Anatomy of the Spine

Musculoskeletal block- Anatomy-lecture 4

Editing file

Objectives

By the end of this lecture you should be able to:

- ✓ Distinguish and describe the cervical, thoracic, lumbar, sacral and coccygeal vertebrae.
- ✓ Describe the vertebral curvatures.
- ✓ Describe the movement which occur in each region of the vertebral column.
- ✓ List the structures which connect 2 adjacent vertebrae together.
- ✓ List and identify the ligaments of the intervertebral joints.

Color guide :
Only in boys slides in **Blue**
Only in girls slides in **Purple**
important in **Red**
Doctor note in **Green**
Extra information in **Grey**

Spine or Vertebral Column

- The vertebral column extends from the skull to the pelvis.
- It surrounds and protects the spinal cord and supports the whole body.
- It is formed from **33** irregular vertebrae.

It consists of **24** single vertebrae and **2** bones:

- **Sacrum**, (5 fused vertebrae).(Convex)
- **Coccyx**, (4 fused vertebrae).

Of the 24 single bones,

- 7 **Cervical** vertebrae (concave)
- 12 **Thoracic** vertebrae(convex)
- 5 **Lumbar** vertebrae.(concave)

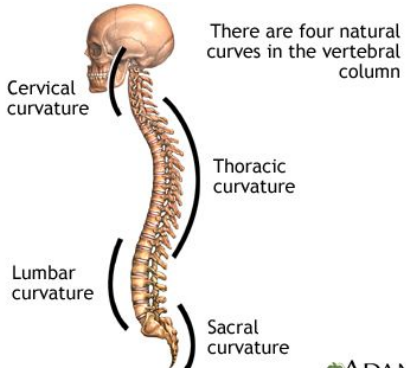
The single vertebrae are separated by pads of flexible fibrocartilage called the **intervertebral disc.**

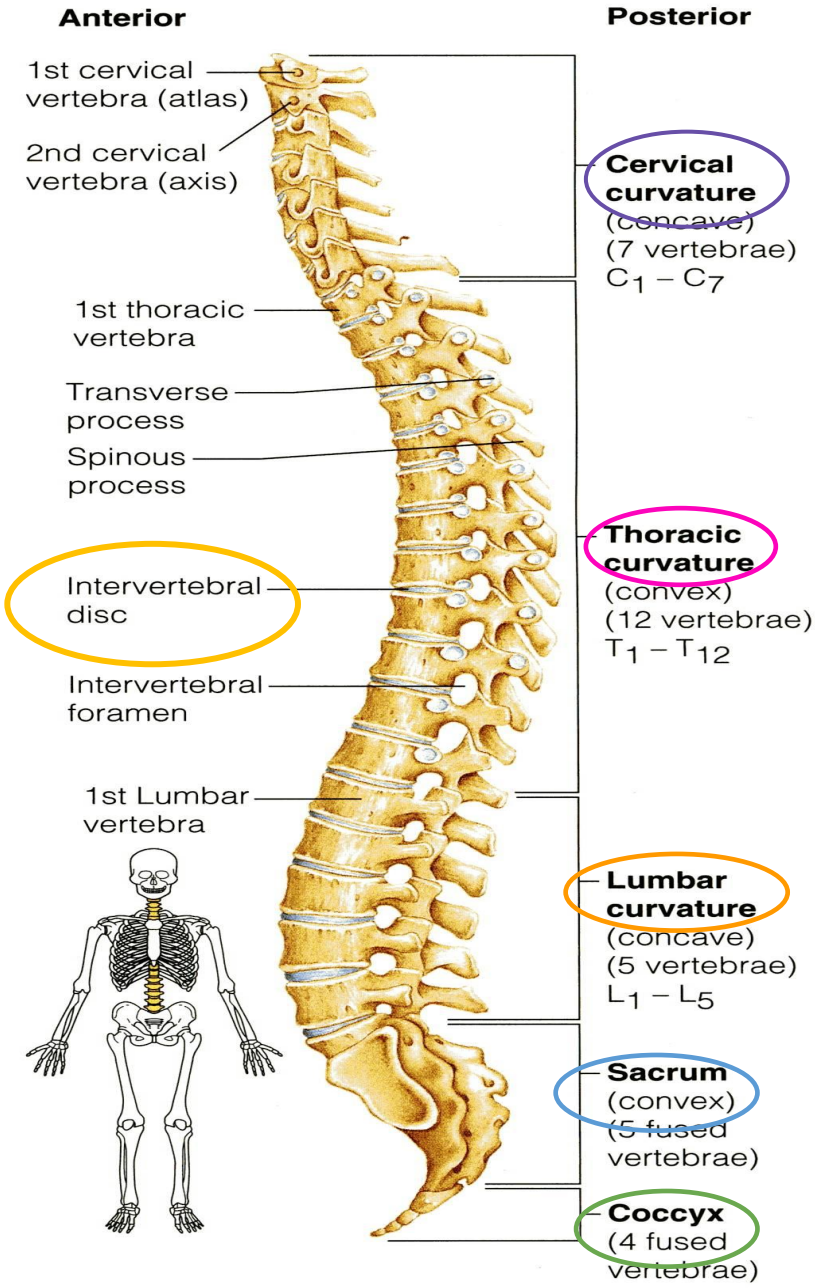
- The **intervertebral discs** cushion the vertebrae and **absorb shocks**.
- The spinal curvature and discs make the body trunk flexible and prevent shock to head while walking or running.

