The University Of Jordan
Faculty Of Medicine

The Vertebral Column

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Vertebral Column

It is composed of 33 vertebrae;

7 cervical,

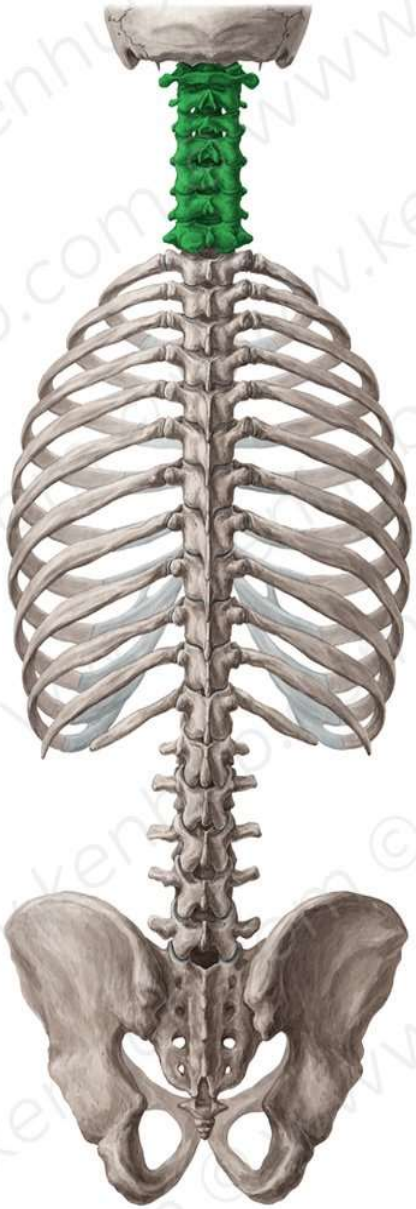
12 thoracic,

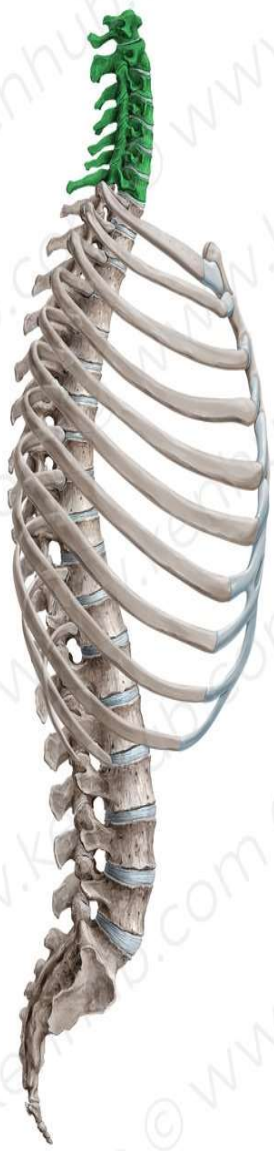
5 lumbar,

5 sacral,

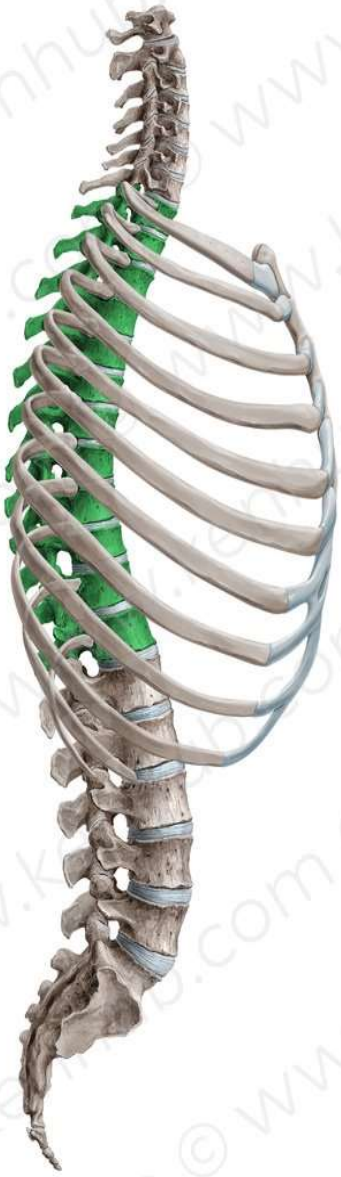
4 coccygeal separated from each other by intervertebral discs.

Cervical Region





Thoracic Region



Lumbar Region

Sacral Region

Structure of a Typical Vertebrae

1- Vertebral Body

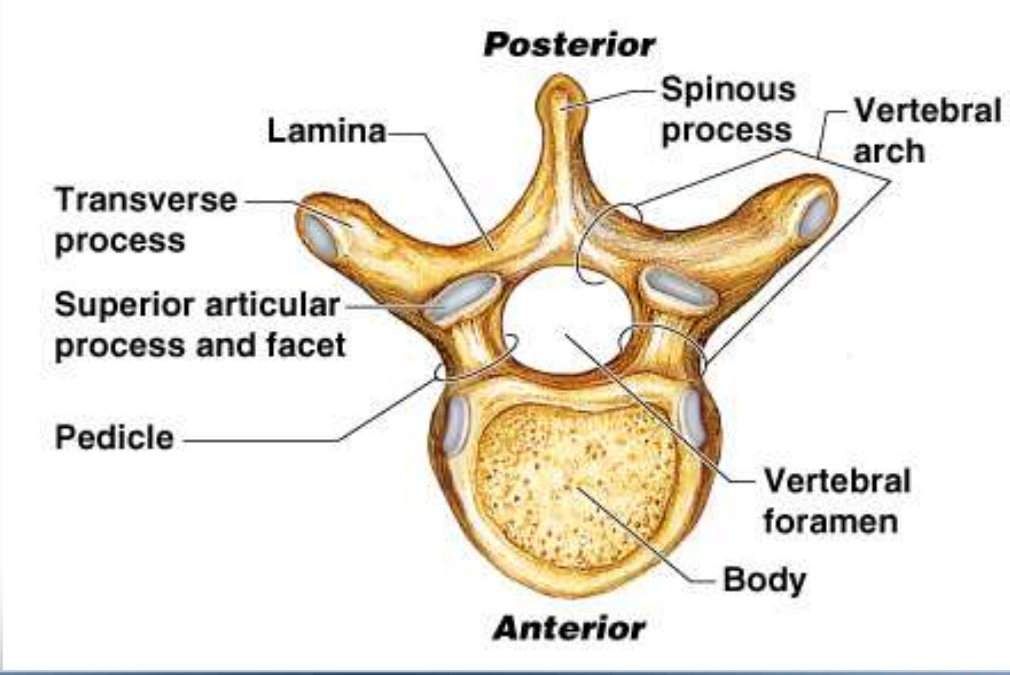
2-Vertebral arch ; composed of two pedicle and two lamina

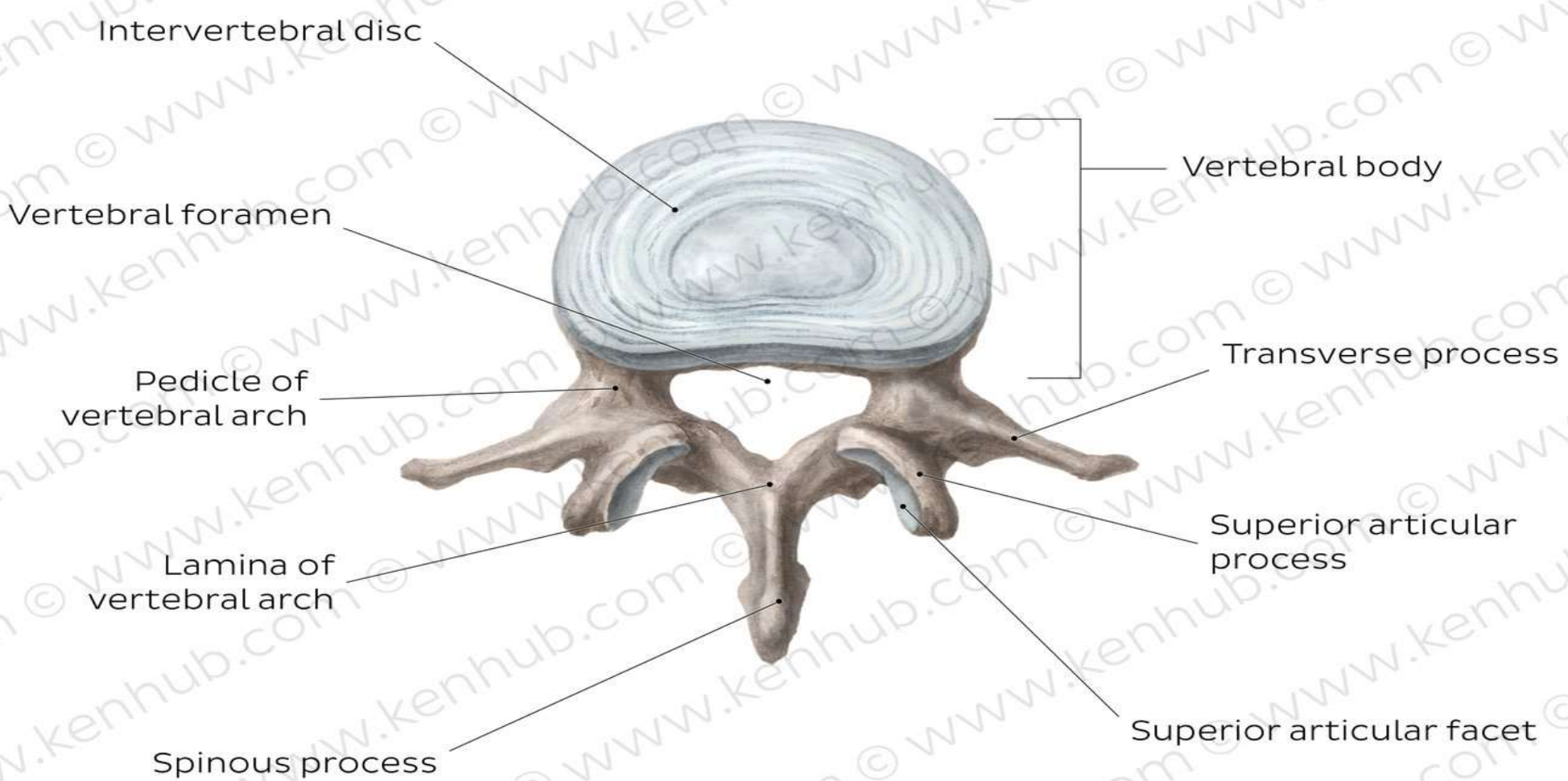
3-Vertebral Foramen between Body and arch transmits spinal cord

