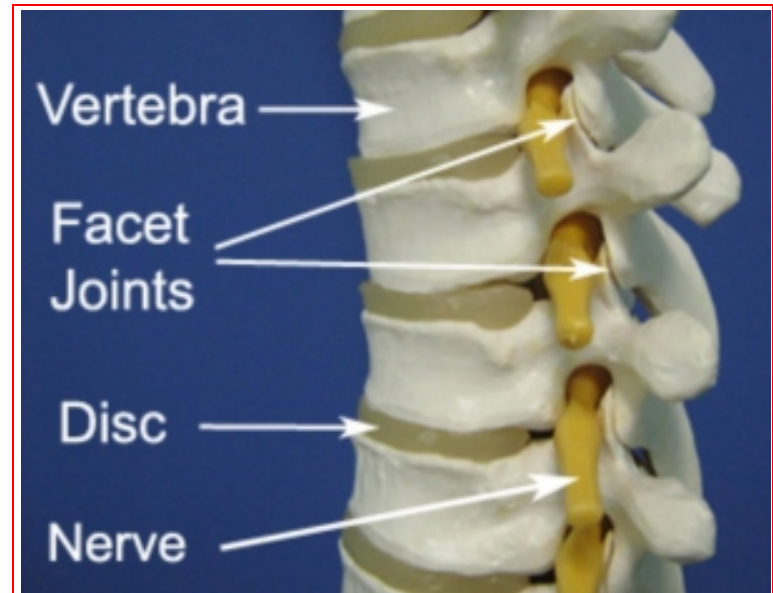
- The intervertebral discs are responsible for **one fourth of the length of the vertebral column**
- They are **thickest** in the **cervical** and **lumbar** regions, where the **movements** of the vertebral column are **greatest**.
- **Each disc consists of a:**
 - **Peripheral part**, the **anulus fibrosus**, composed of fibrocartilage,
 - **Central part**, the **nucleus pulposus**, a mass of **gelatinous material** containing a **large amount of water**, a small number of **collagen fibers**, and a few **cartilage cells**.
- **No discs** are found between **the first & second cervical vertebrae** or in the **sacrum** or **coccyx**.



FUNCTION OF THE INTERVERTEBRAL DISCS

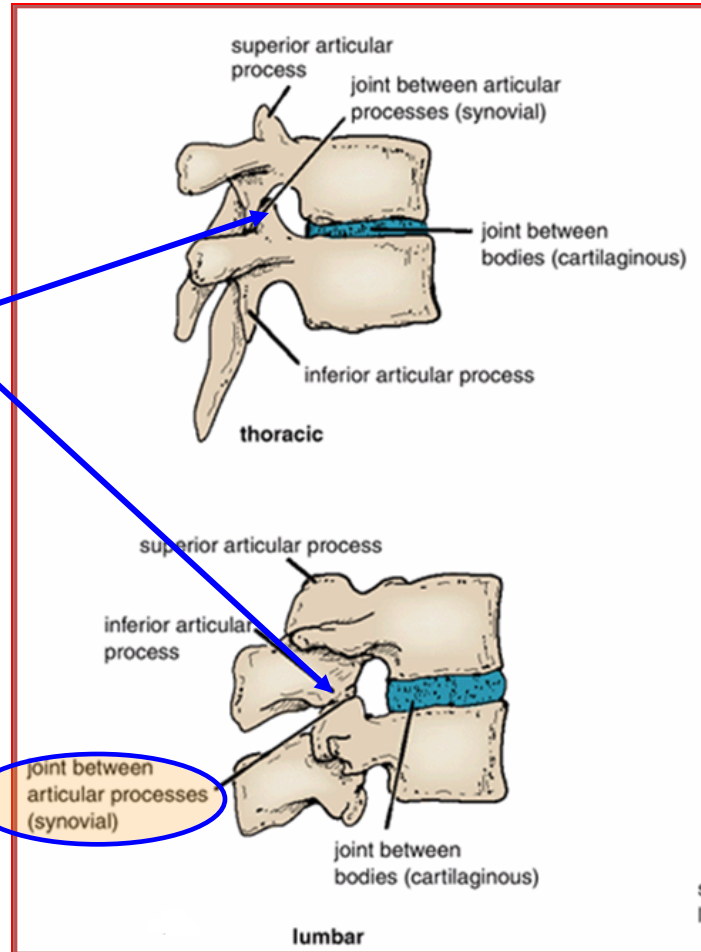
- **Allow** one vertebra to rock forward or backward on another, as in **flexion and extension of the vertebral column**.
- **Serve as shock absorbers** when the load on the vertebral column is suddenly increased, as **when one is jumping from a height**.