- We have **2** spinal curvatures:

1) **Primary curvature** (present at birth): Concave forward
   - **Thoracic**
   - **Sacral regions**

2) **Secondary curvature** (present after birth): Convex forward
   - **Cervical** (after the baby holds his head 6th month)
   - **Lumbar** (after walking around one year)





Typical Vertebra

- Any vertebra is made up of:

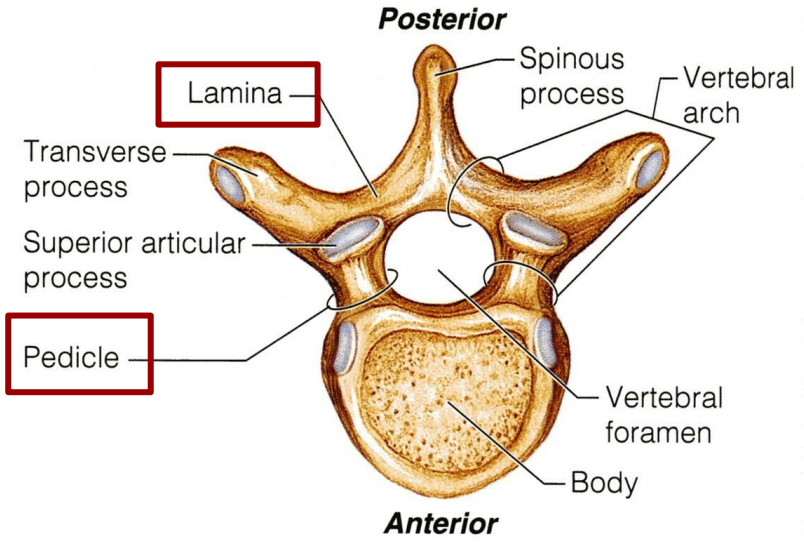
1) **Body or Centrum:**
   - disc-like weight bearing part that lies anteriorly

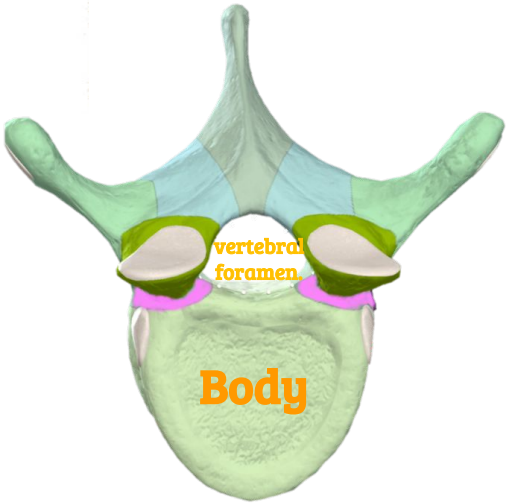
2) **Vertebral Arch:**
   - Formed from fusion of 2 pedicles and 2 laminae

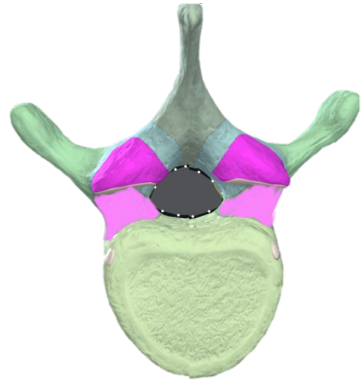
- Vertebral foramen lies between the body and the arch
- The spinal cord passes through the vertebral foramen.