4- Intervertebral foramens transmit the spinal nerves

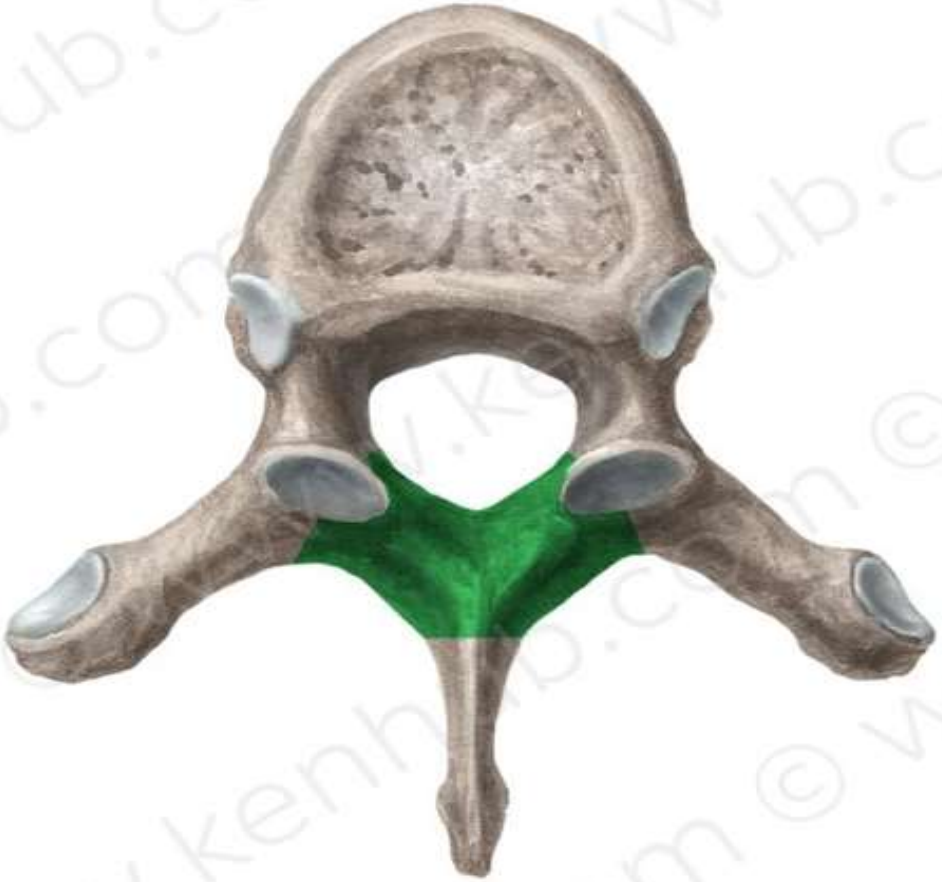
5- Processes it has seven processes

- 2 Transverse
- 2 Superior articular
- 2 Inferior articular
- 1 Spine

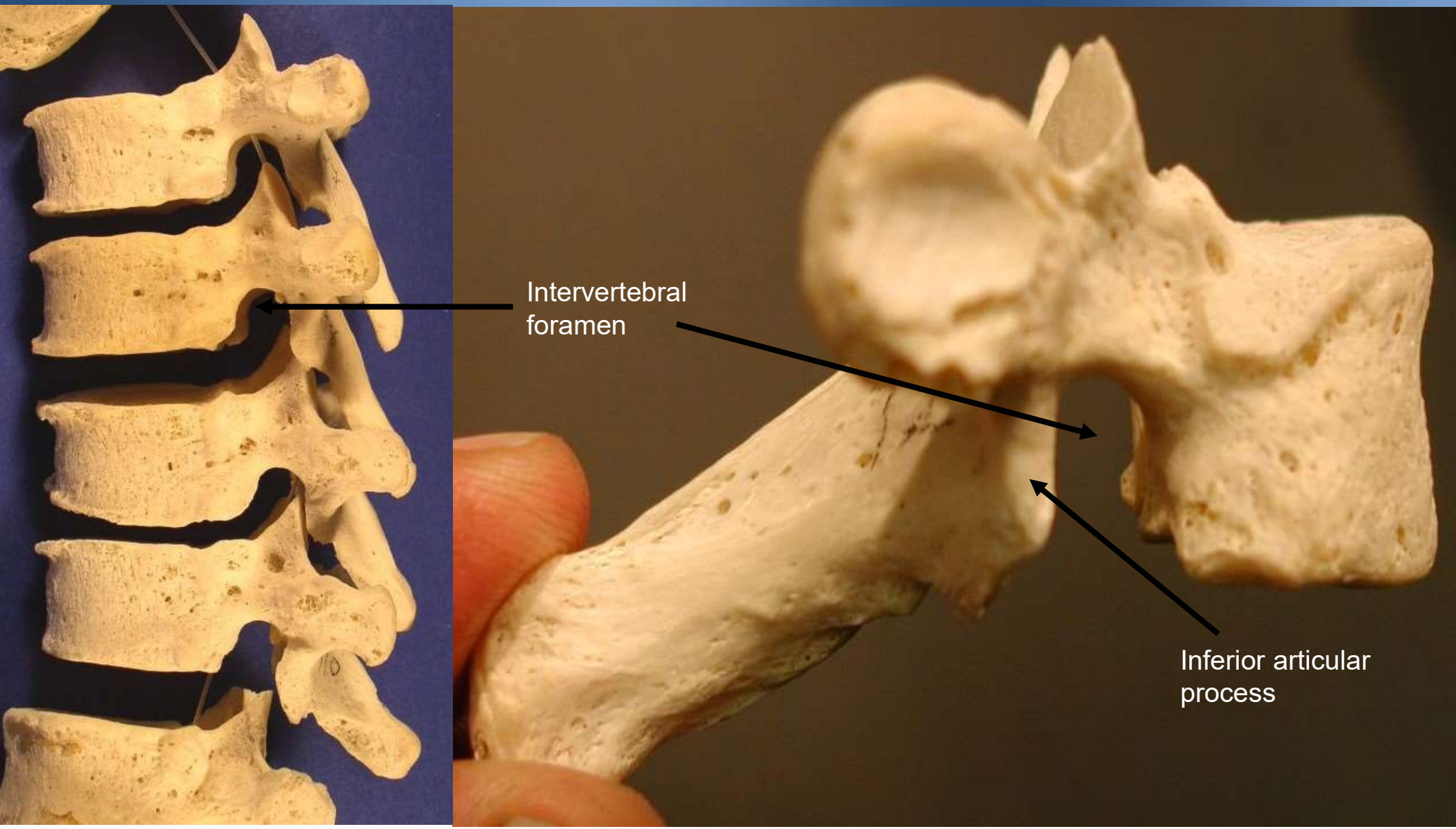


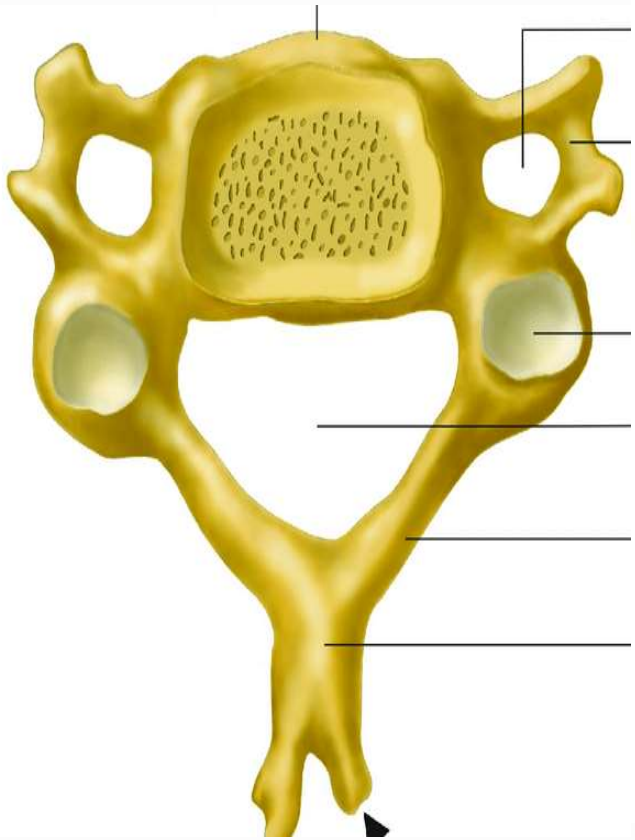


Pedicle



Lamina





Cervical

Thoracic

Lumbar

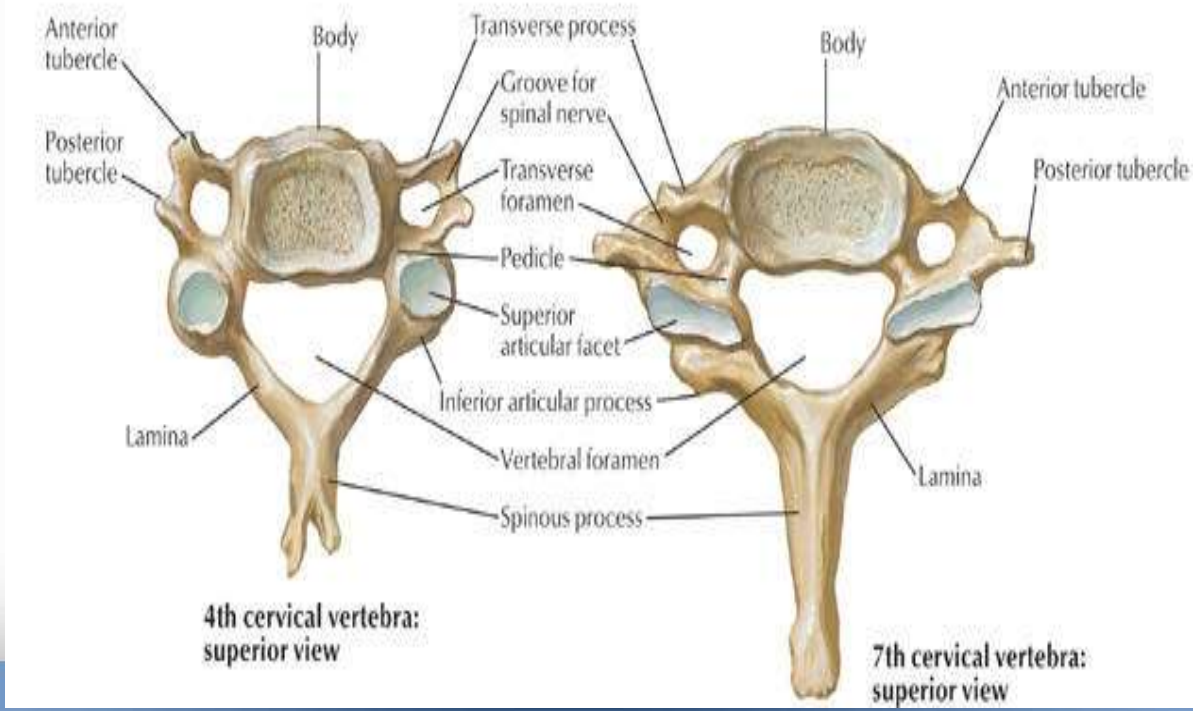
TYPICAL CERVICAL VERTEBRA

- The body is small & oval.
- The foramen is large triangular.
- The transverse processes are short, bifid with a foramen (foramen transversarium) which transmit vertebral artery and vein .
- The spine is short & bifid.

7th cervical vertebra

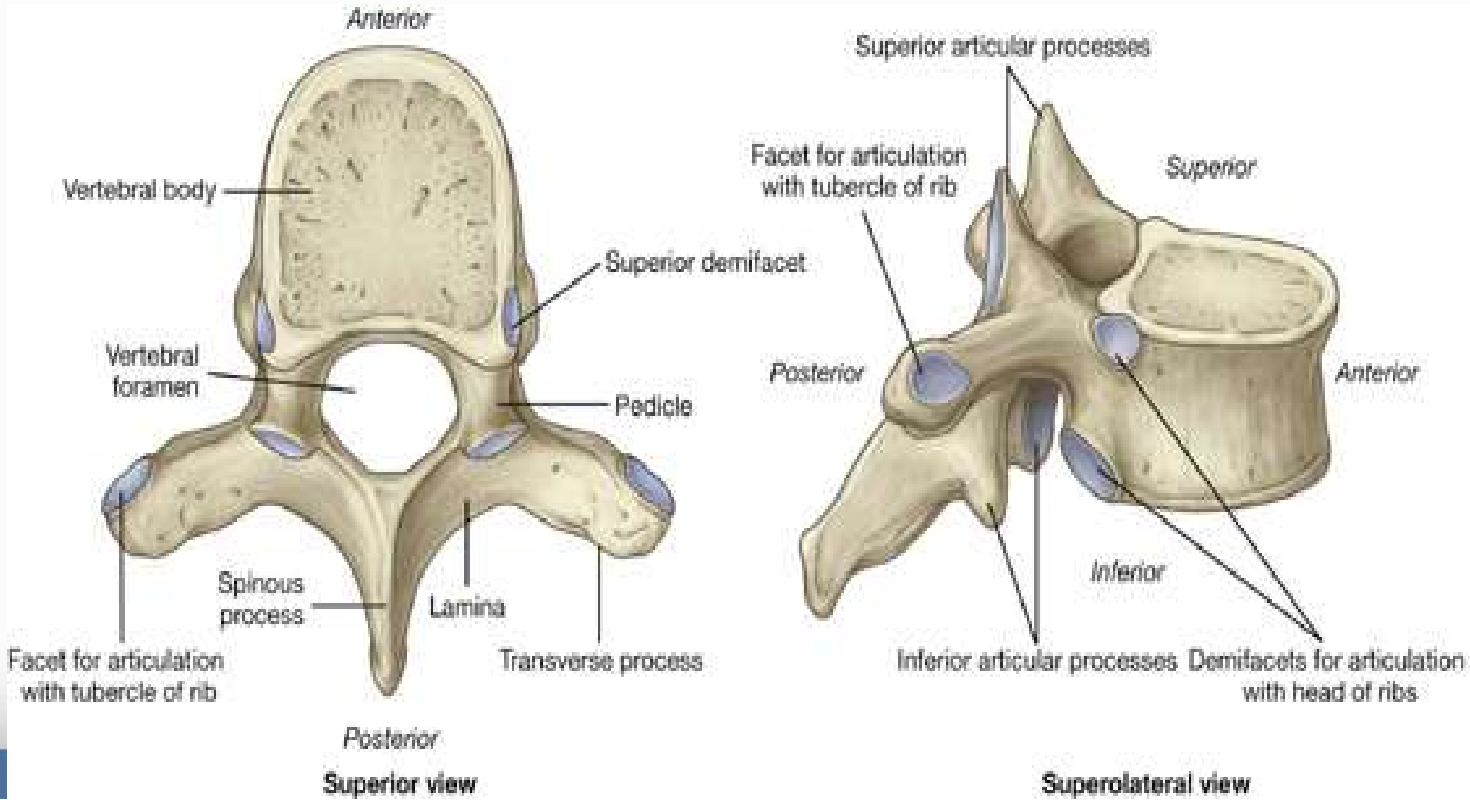
(vertebra prominens)

It has the longest not bifid spinous process

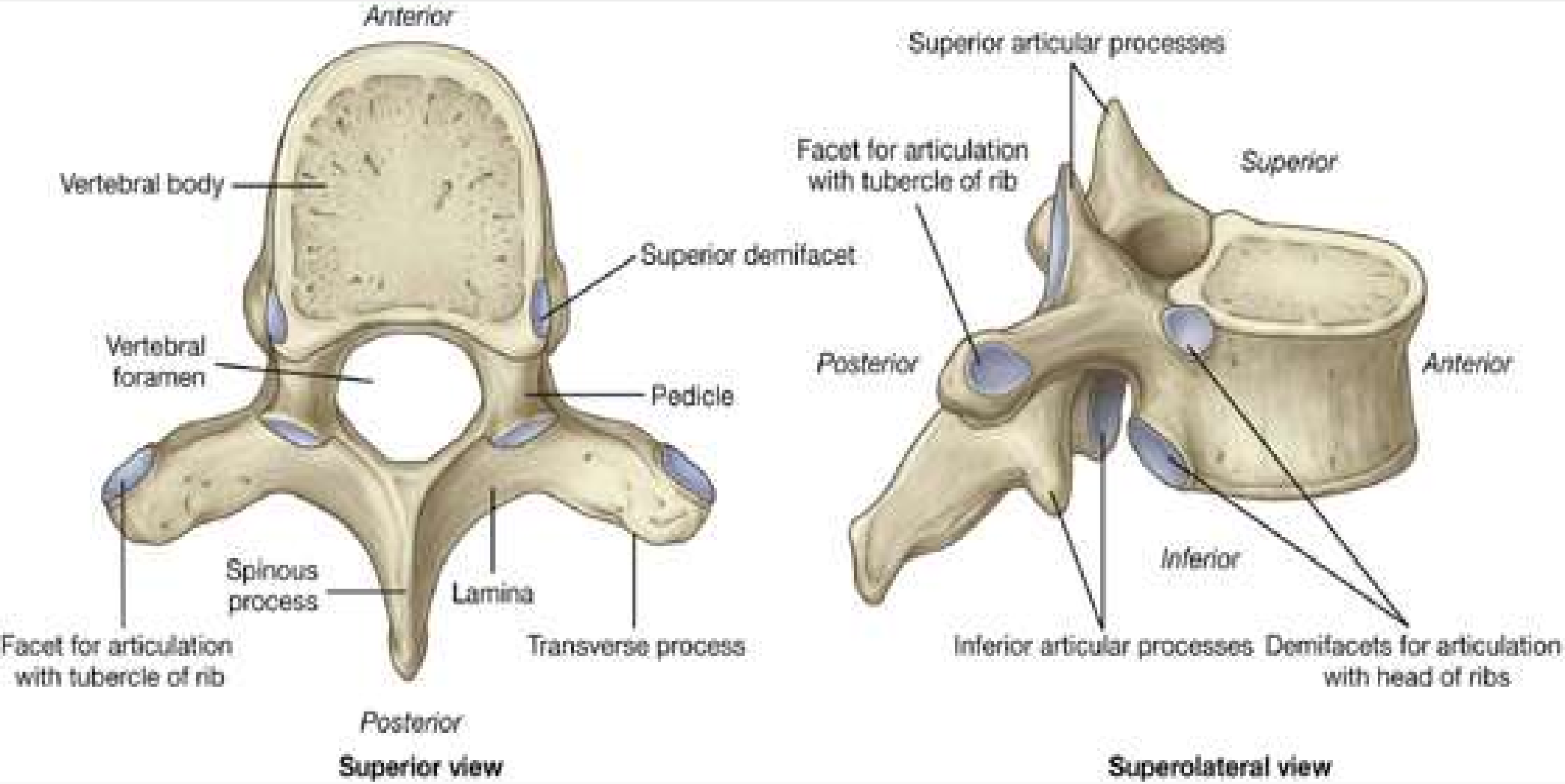


TYPICAL THORACIC VERTEBRA

- The body is moderately sized & heart shaped.
- The foramen is small rounded.
- The transverse processes are large with impression for the rib & directed posterolaterally.
- The spine is large & long.

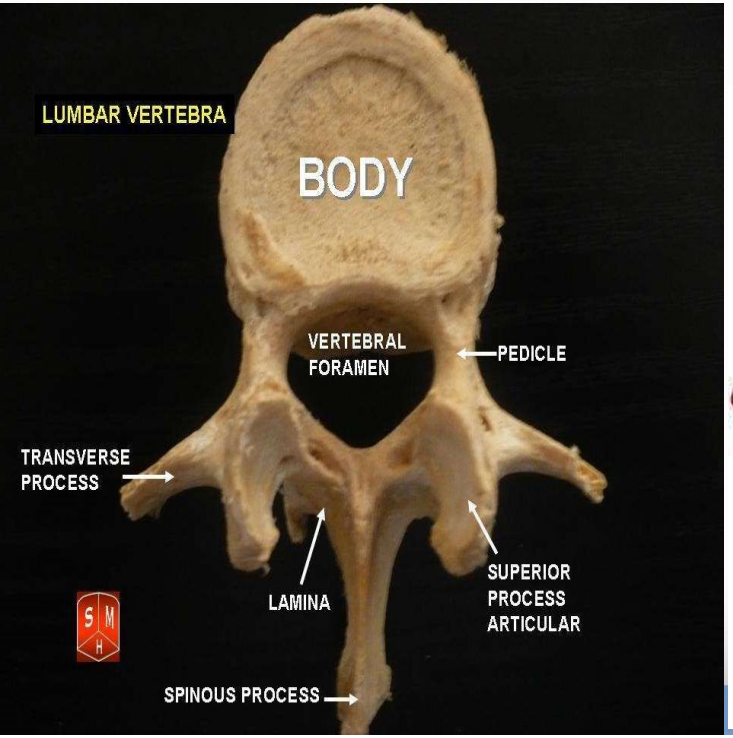


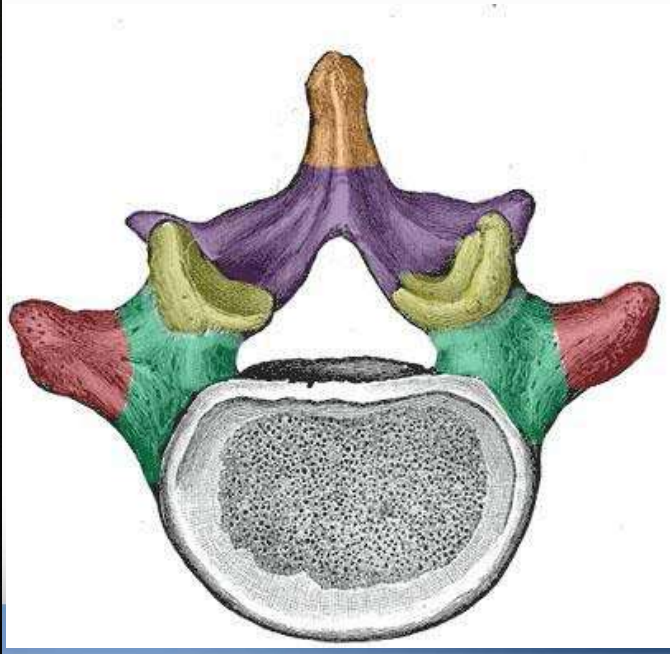
Typical thoracic vertebrae



LUMBAR VERTEBRA

- The body is large kidney shaped.
- The foramen is large triangular.
- The transverse process is thin & directed laterally.
- The spine is short, thick & broad.

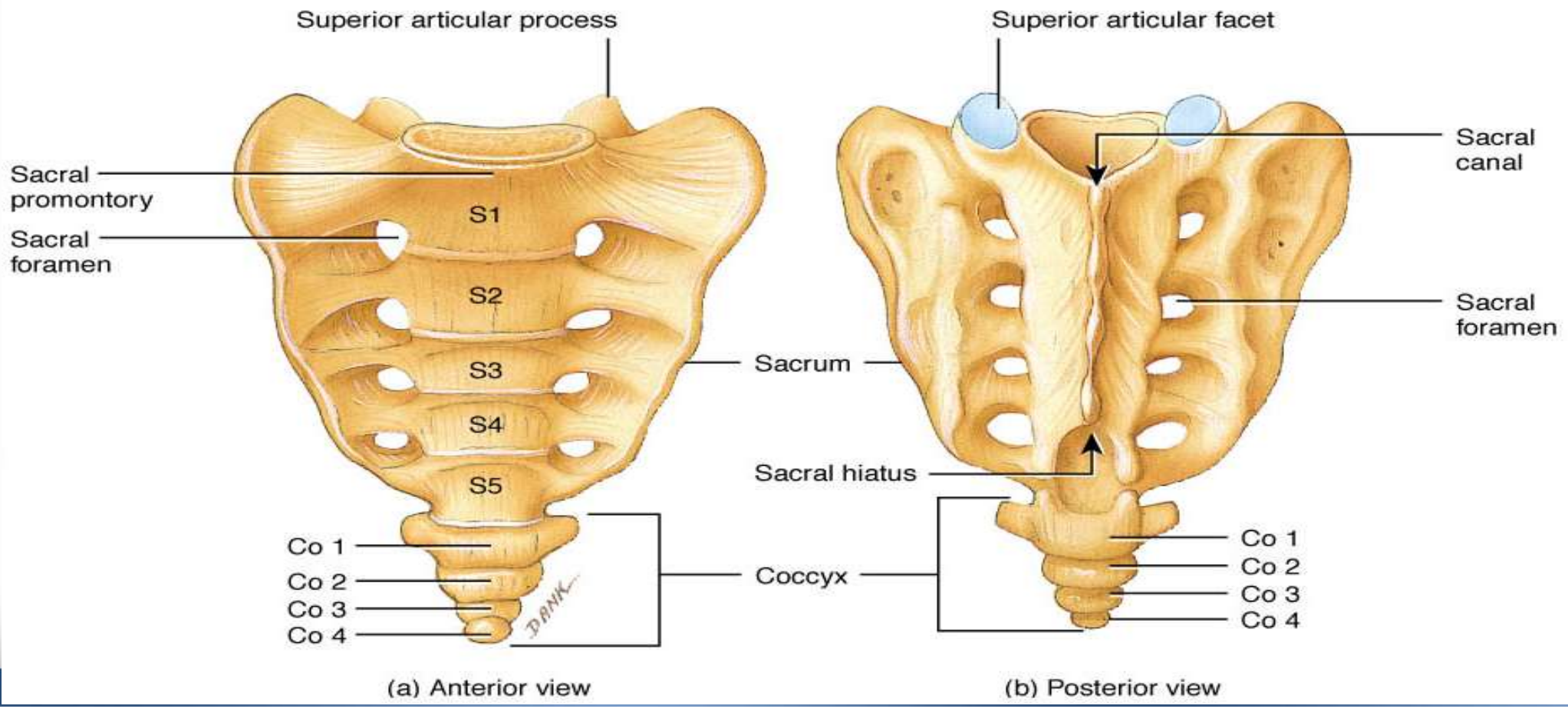




Spinous process
Lamina
Superior articular processes
Pedicles
Transverse processes