- Sometimes, the **annulus fibrosus ruptures**, **allowing the nucleus pulposus to herniate and protrude into the vertebral canal**, where it may press on the spinal nerve roots, the spinal nerve, or even the spinal cord.



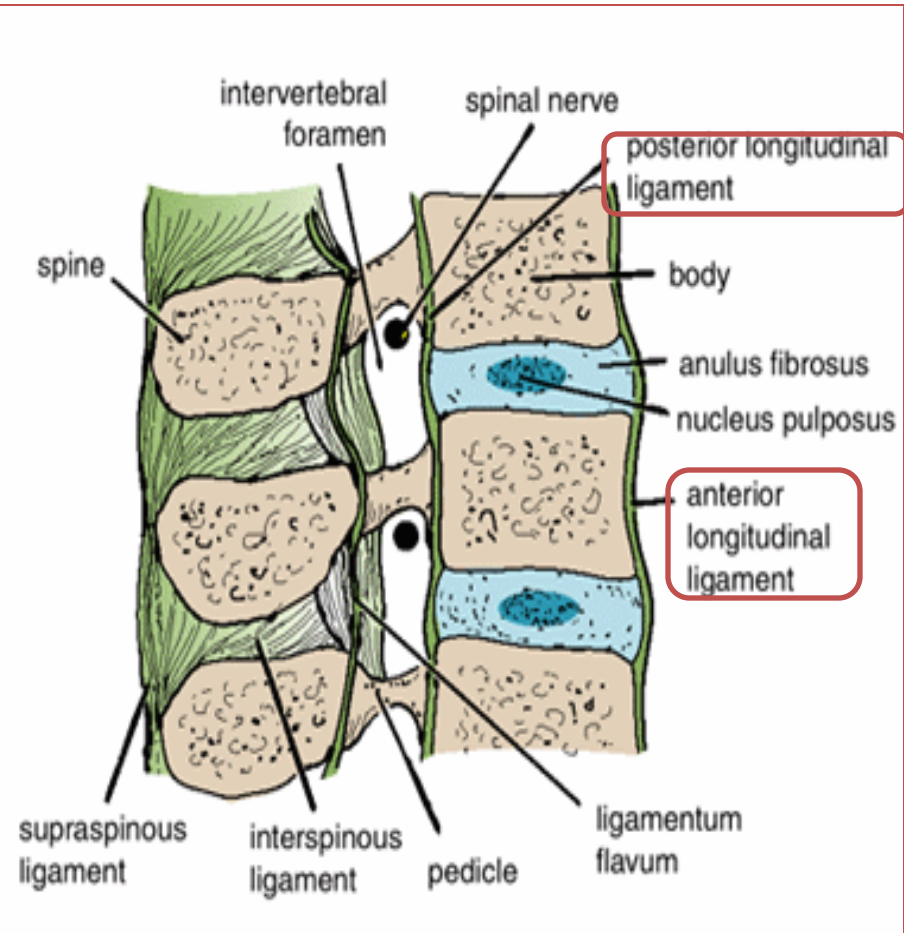
JOINTS BETWEEN TWO VERTEBRAL ARCHES

- Consist of **synovial joints** between the **superior** and **inferior articular processes** of adjacent vertebrae.



LIGAMENTS

- The **anterior and posterior longitudinal ligaments** run as continuous bands down the **anterior and posterior surfaces** of the vertebral column **from the skull to the sacrum**
- The **anterior longitudinal ligament** is **wide** and is **strongly** attached to the front and sides of the vertebral bodies and to the intervertebral discs.
- The **posterior longitudinal ligament** is **weak** and **narrow** and is attached to the posterior borders of the discs.