We have **7** processes:
- 2 → transverse processes: lateral projections from the arch
- 2 → superior articular processes: paired projections lateral to the vertebral foramen
- 2 → inferior articular processes: paired projections lateral to the vertebral foramen
- 1 → spinous process: single projection posteriorly

} forms joints between vertebrae







Atlas & Axis

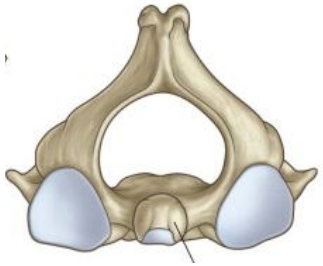
- The 7 **Cervical vertebrae** (identified as C1 to C7) form the neck region of the spine.
- The first two vertebrae (**atlas** and **axis**) are different because they perform functions not shared by the other cervical vertebra

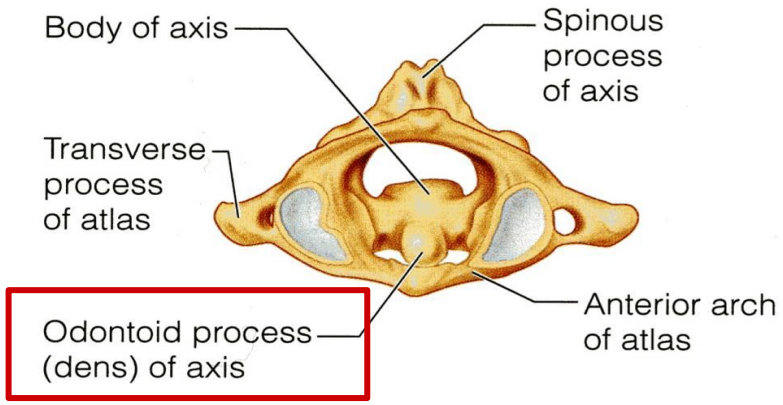
Atlas (C1):

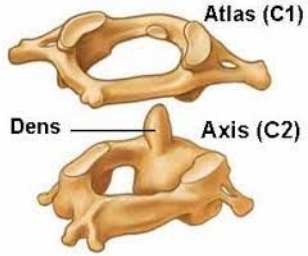
- has no body and is formed of 2 lateral masses.
- contain kidney shaped facets superiorly.
- The facets forms a joint with the occipital condyles of the skull form **atlanto-occipital joint**.
- The joint allows flexion, extension, and lateral flexion movements (saying yes). no rotattion

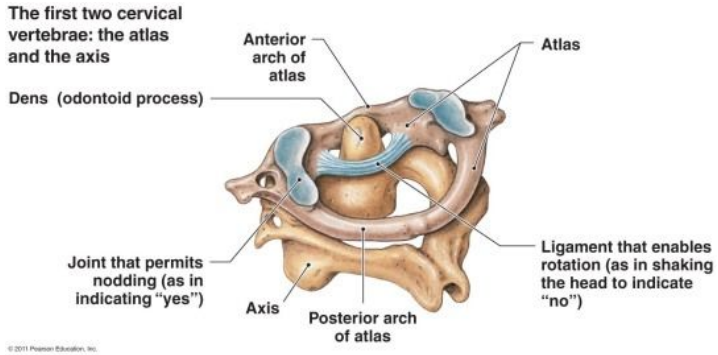
Axis (C2):

- Forms a joint with the atlas called **atlanto-axial joint**.
- The joint allows rotational movement (saying no).
- It has a large upright process called odontoid process or dens that acts as a pivot