THE SACRUM & COCCYX

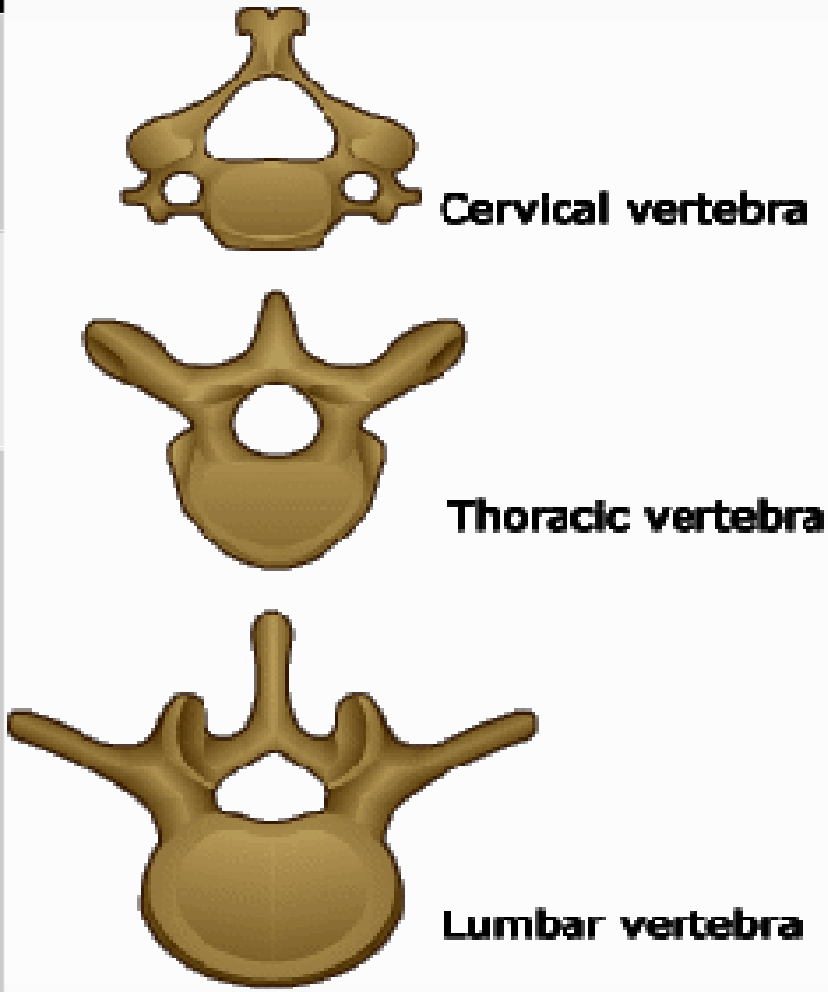
- The 5 sacral vertebrae join to form one mass known as the sacrum.
- It is roughly triangular with a base above & apex below & has 4 Anterior & 4 posterior sacral foramina
- The coccygeal segments join to form one mass known as the coccyx.



Comparison between vertebrae

Read Only

	Cervical	Thoracic	Lumbar
Body	Small - oval	Moderate - round	Large – kidney shape
Foramen	Large triangular	Small round	Large triangular
Arch	-Short bifid transverse process with a foramen. - Short bifid spine	-Thick large transverse process with rib facet. - Long strong spine	-Thin short transverse process. - Short, broad, horizontal spine.



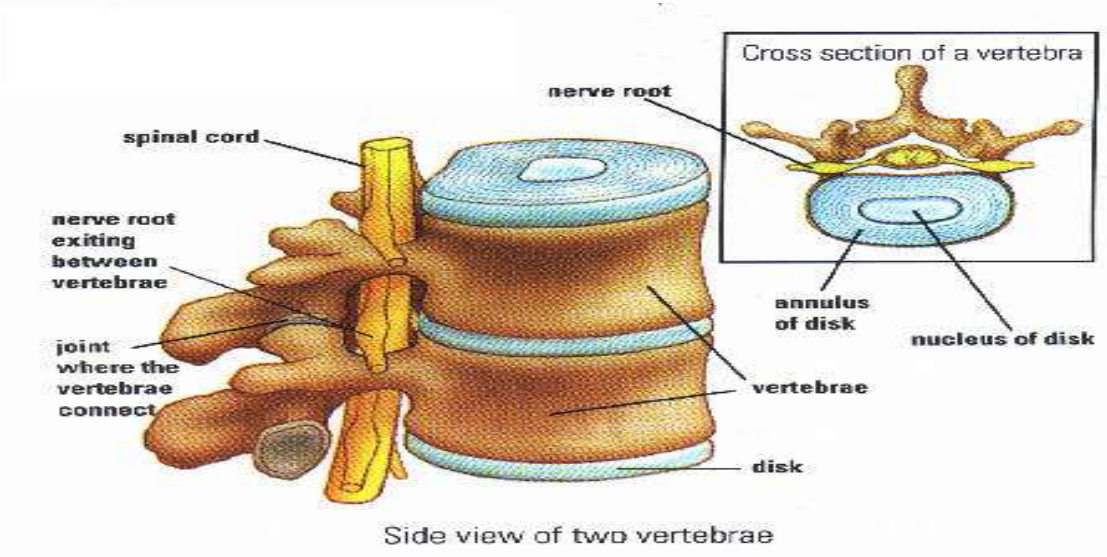
Joints of the Vertebral Column

The vertebrae articulate with each other by cartilaginous joints between their bodies and by synovial joints between their articular processes.

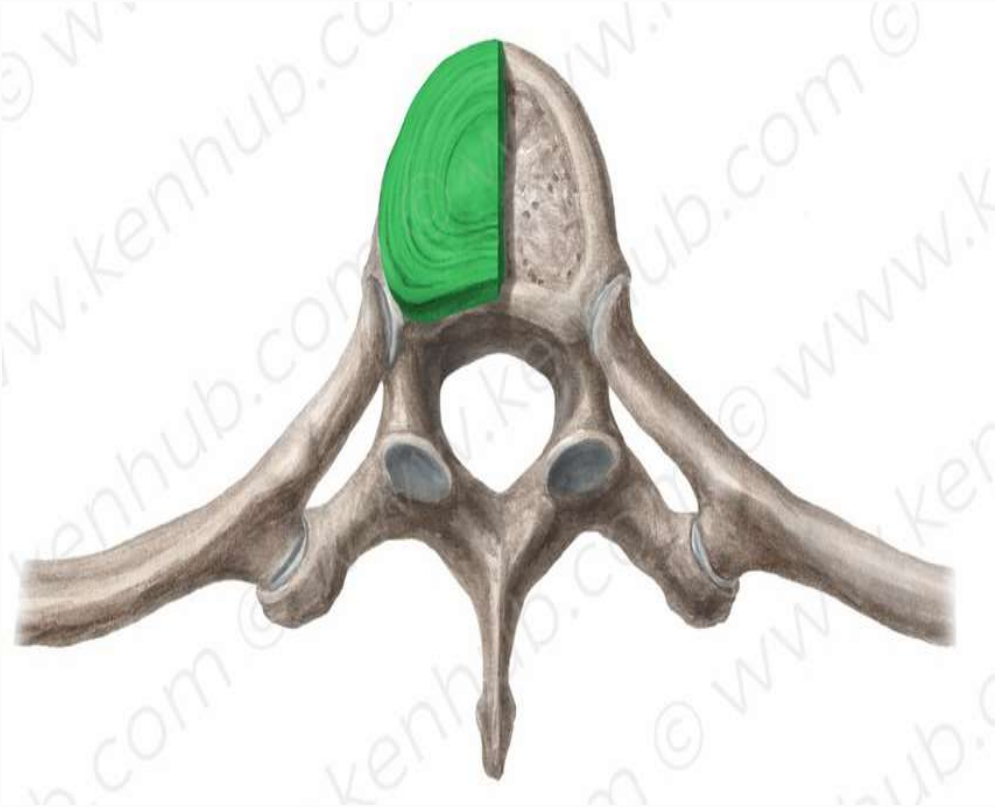
Intervertebral Disc

- Act as shock absorbers.
- Their elasticity allows the rigid vertebrae to move one on the other.
- Their elasticity is gradually lost with advancing age

Type : Secondary cartilaginous



Side view of two vertebrae



Intervertebral Disc

Structure :

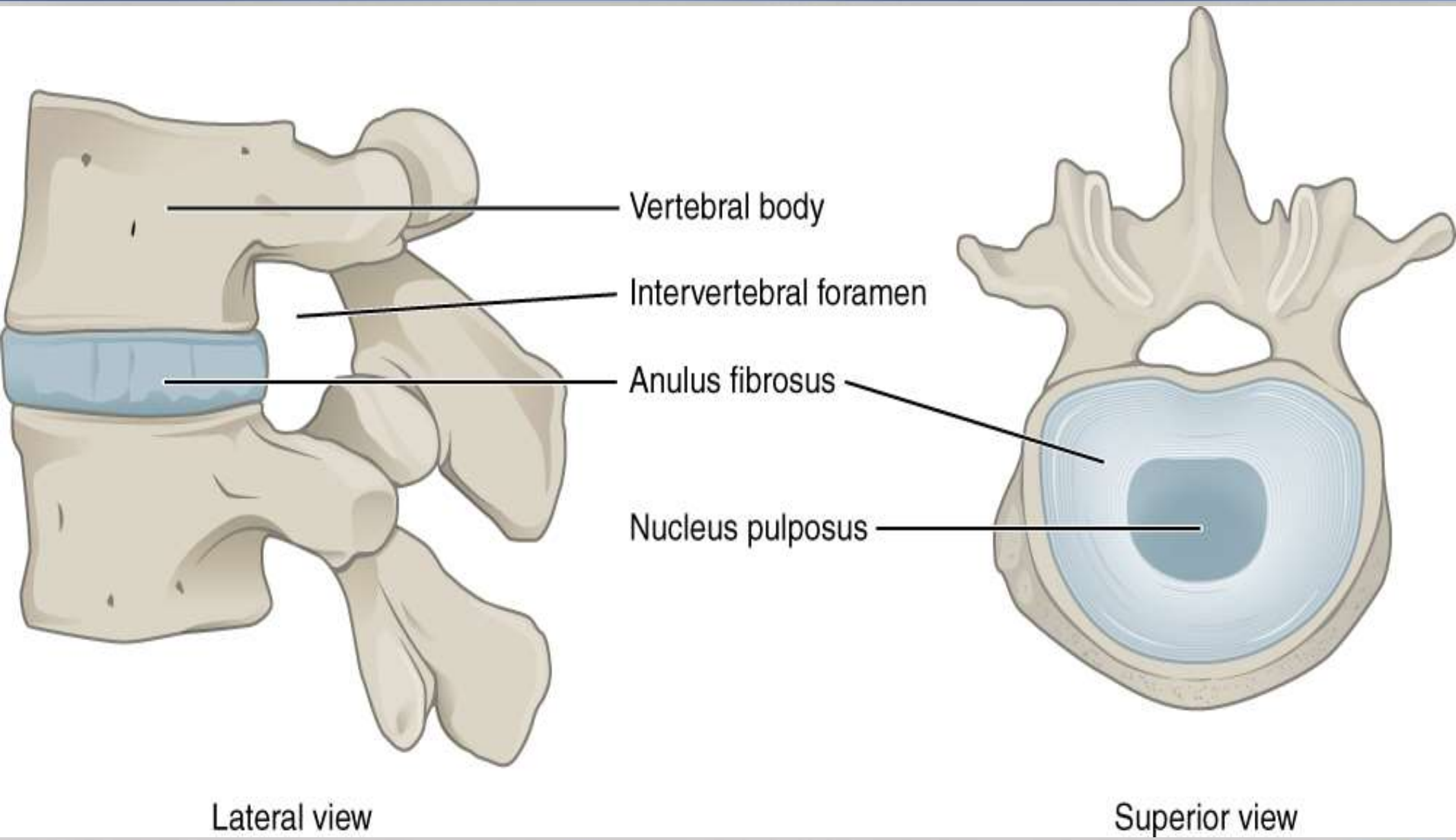
The upper and lower surfaces of the bodies of vertebrae are covered by thin plates of hyaline cartilage. Between the plates of hyaline cartilage is an intervertebral disc of fibrocartilage.

Each intervertebral disc consists of:

1- Peripheral part, the anulus fibrosus: is composed of concentric layers of fibrocartilage.

2-Central part, the nucleus pulposus: is an ovoid mass of gelatinous material contains amount of water, a small number of collagen fibers, and a few cartilage cells.

It is normally under pressure and situated slightly nearer to the posterior than to the anterior margin of the disc.


Vertebral body
Intervertebral foramen
Anulus fibrosus
Nucleus pulposus
Lateral view
Superior view

Anulus fibrosus

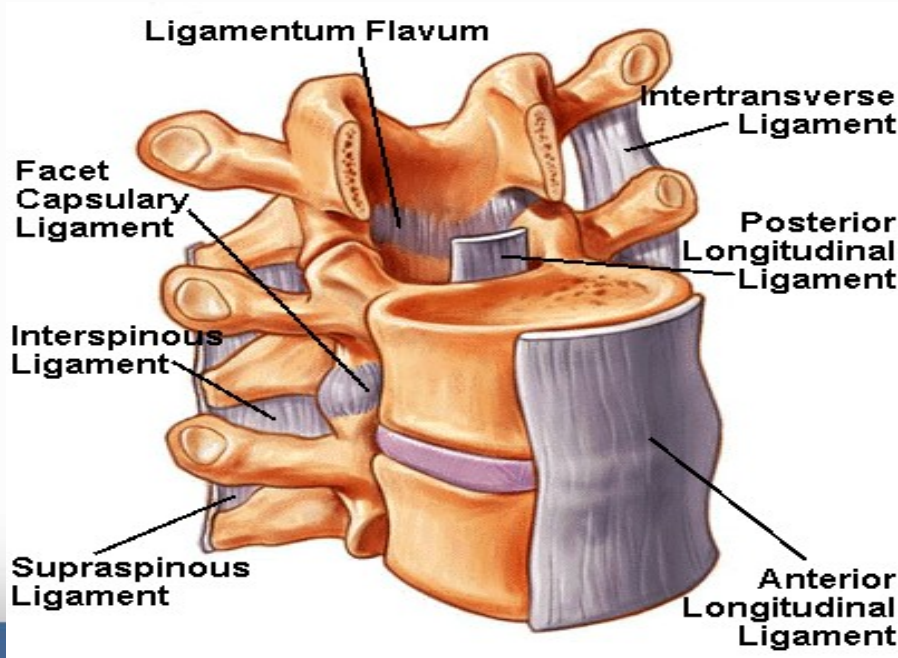
Nucleus pulposus

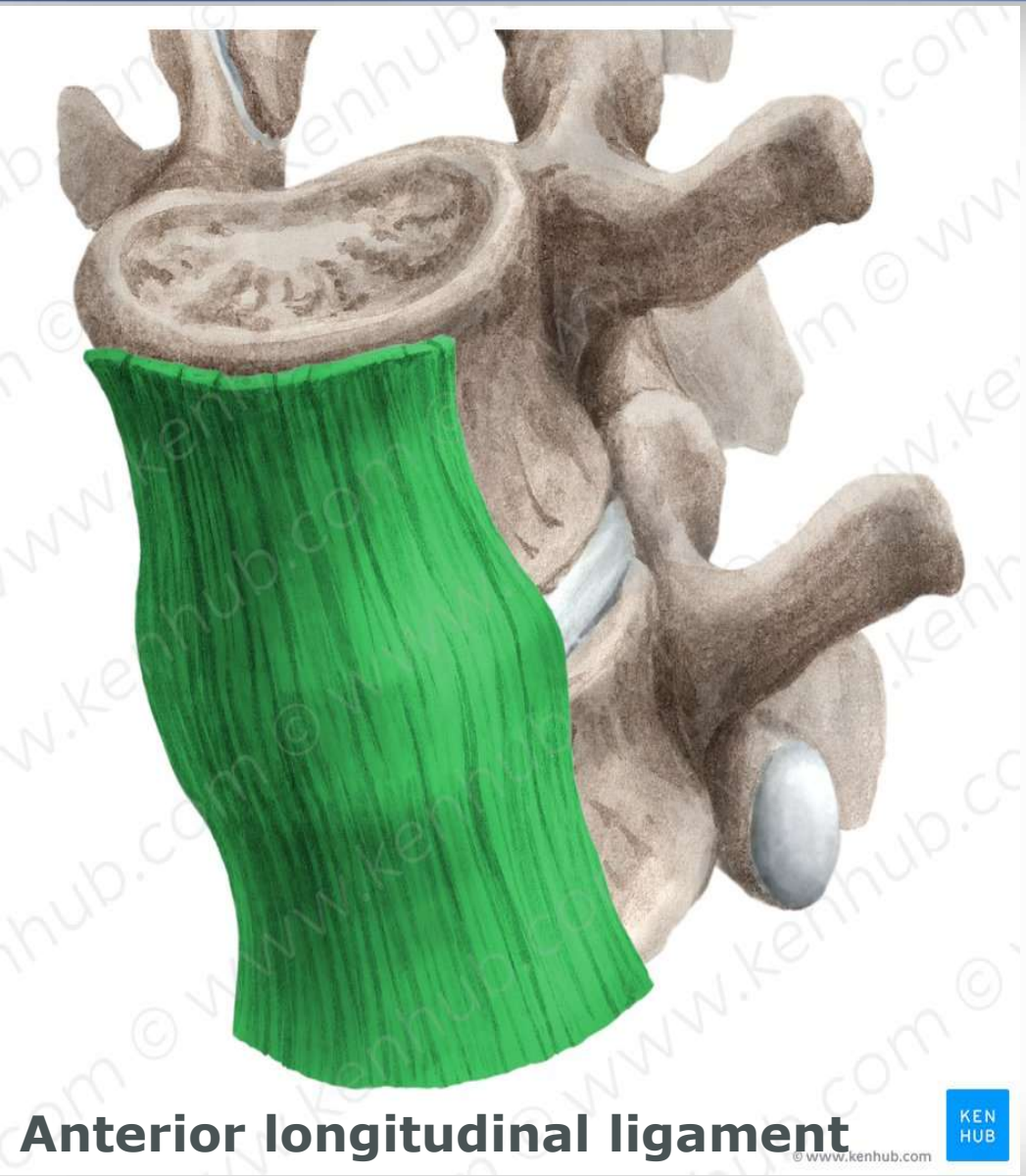
Ligaments of Intervertebral joints

The anterior and posterior longitudinal ligaments run down the anterior and posterior surfaces of the bodies of vertebrae 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.