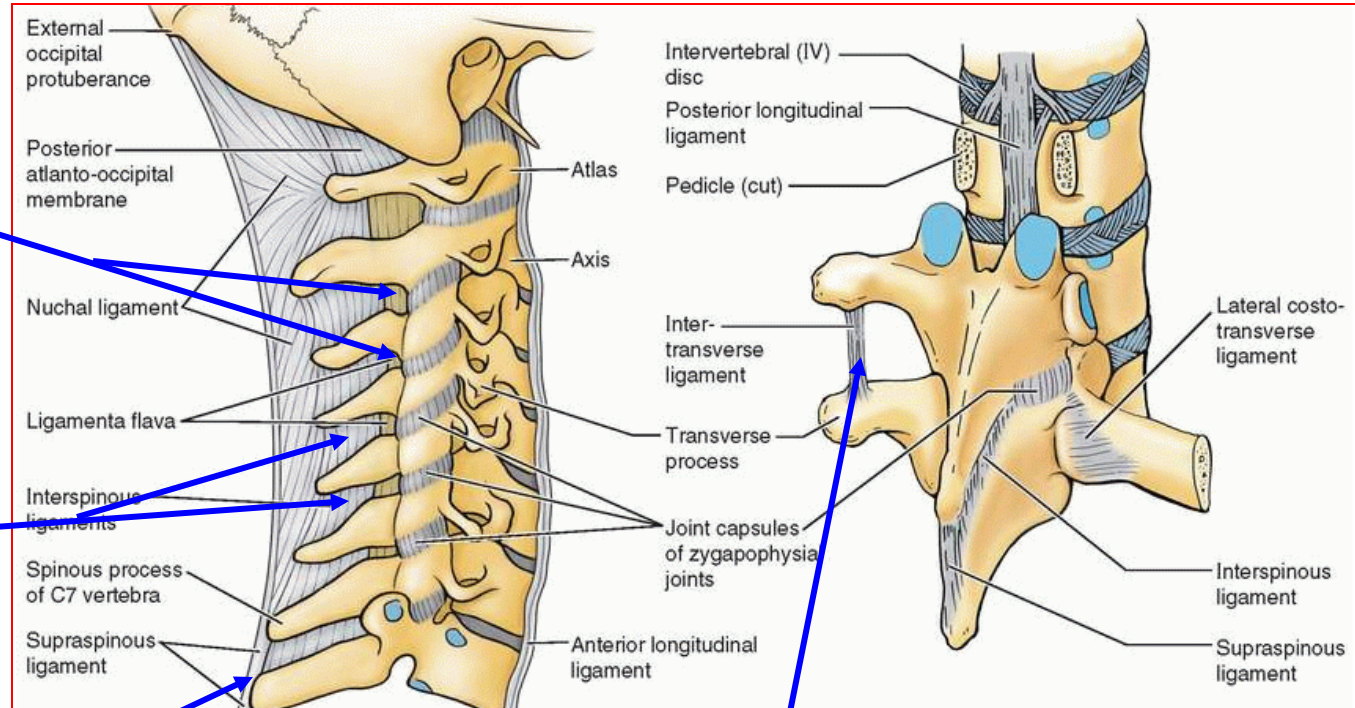
These ligaments **hold the vertebrae firmly together** but at the same time permit a **small amount of movement** to take place between them.

LIGAMENTS

Ligamentum flavum: connects the laminae of adjacent vertebrae

Interspinous ligament: connects adjacent spines

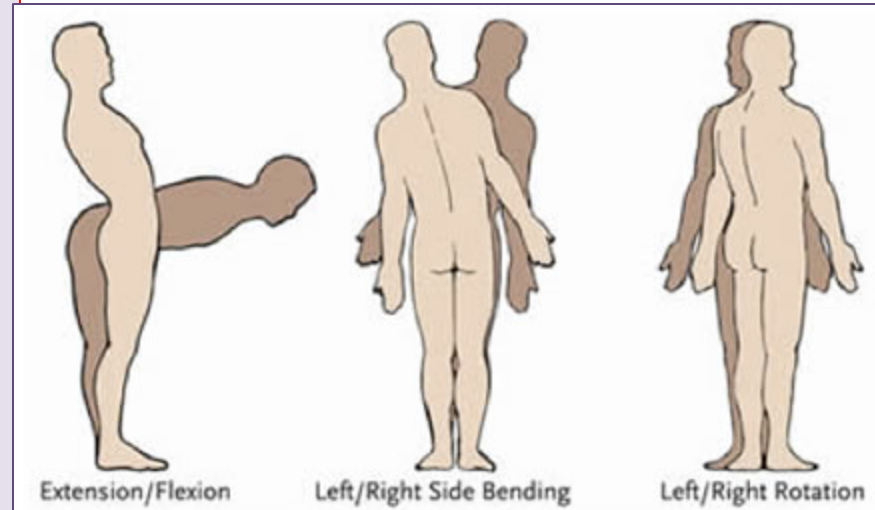
Supraspinous ligament: runs between the tips of adjacent spines