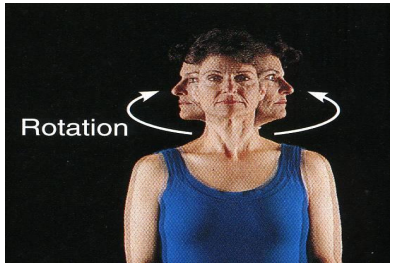




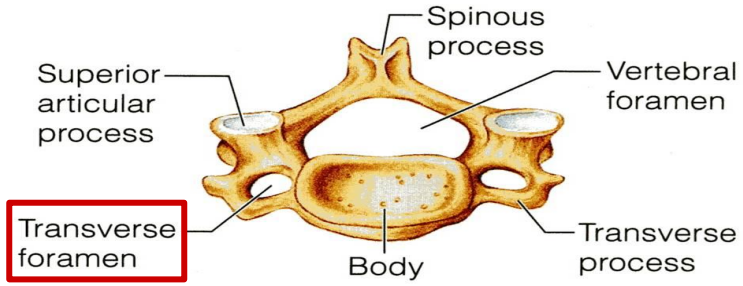


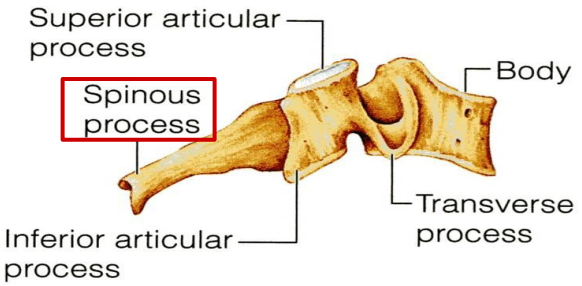
atlanto-occipital joint. (saying yes). no rotation

atlanto-axial joint. (saying no).



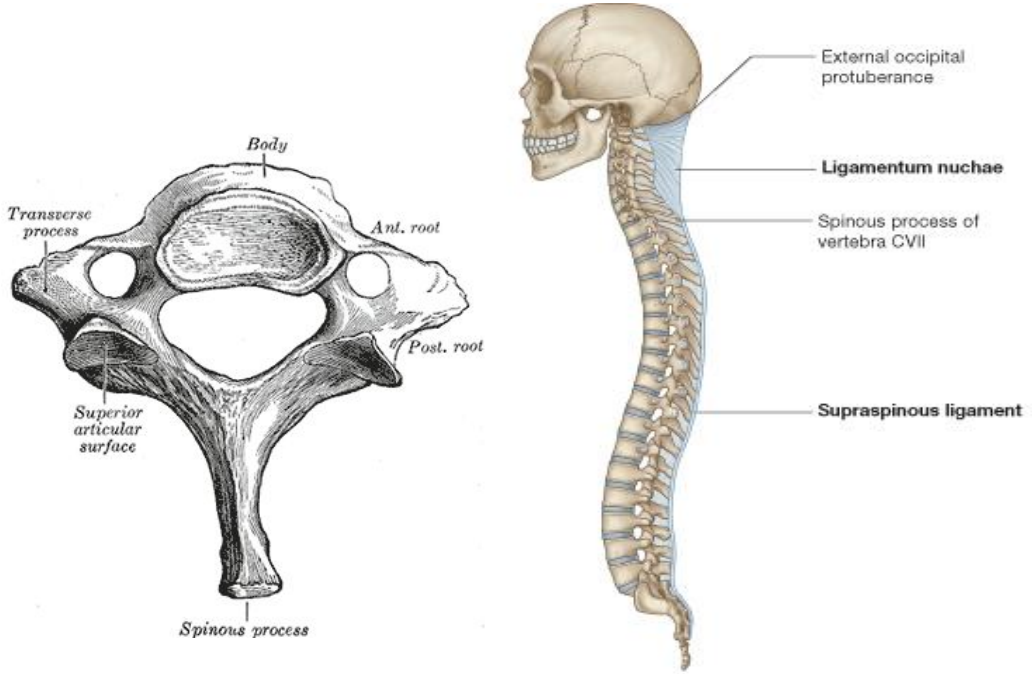
Typical Cervical Vertebrae & C7





The "typical" Cervical vertebrae (C_3 to C_6):