Anterior longitudinal ligament

Posterior longitudinal ligament

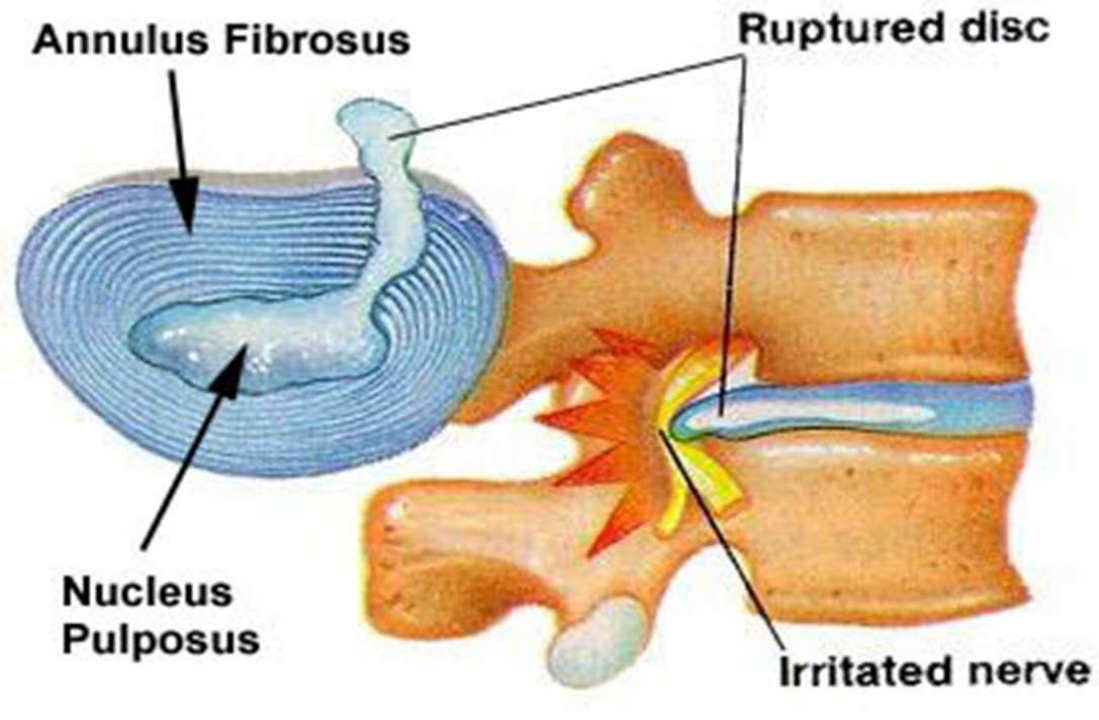
Intervertebral disc Herniation

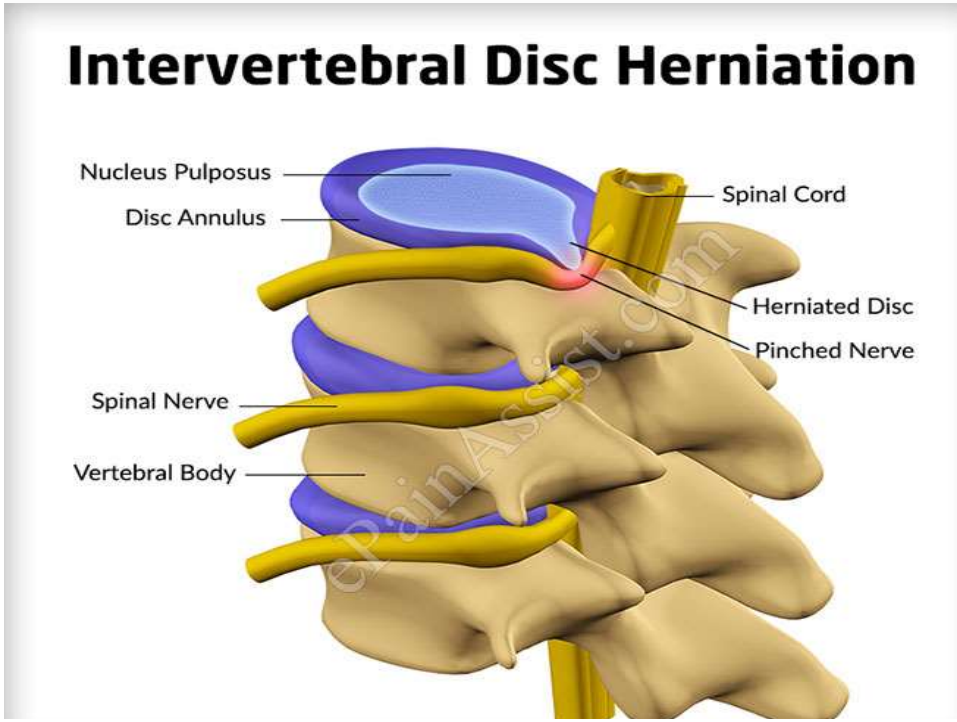
Leads to compression of spinal nerves and neurological manifestations .

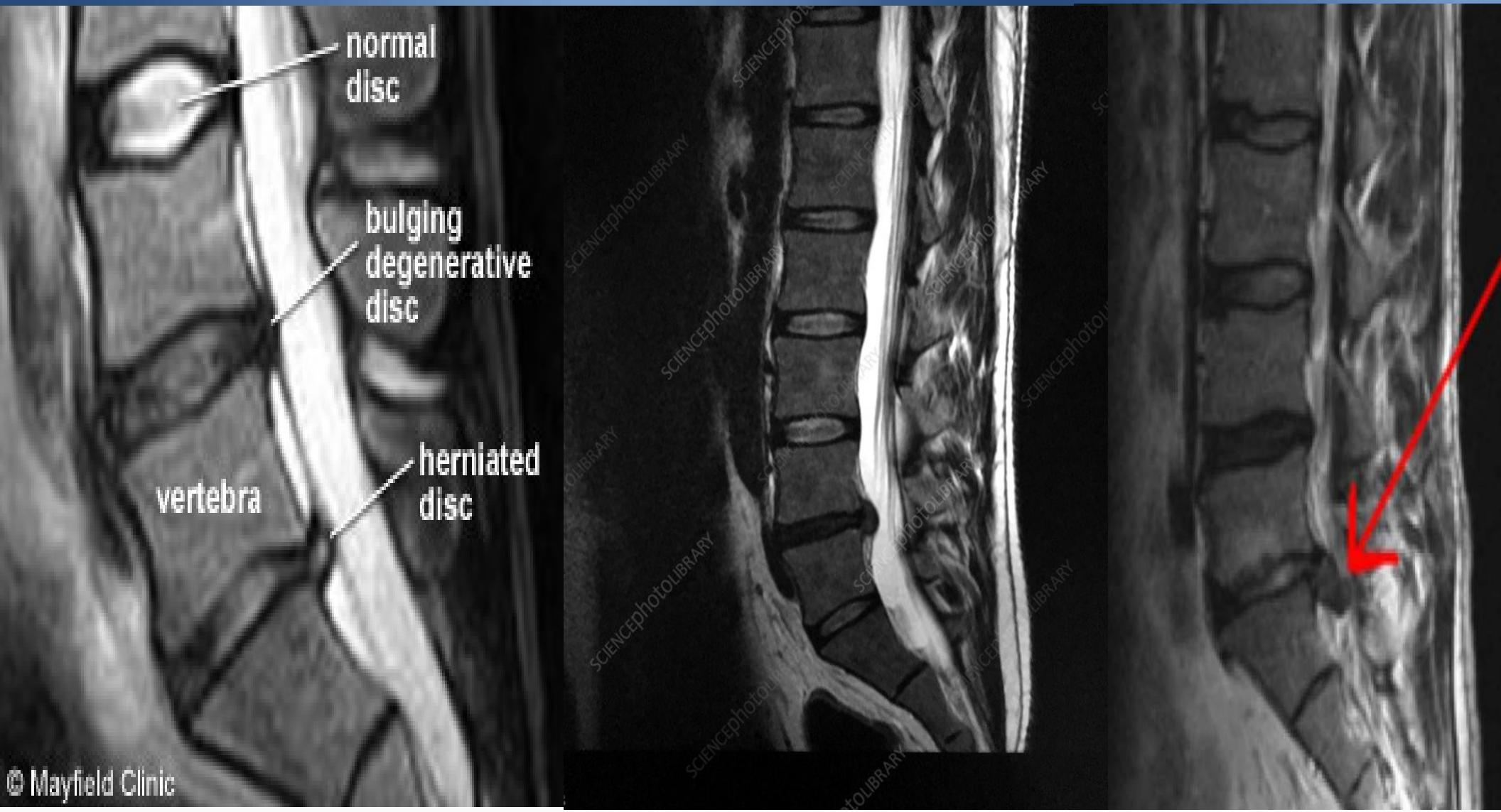
Sensory like numbness pain or sensory loss or Motors as muscle weakness .

Intervertebral disc Degeneration

As effect of ageing and disc degeneration thus limiting the ability of the disc to absorb shock.



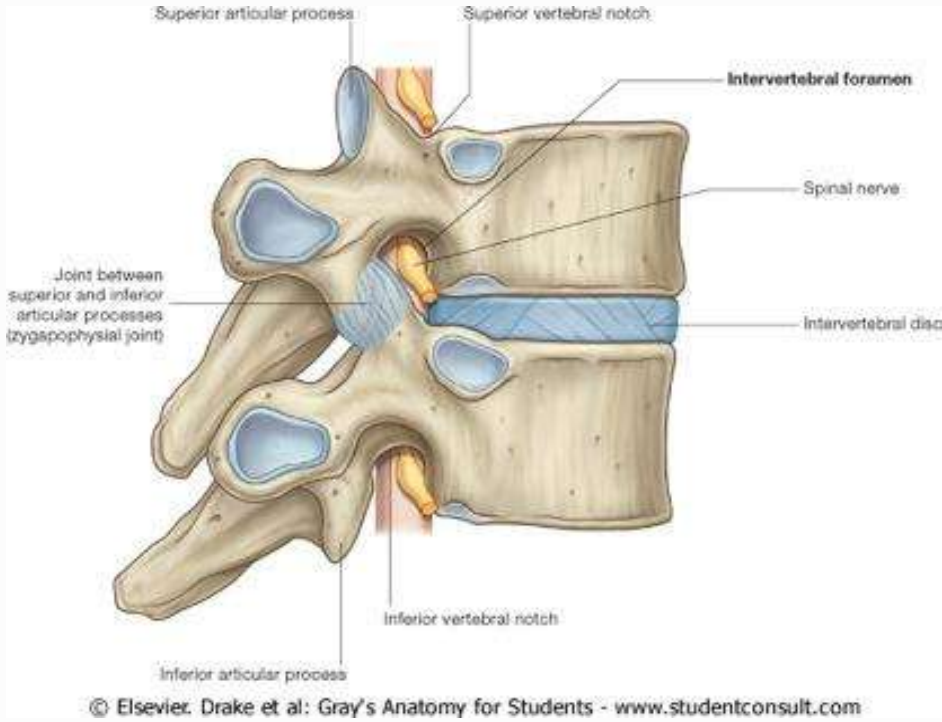



normal
disc
bulging
degenerative
disc
vertebra
herniated
disc
© Mayfield Clinic

Joints between Vertebral Arches
(Zygapophyseal joint)

Type : Plane synovial joints

Articular surfaces : between the superior and inferior articular processes of adjacent vertebrae The articular facets are covered with hyaline cartilage, and the joints are surrounded by a capsular ligament.



Ligaments

1-Supraspinous ligament:

Between the tips of adjacent spines.

2-Interspinous ligament:

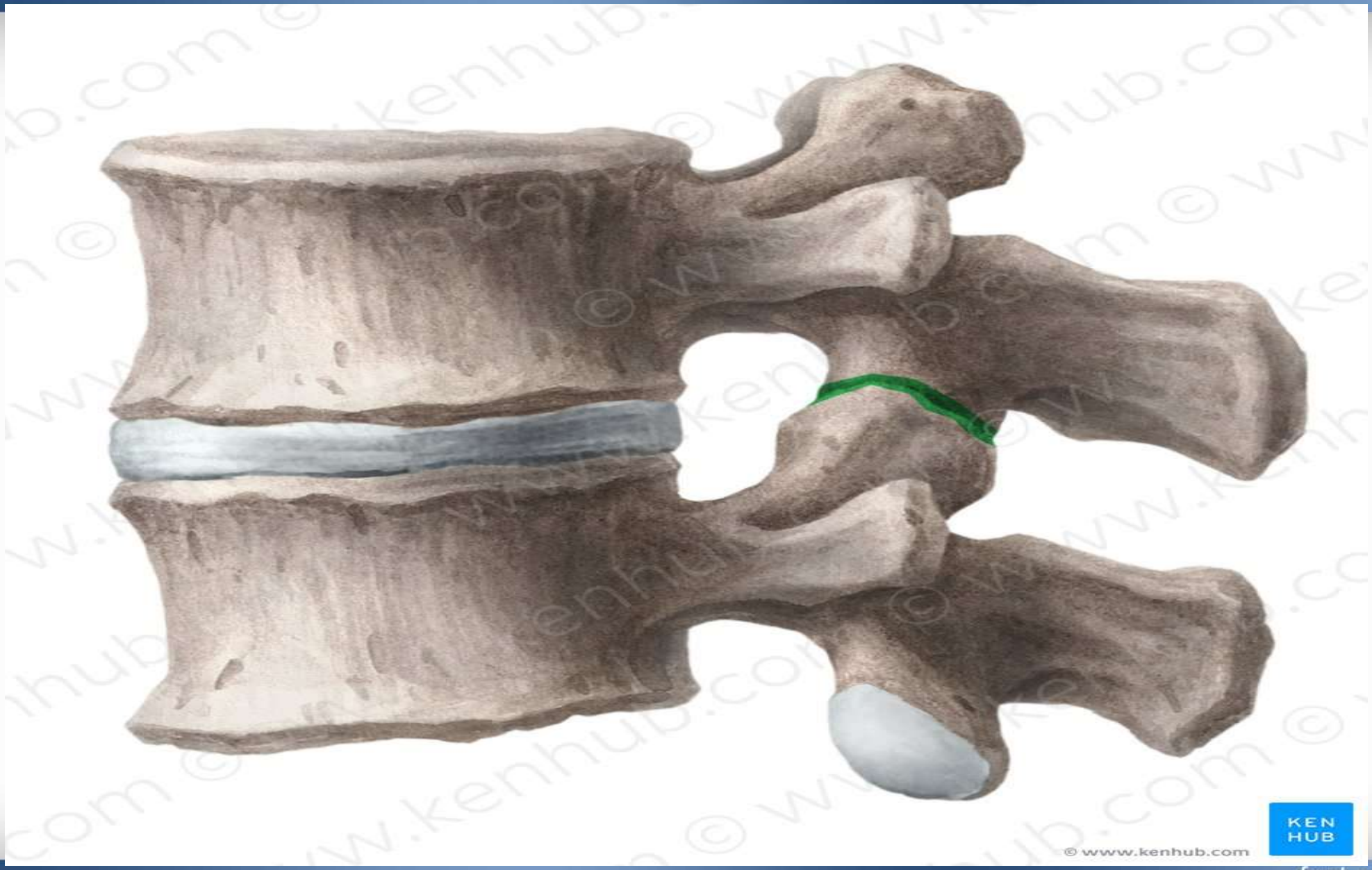
Connects adjacent spines.