Intertransverse ligaments: run between adjacent transverse processes

MOVEMENTS OF THE THORACOLUMBAR SPINE

- The following movements are possible on the spine: **flexion, extension, lateral flexion, rotation, and circumduction.**
- **The type and range of movements** possible in each region of the **vertebral column** largely **depend on** the:
 - **Thickness of the intervertebral discs**
 - **Shape and direction of the articular processes.**
- In the **thoracic region**, the **ribs, the costal cartilages, and the sternum** severely **restrict** the range of movement.
- **Flexion, extension and lateral flexion** are **extensive** in the **lumbar regions** **but restricted** in the **thoracic region**.
- **Rotation** is **least extensive** in the **lumbar region**.



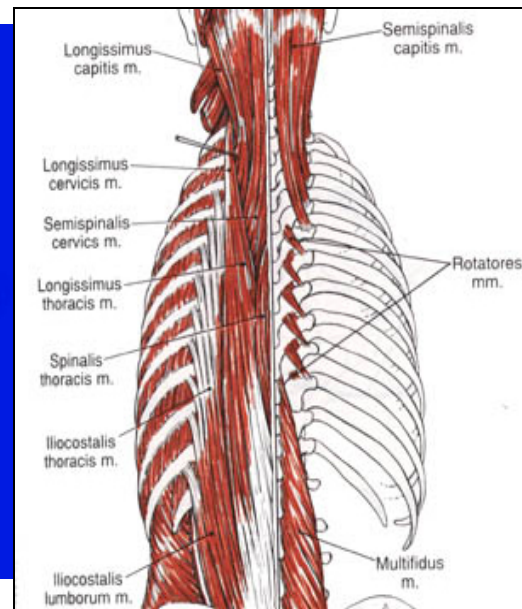
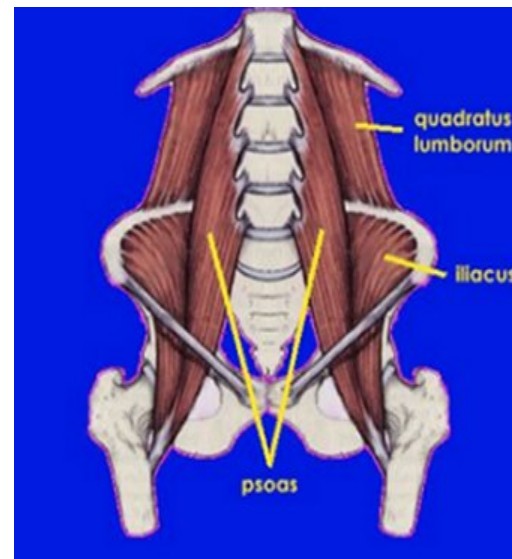
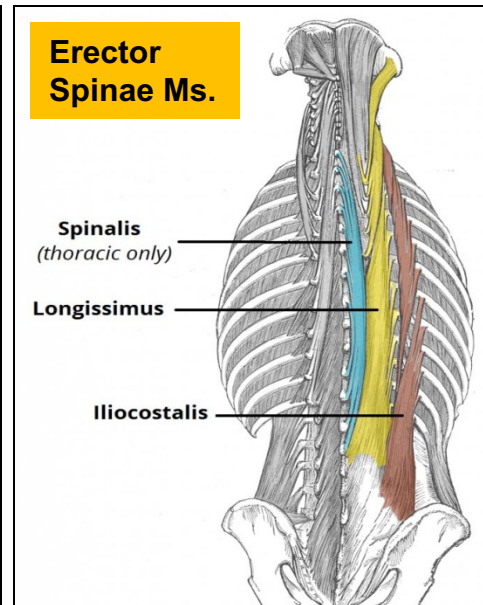
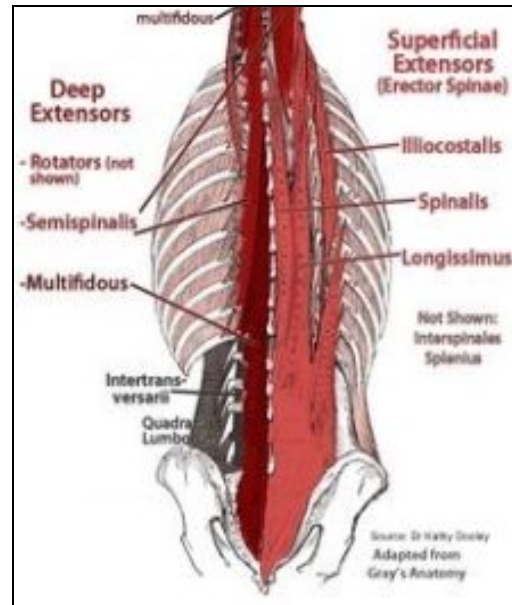
These movements are **extensive** in lumbar spine **But restricted** in thoracic spine.

This movement is **extensive** in thoracic spine **But least extensive** in Lumbar spine.

MUSCLES PRODUCING MOVEMENTS

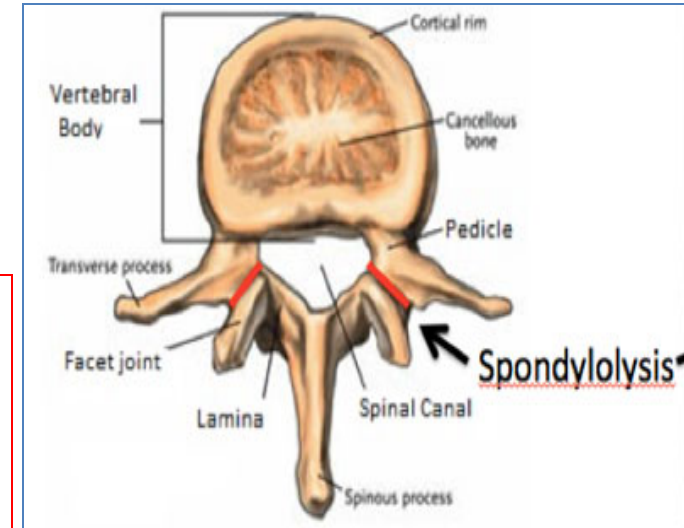
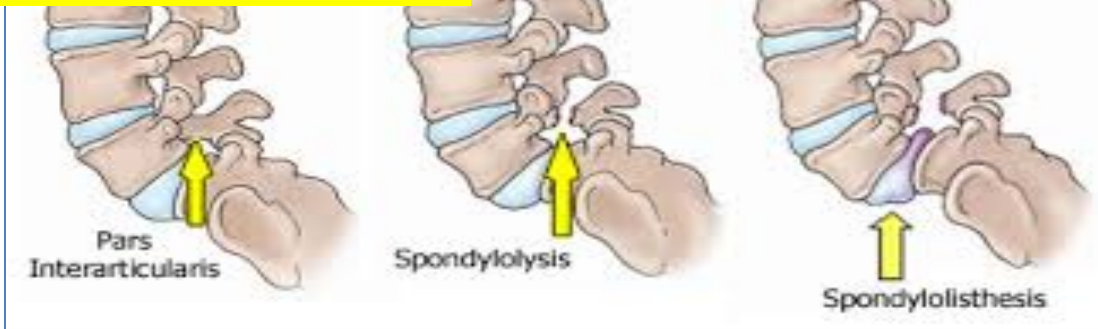
- In the **thoracic region**, **rotation** is produced by the **semispinalis** and **rotator muscles**, assisted by the **oblique muscles** of the **anterolateral abdominal wall**.