3-Intertransverse ligament:

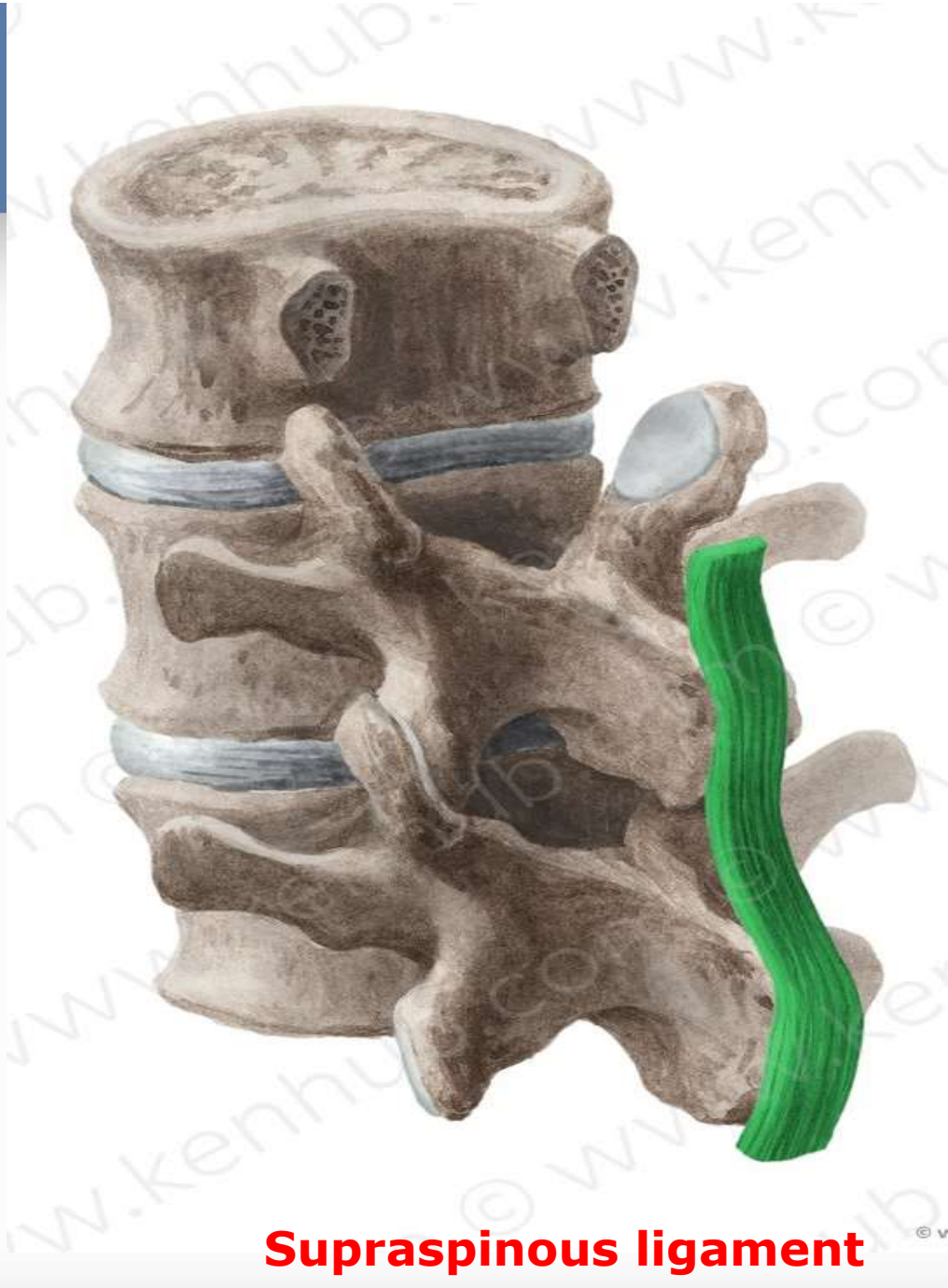
Between adjacent transverse processes.

4-Ligamentum flavum:

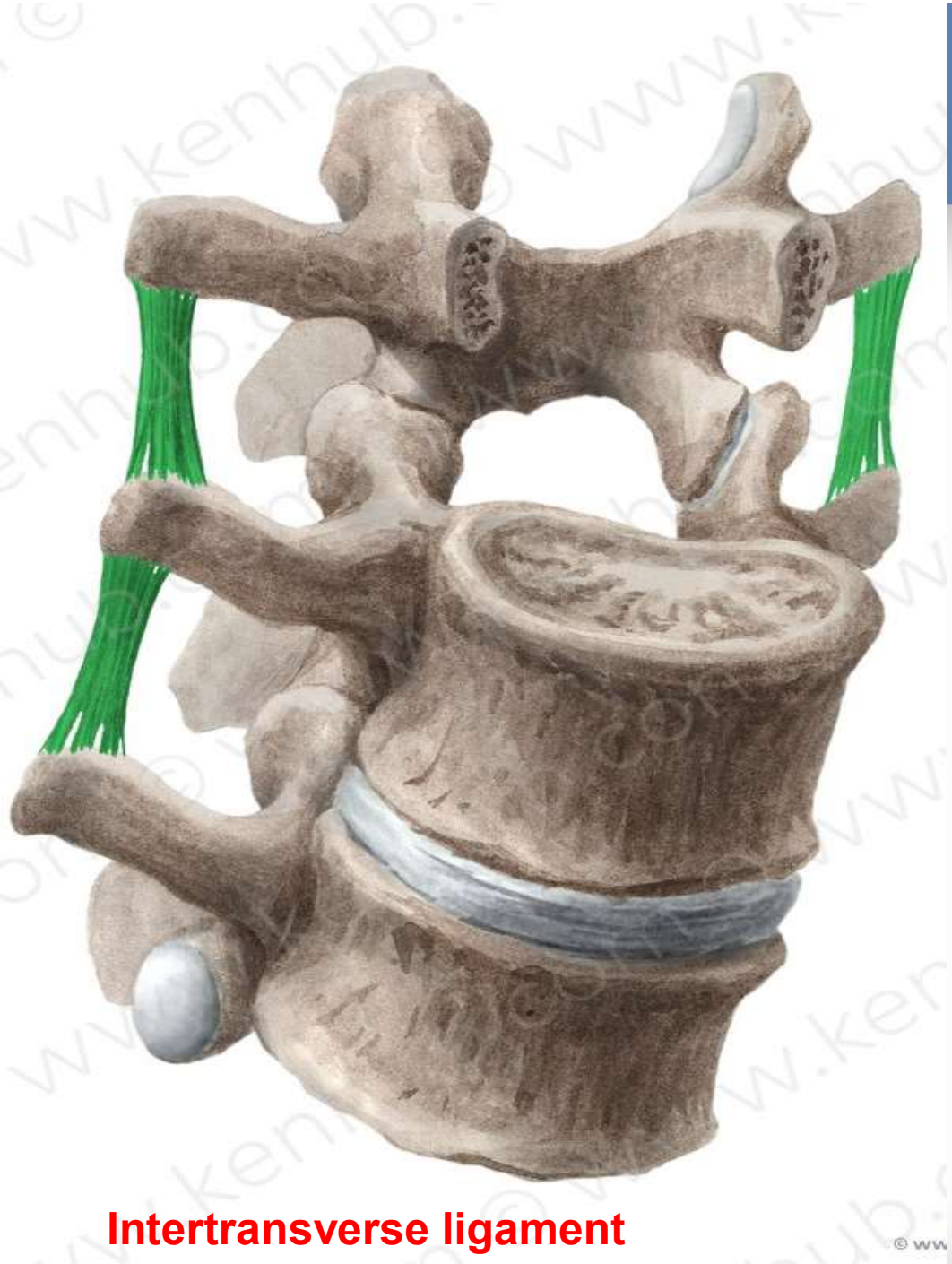
Connects the laminae of adjacent vertebrae