- In the **lumbar region**:
- Flexion** is produced by the **rectus abdominis** and the **psaos muscles**.
- Extension** is produced by the **postvertebral muscles**
- Lateral . flexion** is produced by the **postvertebral muscles**, the **quadratus lumborum**, and the **oblique muscles** of the **anterolateral abdominal wall**. The **psaos may** also play a part in this movement.
- Rotation** is produced by the **rotator muscles** and the **oblique muscles** of the **anterolateral abdominal wall**.

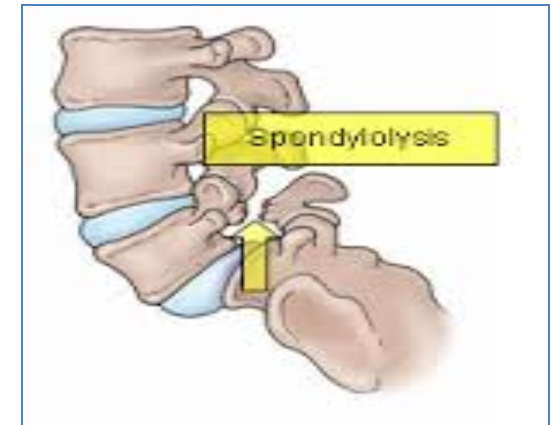


CLINICAL NOTES

Vertebra L5



- Is the **largest** of all movable vertebrae.
- Is distinguished by its **massive body** and **thick transverse processes**
- It carries the **weight** of the whole upper body.
- The **L5 body** is largely **responsible** for the **lumbosacral angle** between the long axis of the **lumbar vertebral column** and that of the **sacrum**
- **Body weight** is **transmitted** from **L5 vertebra** to the base of the **sacrum**, formed by the superior surface of S1 vertebra
- The **fifth lumbar vertebra** is by far the most **common site** of **spondylolysis** (defect in the pars interarticularis of the vertebral arch) and also **Spondylolisthesis** (the forward displacement of a vertebra).



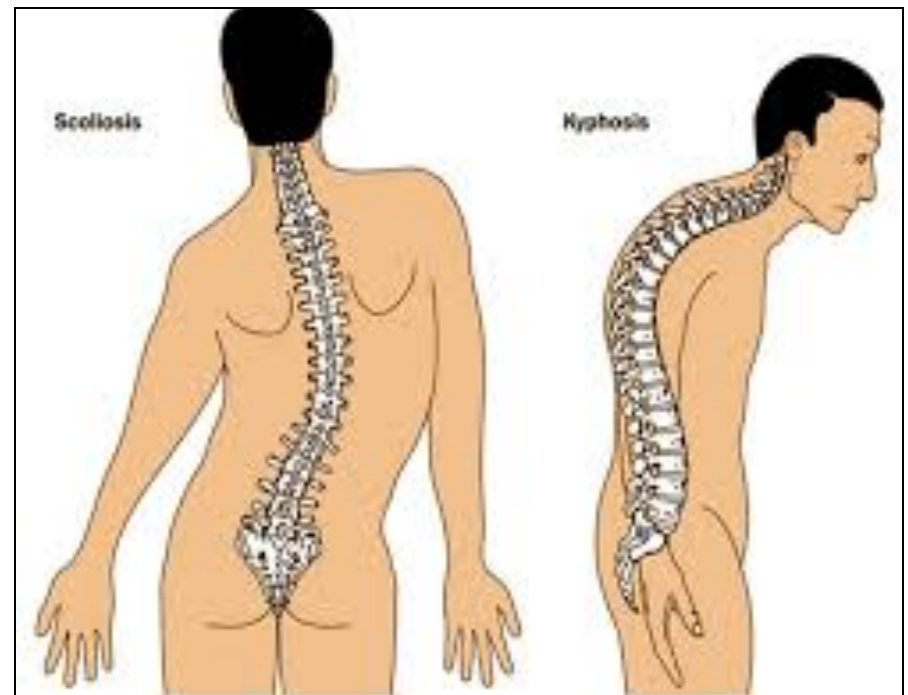
Normal Curvatures in Spine

- Primary (Thoracic & Pelvic)
- Secondary (Cervical & Lumbar)



Abnormal Curvatures of spine :

- Exaggerated **Thoracic** curvatures (**Kyphosis**)
- Exaggerated **lumbar** curvature (**Lordosis**)
- **Lateral curvature of spine.** (**Scoliosis**)



Thank You

Question 1

1. Which one of the following contributes in lordosis of the spine ?


a. Exaggerated cervical curvature.

b. Exaggerated thoracic curvature.

c. Exaggerated lumbar curvature. 

d. Lateral curvature.