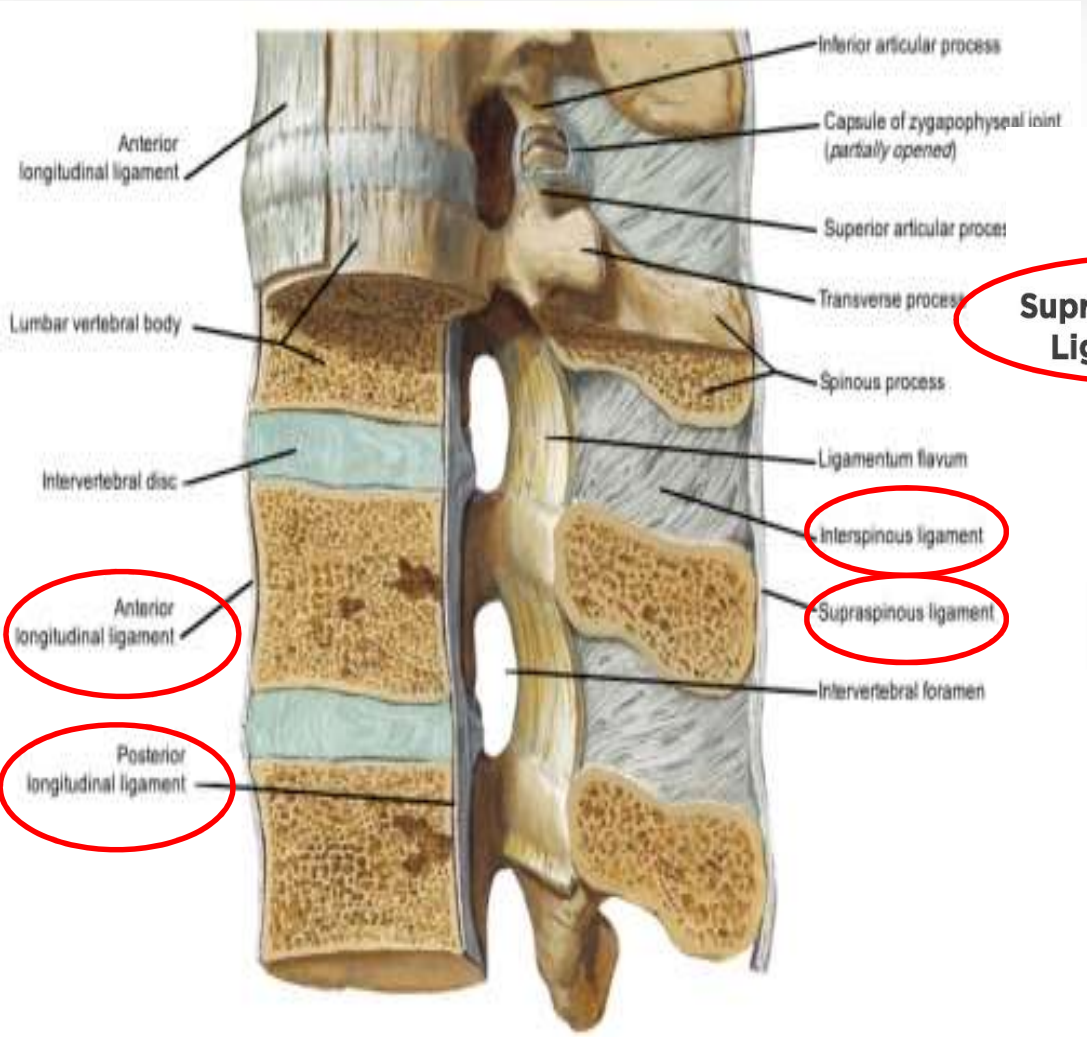
Interspinous ligament

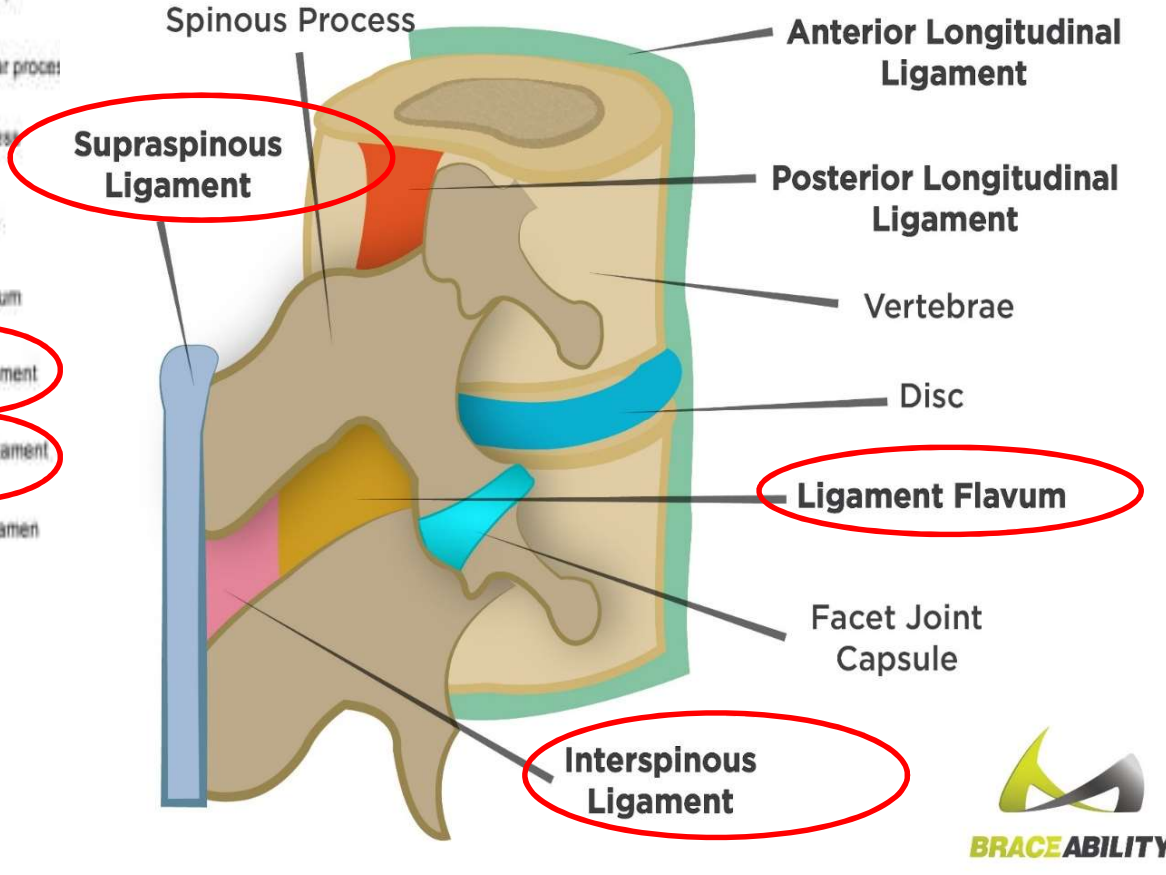


Supraspinous ligament



Intertransverse ligament

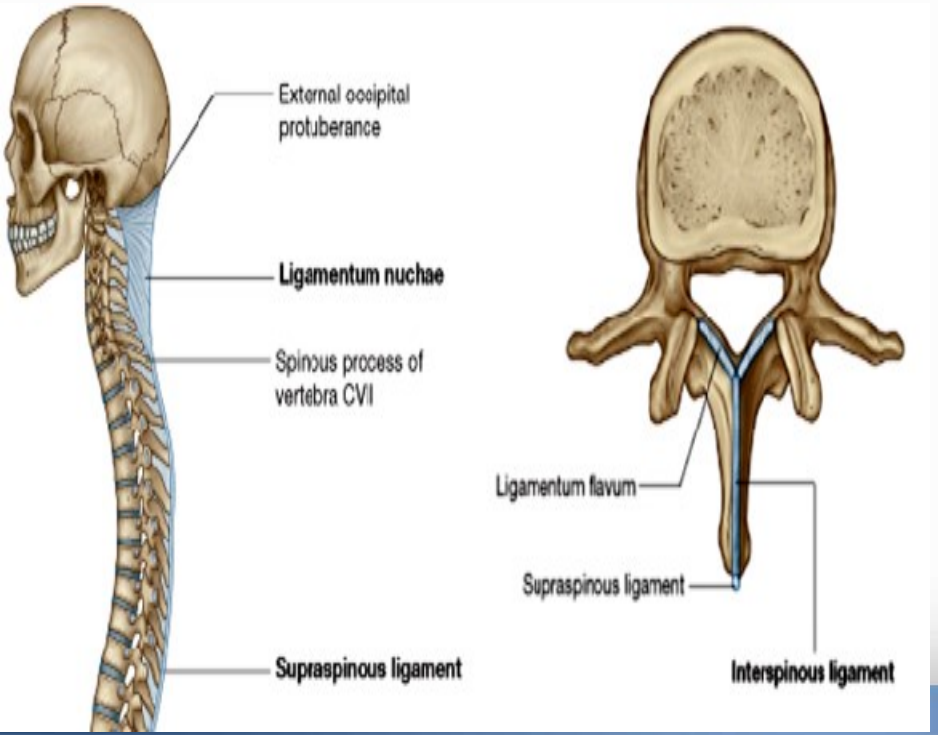


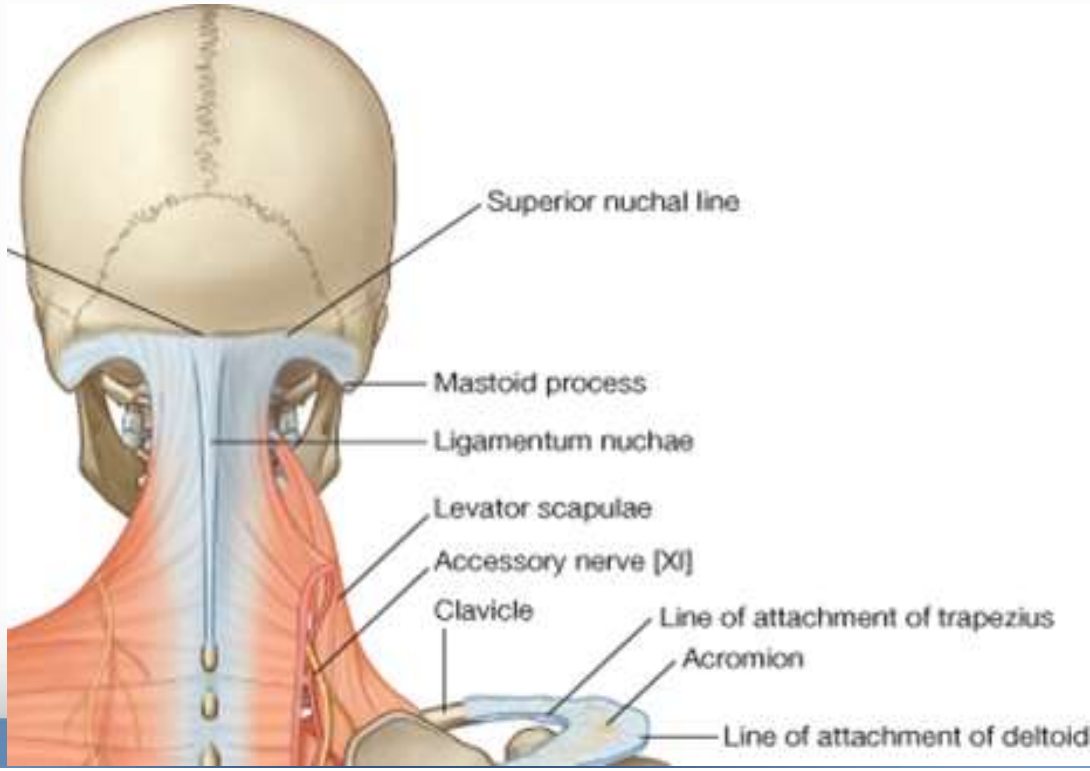


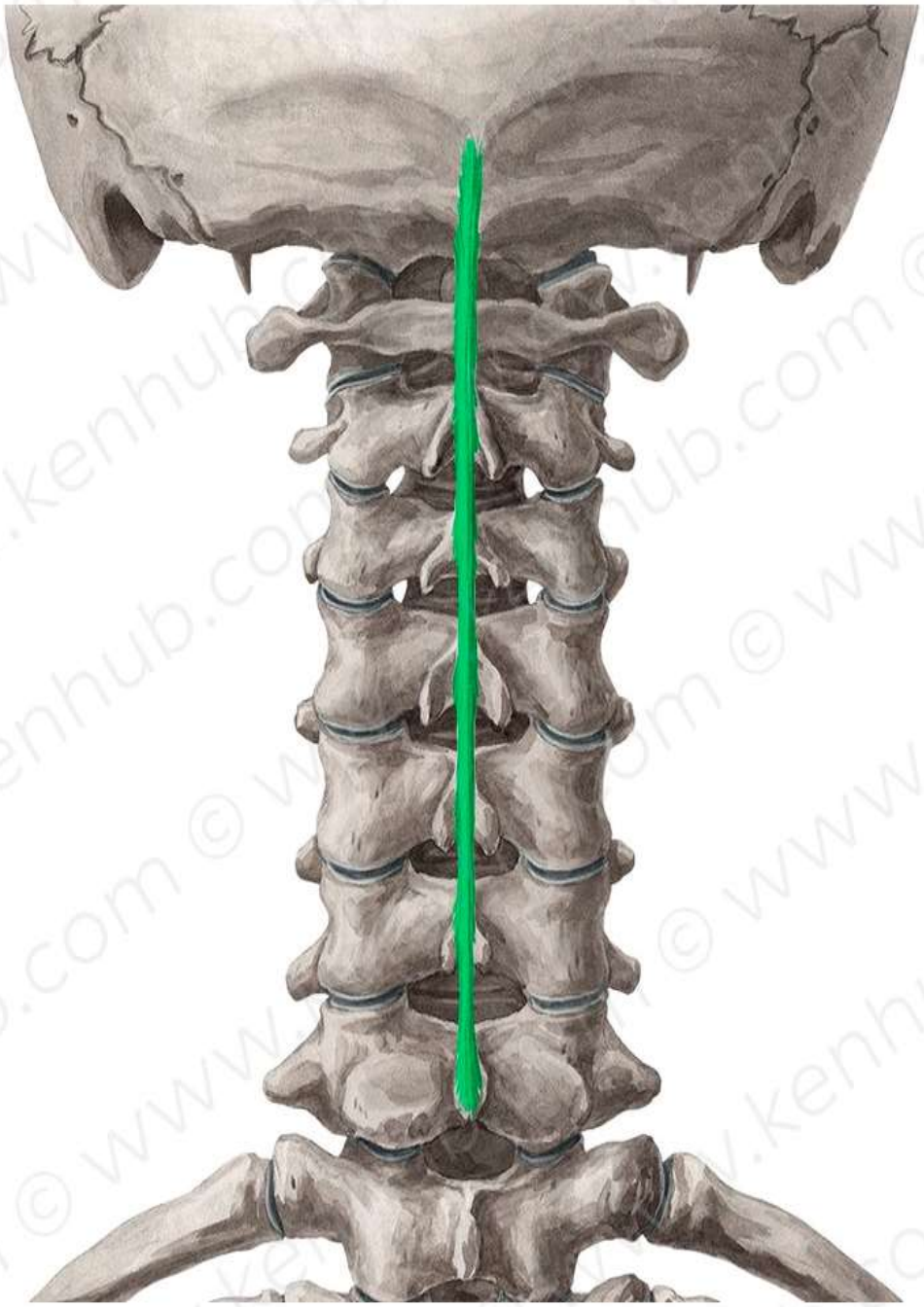
5-Ligamentum nuchae :

In the cervical region, the supraspinous and interspinous ligaments are greatly thickened to form the strong ligamentum nuchae.

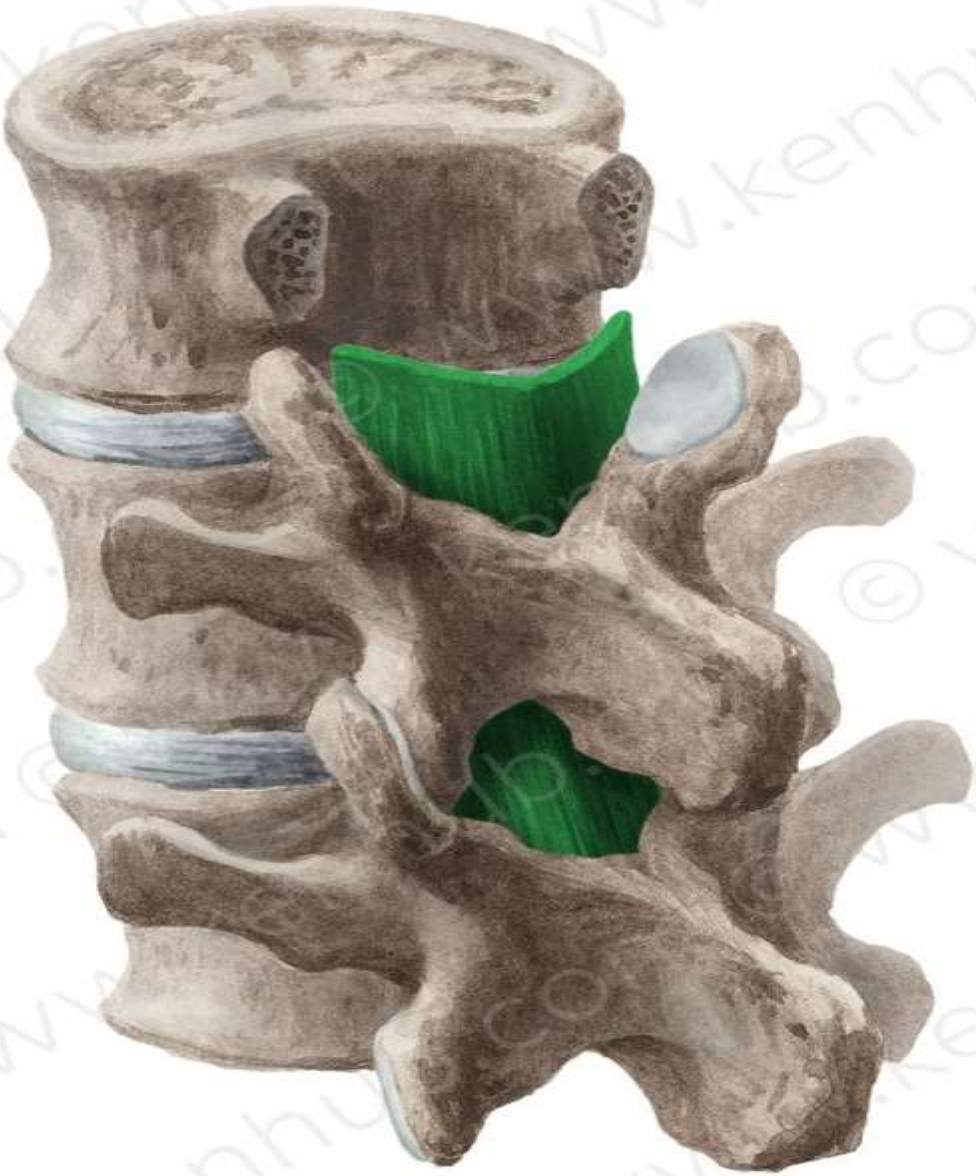
It is a triangular, The base of the triangle is attached to the external occipital protuberance. The apex is attached to the tip of the spinous process of 7th cervical vertebra.







Ligamentum nuchae



Ligamentum flavum

CURVES OF THE VERTEBRAL COLUMN

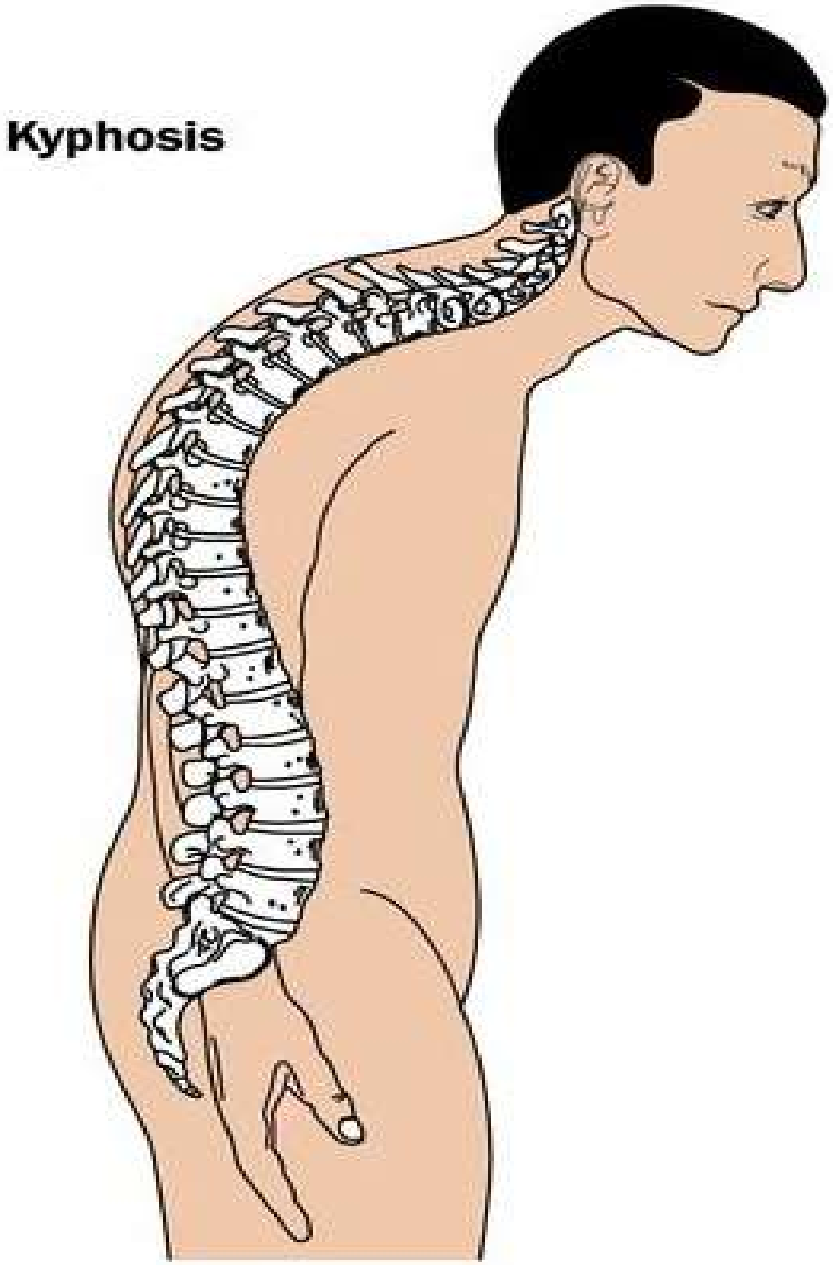
- In the fetus, the vertebral column has one continuous anterior concavity.
- After birth, when the child becomes able to raise his head the cervical part of the vertebral column becomes convex anteriorly (cervical Lordosis).
- Toward the end of the first year, when the child begins to stand upright, the lumbar part of the vertebral column becomes convex anteriorly (lumbar Lordosis).

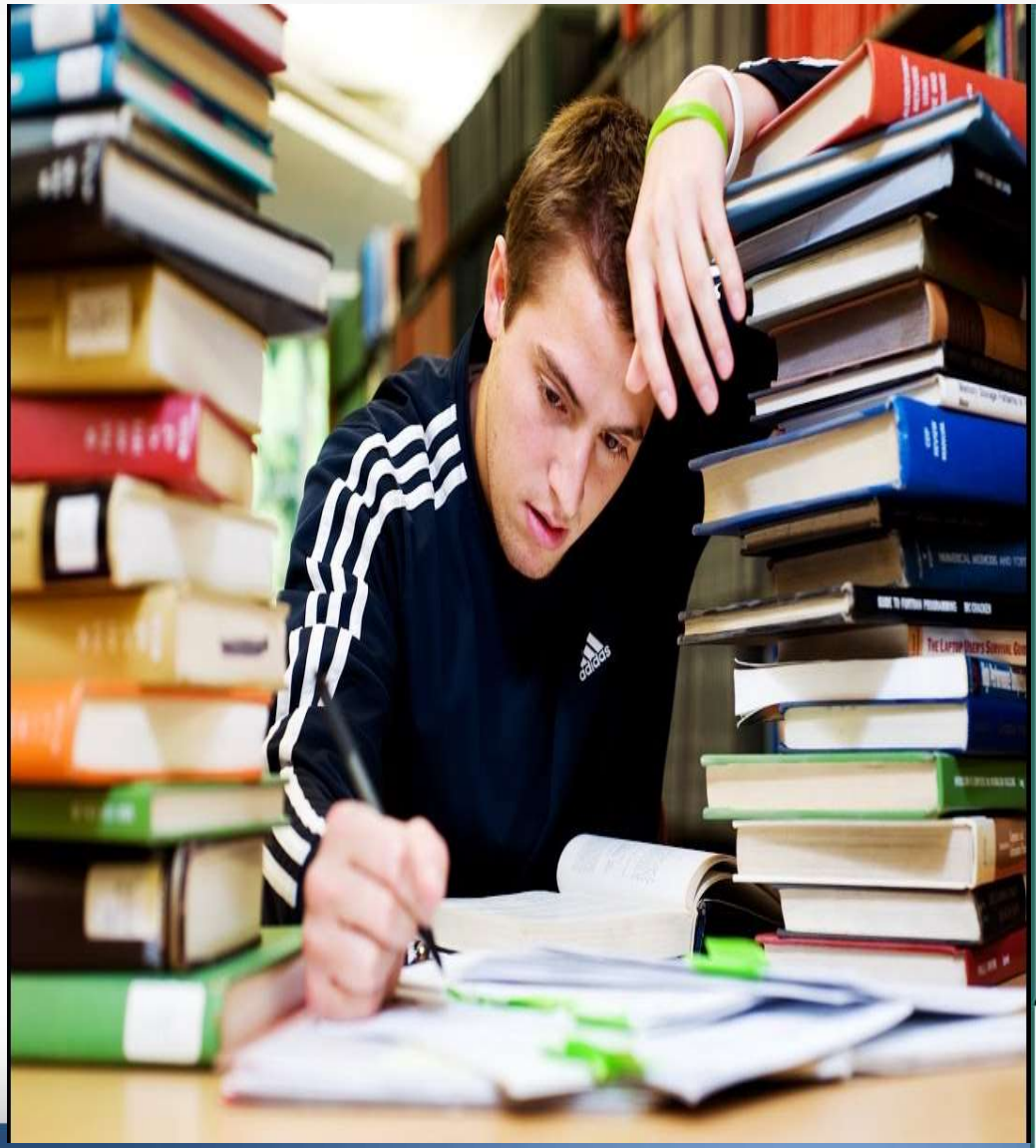
Abnormal Curves of the Vertebral Column

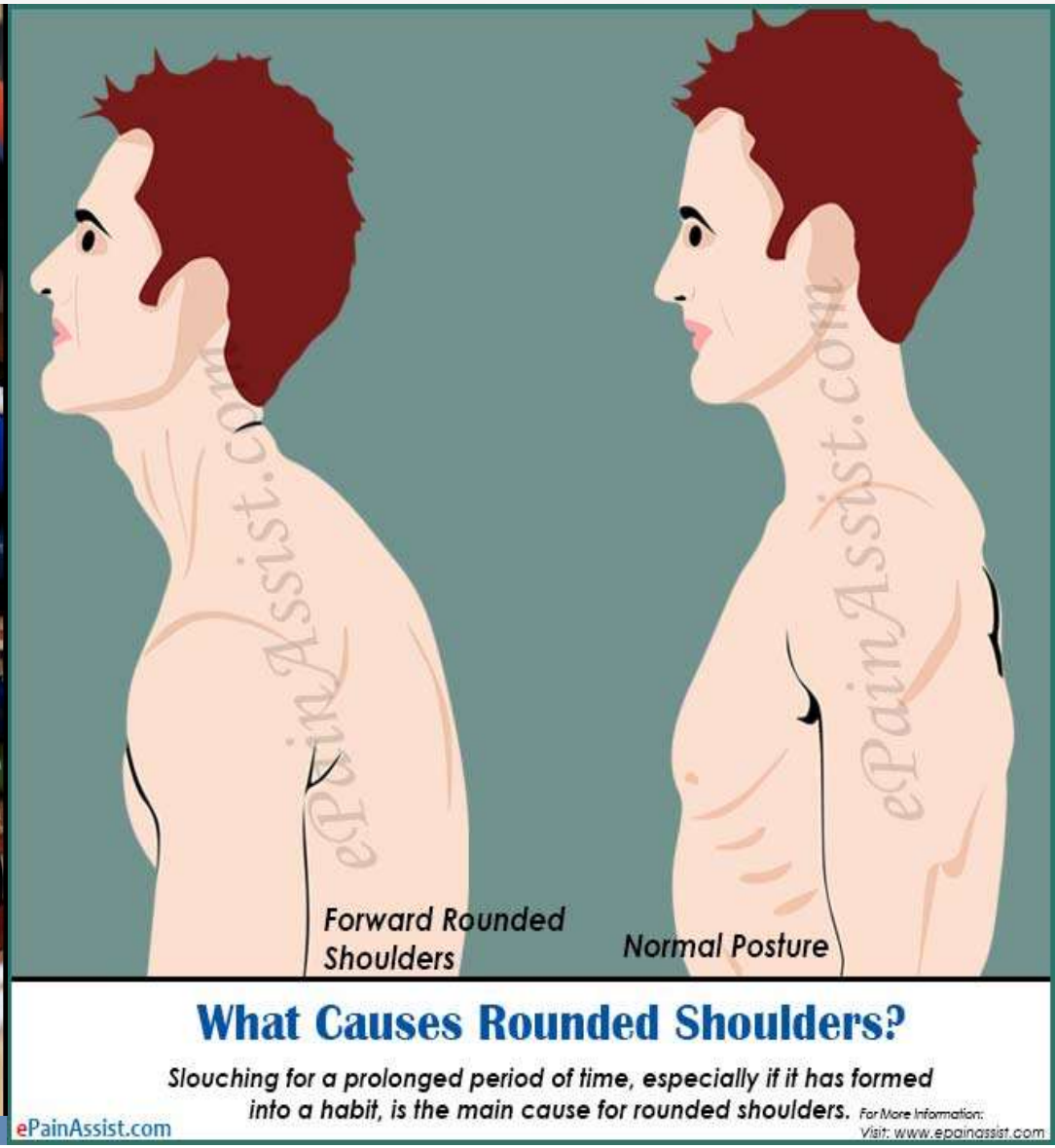
1-Kyphosis: is increase in the sagittal curvature present in the thoracic part of the vertebral column.
Causes : by muscular weakness or by structural changes in the vertebral bodies or by intervertebral discs
Types :
1-Acute angular kyphosis : due to Crush fractures or tuberculous destruction of the vertebral bodies

2- Senile kyphosis: due to osteoporosis and or degeneration of the intervertebral discs involving the cervical, thoracic, and lumbar regions of the column.