Question 2

2. Which one of the following ligaments connects the laminae of adjacent vertebrae ?
- a. Supraspinous.
 - b. Interspinous.
 - c. Intertransverse.
 - d. Ligamentum flavum. 

Question 3

3. Which one of the following muscles specifically contributes in lateral flexion of lumbar spine ?

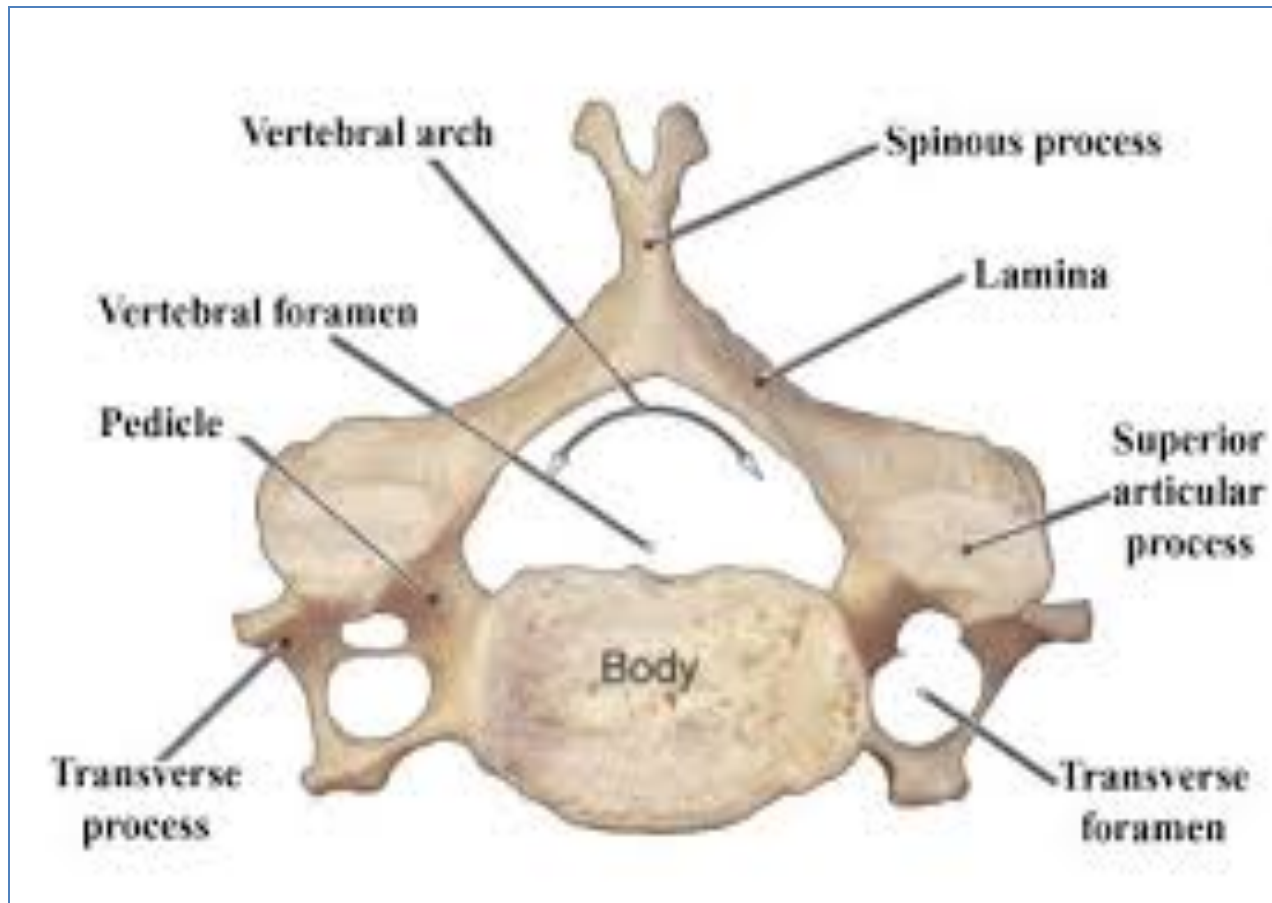
a. Semispinalis.

b. Quadratus lumborum. 

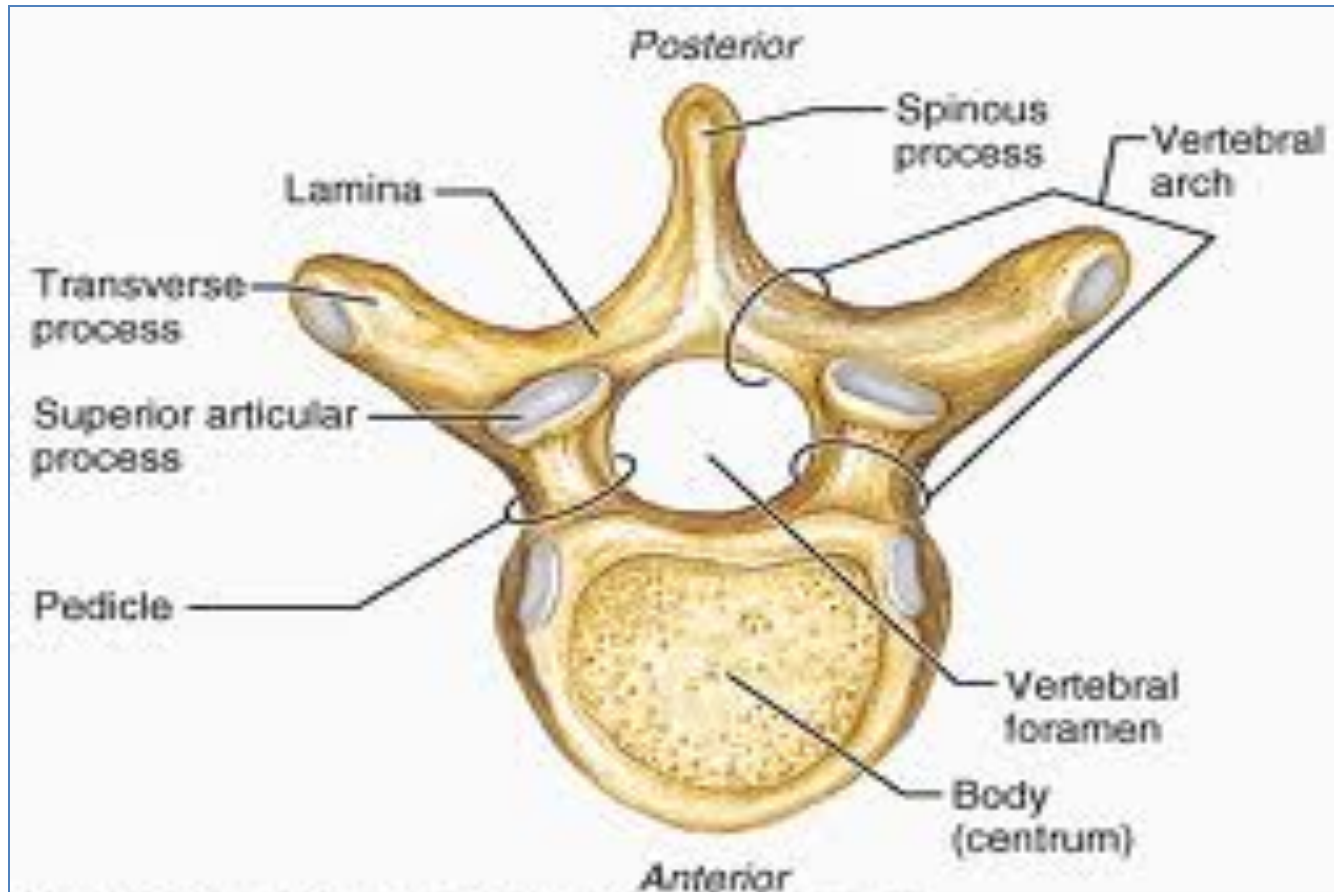
c. Psoas major.

d. Rectus abdominis.

Cervical



Thoracic



Lumbar