3- Round-shouldered :due to weak muscle tone with long hours of study or work over a low desk can lead to a gently curved kyphosis of the upper thoracic region





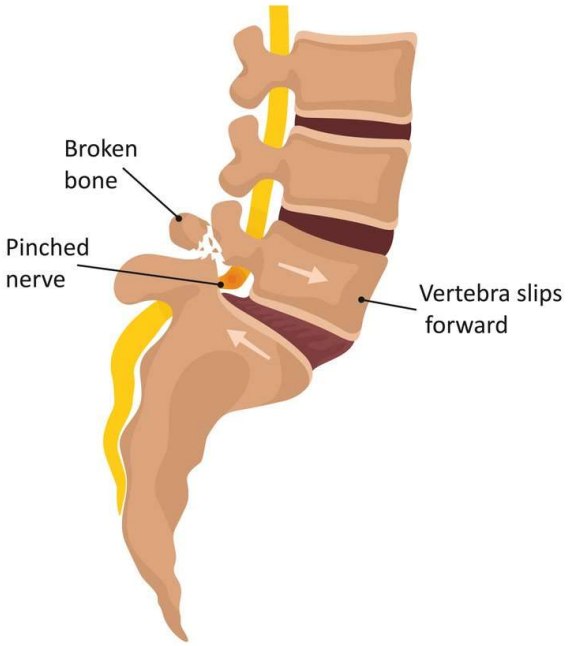

ePainAssist.com
ePainAssist.com
Forward Rounded Shoulders
Normal Posture
What Causes Rounded Shoulders?
Slouching for a prolonged period of time, especially if it has formed into a habit, is the main cause for rounded shoulders.
For More Information: Visit: www.epainassist.com
ePainAssist.com

Lordosis

is an exaggeration in the sagittal curvature present in the lumbar region.

Causes :

- ✓ An increase in the weight of the abdominal contents, as with the gravid uterus or a large ovarian tumor
- ✓ Disease of the vertebral column such as spondylolisthesis



Scoliosis

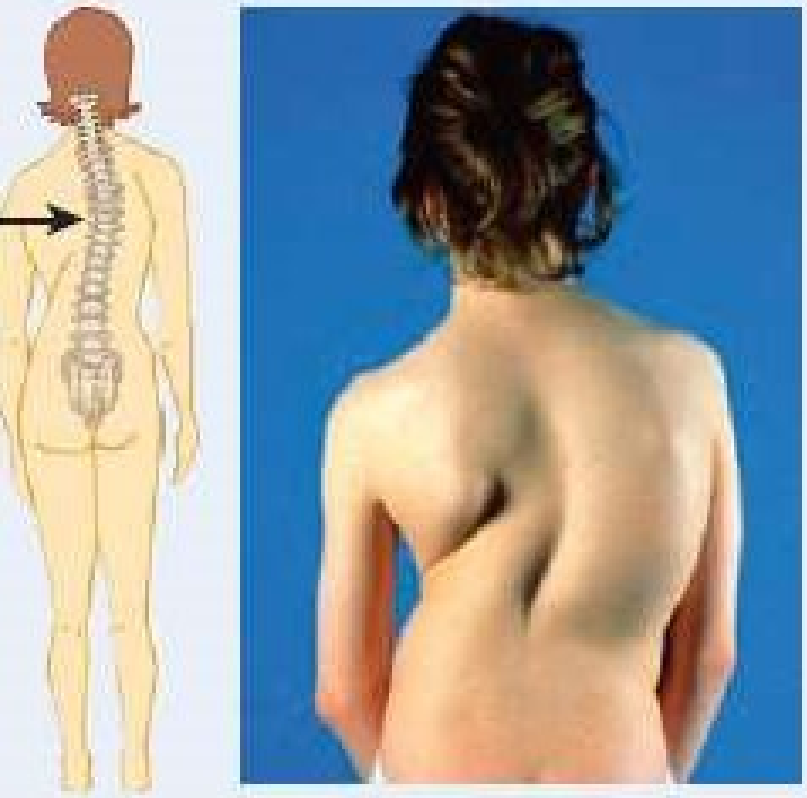
is a lateral deviation of the vertebral column.

This is most commonly found in the thoracic region

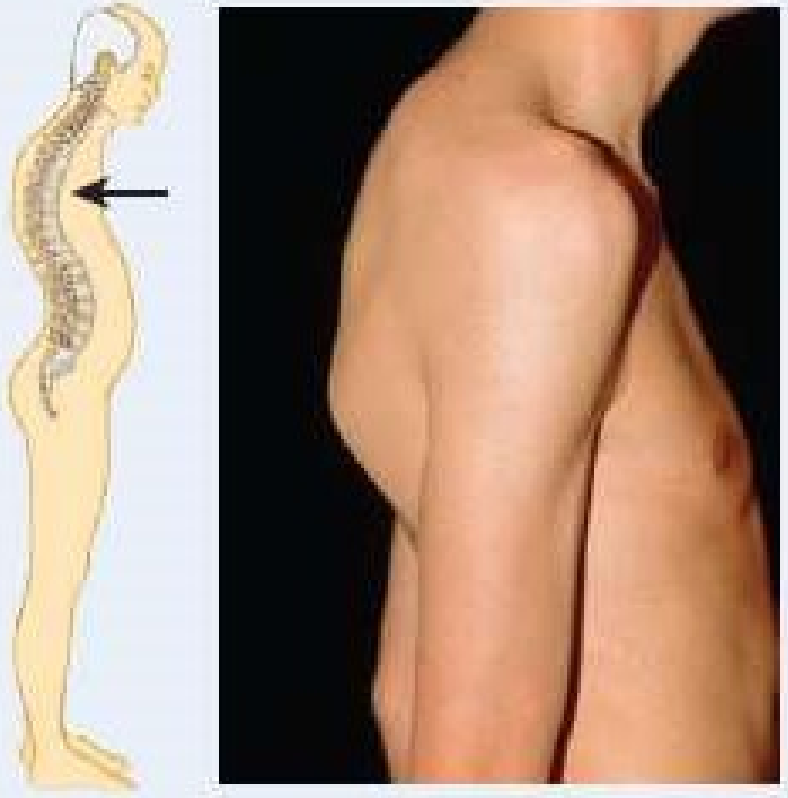
Causes :

- ✓ Paralysis of muscles caused by poliomyelitis.
- ✓ Congenital hemivertebra

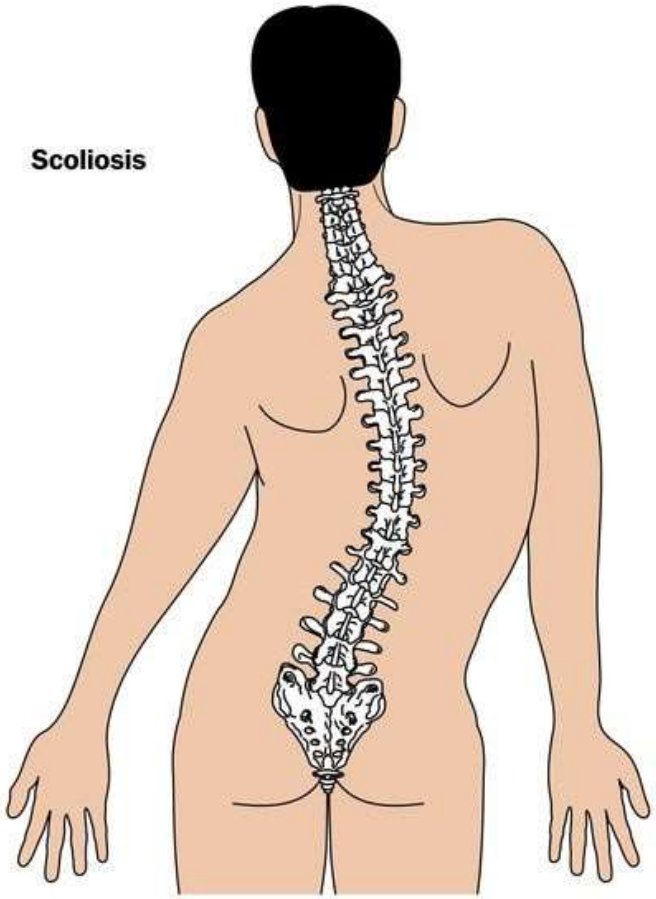
Abnormal Curves of the Vertebral Column

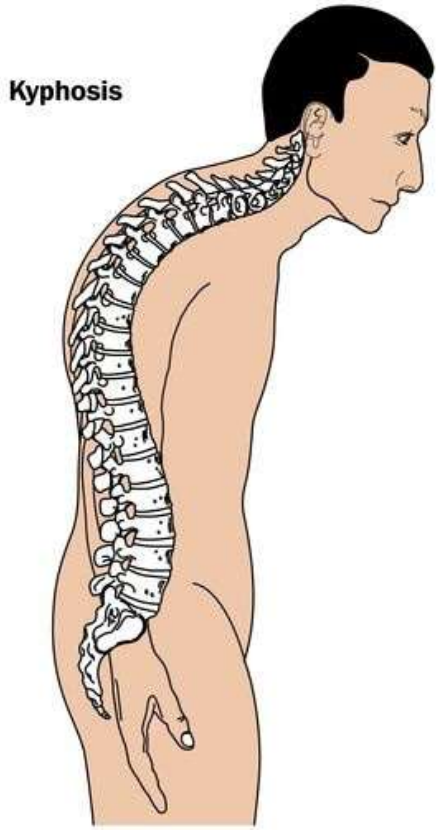


(a) Scoliosis



(b) Kyphosis





Dislocations of the Vertebral Column

- Dislocations without fracture occur only in the cervical region.
- Dislocations commonly occur between the 4th and 5th or 5th and 6th cervical vertebrae.
- Dislocations with fracture occur in thoracic and lumbar regions
- Unilateral dislocations cause spinal nerve injury producing severe pain
- Bilateral dislocations cause spinal cord injury
- Bilateral upper cervical dislocations cause death due to injury of phrenic nerves C3 to 5 leads to diaphragm paralysis

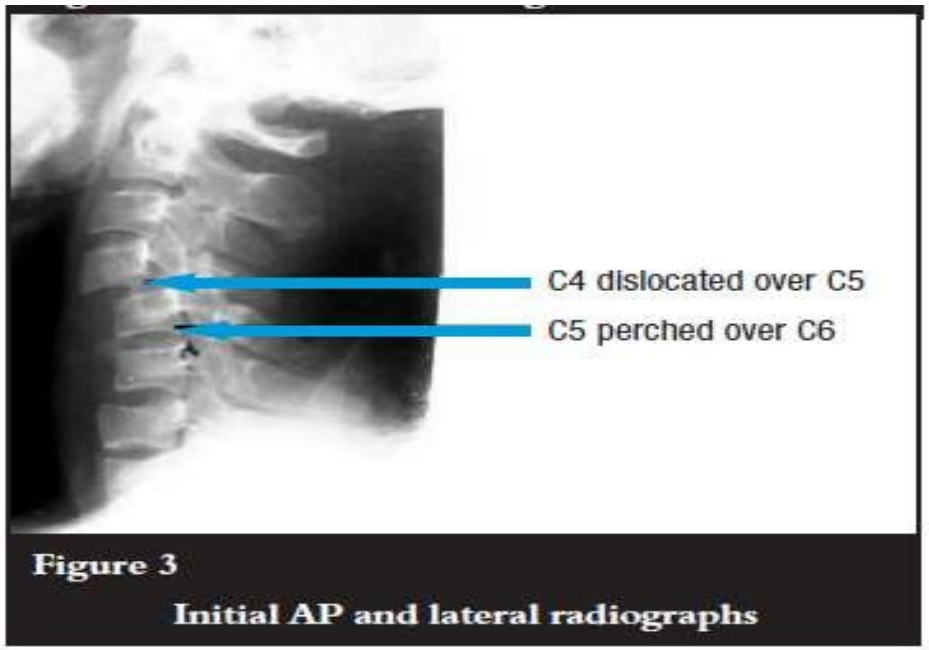
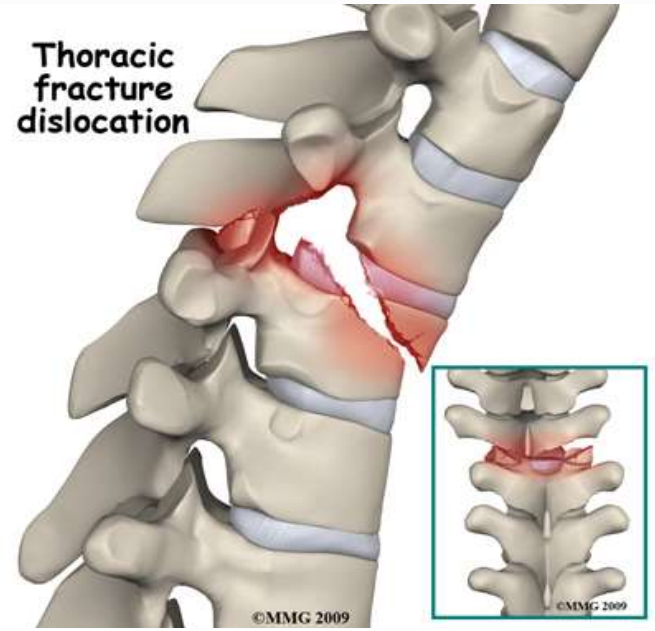


Figure 3
Initial AP and lateral radiographs



Movement of Vertebral column

Flexion is a forward movement

Extension is a backward movement

Both are extensive ***in the cervical and lumbar regions***

but restricted in the thoracic region.

Lateral flexion is the bending of the body to one or the other side.

It is extensive in the cervical and lumbar regions but restricted in the thoracic region.

Rotation ***is a twisting of the vertebral column.*** This is least extensive in the **lumbar region**.

Circumduction is a combination of all these movements.

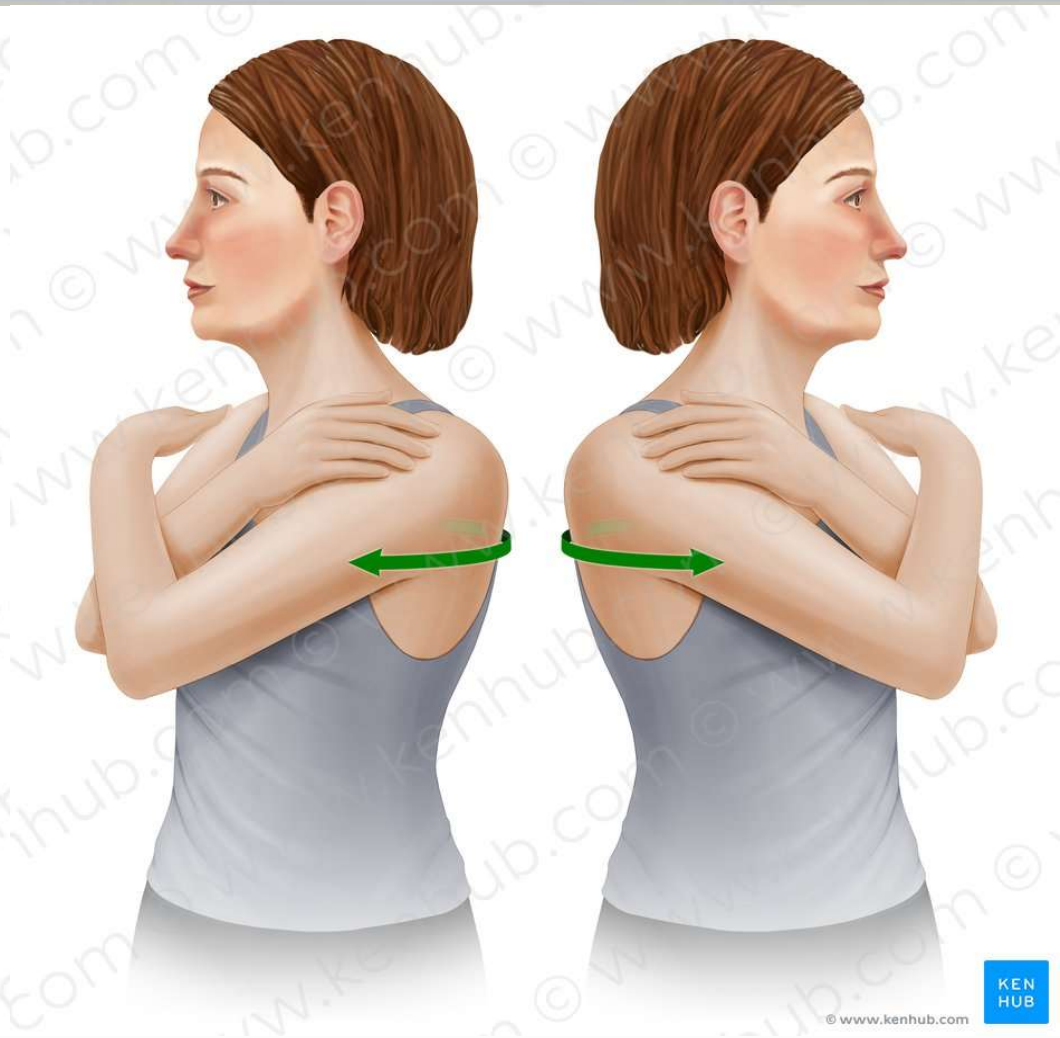
Movement of Vertebral column

Flexion

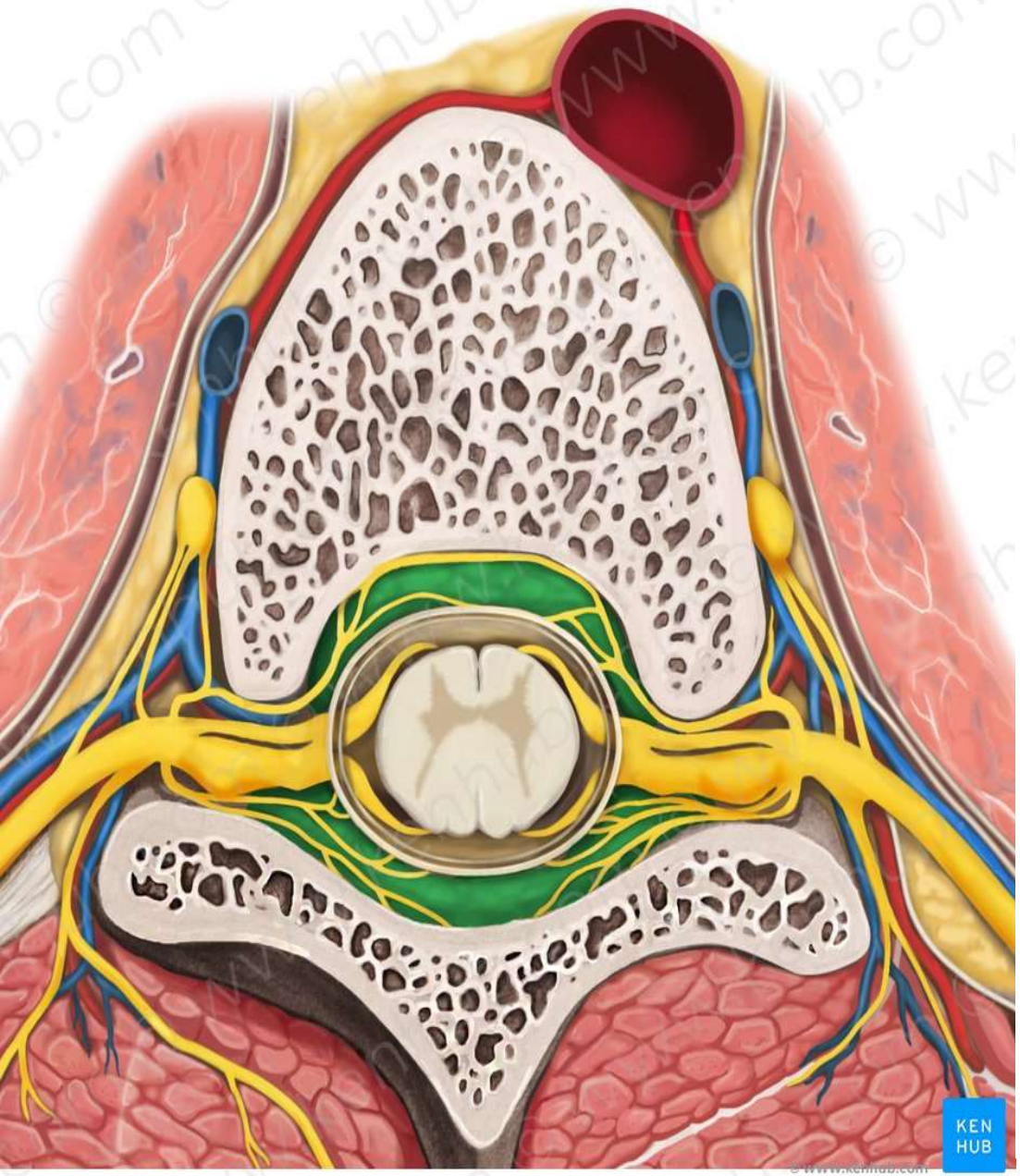
Extension

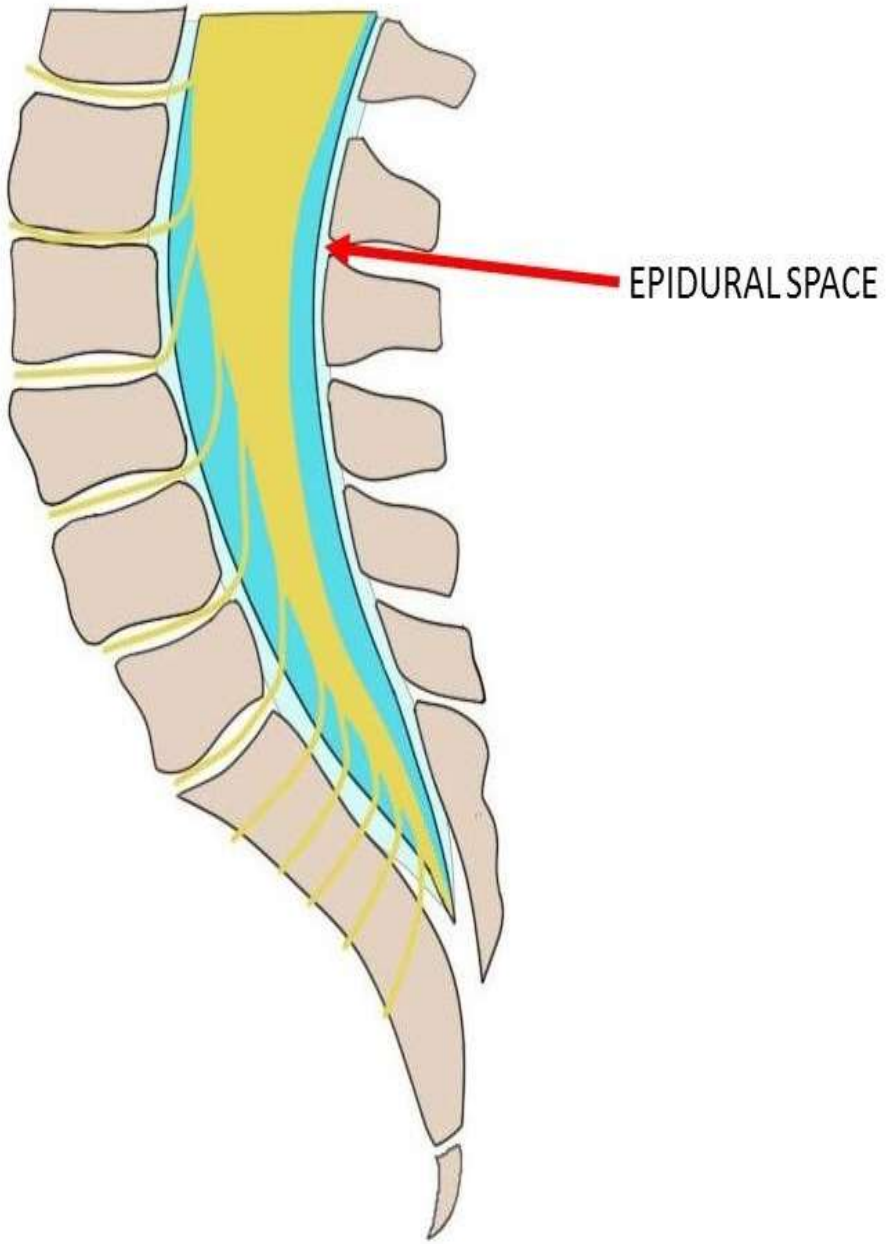
Movement of Vertebral column

Lateral flexion



Rotation





Vertebral venous plexus

Is a valveless plexiform of veins

Location : epidural space between the wall of the vertebral canal and the dura mater

Tributaries from

- ✓ Spinal cord
- ✓ Vertebrae
- ✓ Vertebral veins
- ✓ Basilar plexus
- ✓ Occipital and sigmoid dural sinuses

Communication

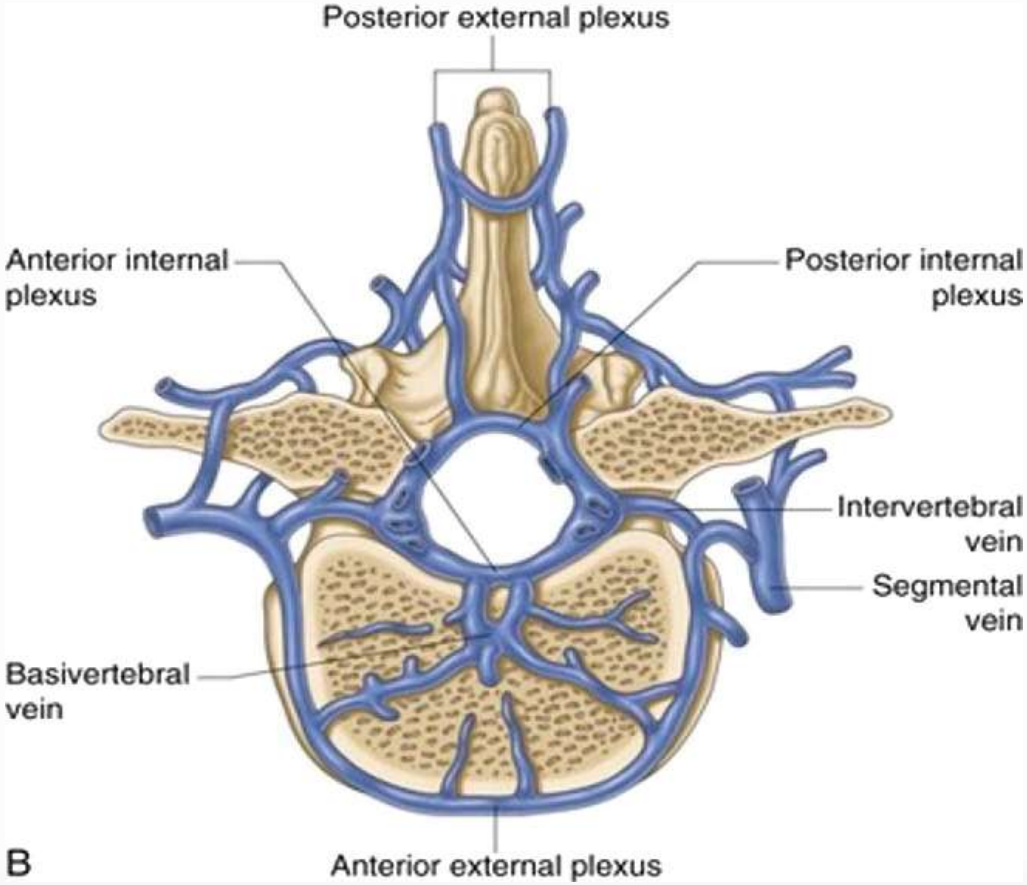
Anteriorly receive the basivertebral veins,which lie within the vertebral bodies.

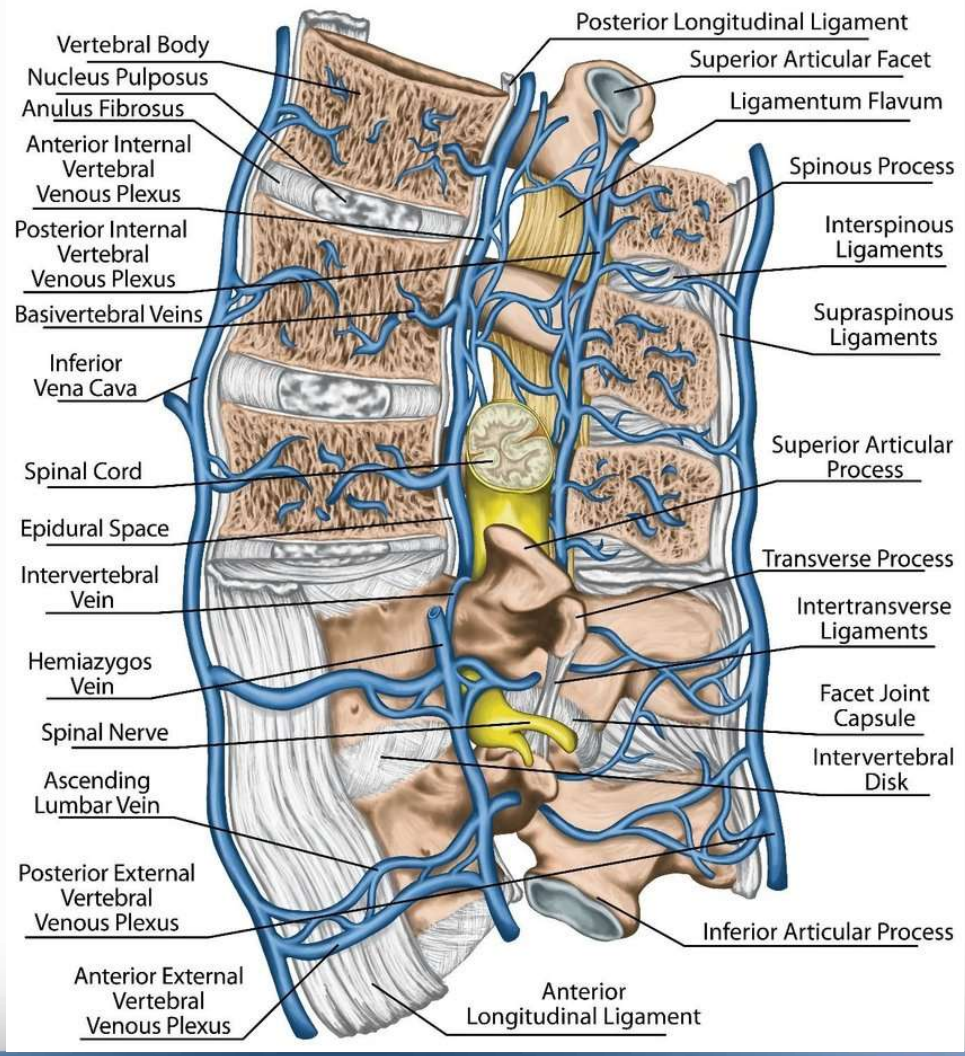
Superiorly with the cranial dural sinuses

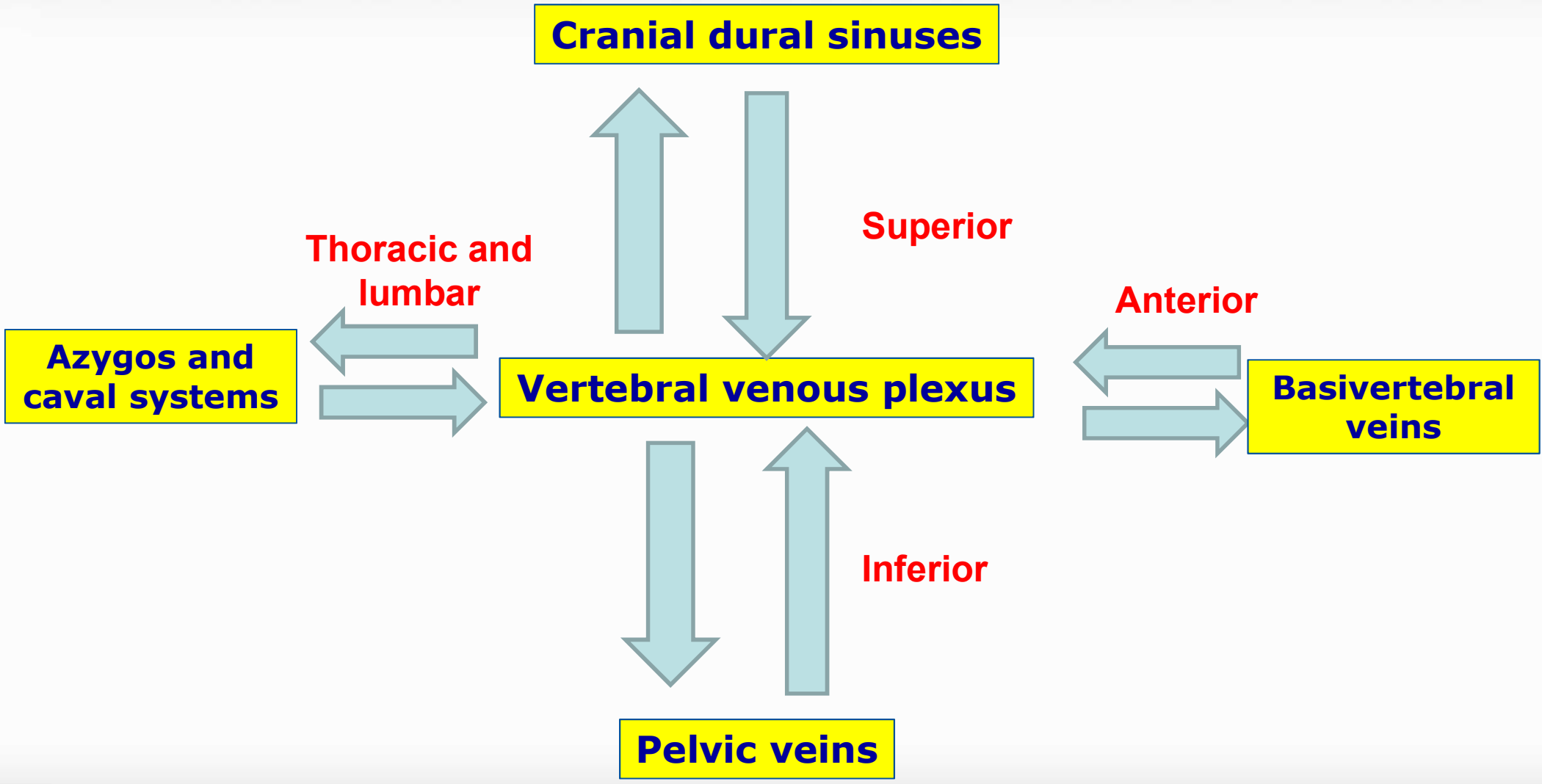
inferiorly with the pelvic veins

It communicates with both the azygos and caval systems in the thoracic and abdominal regions

It is the route of early metastasis of carcinoma from the lung, breast, and prostate gland to bones and the central nervous system (CNS).






Cranial dural sinuses
Superior
Thoracic and lumbar
Anterior
Azygos and caval systems
Vertebral venous plexus
Basivertebral veins
Inferior
Pelvic veins

Thank you