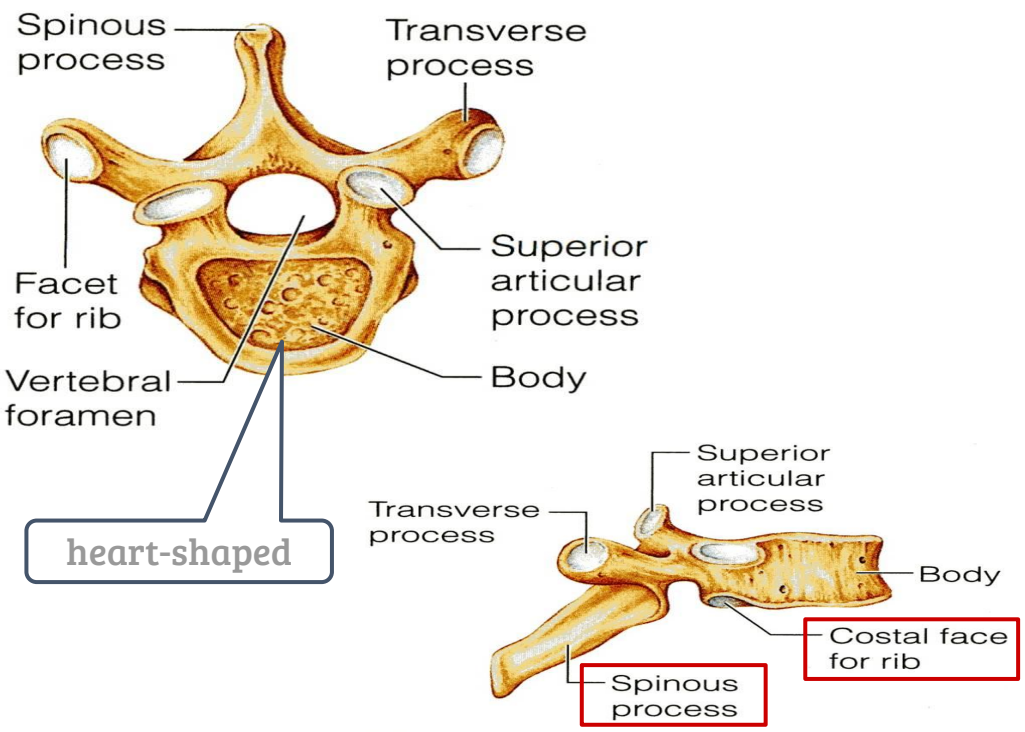
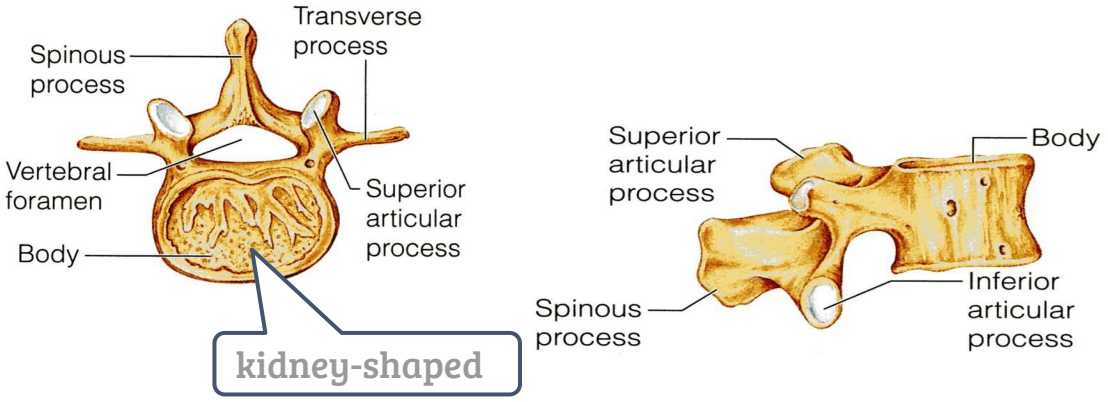
- they're the smallest, lightest vertebrae, and their spinous processes are short and bifid (divided).
- The transverse processes of the cervical vertebrae contain foramina through which the vertebral arteries pass on their way to the brain above. Their transverse foramen is enlarged because of the the cervical enlargement in the spinal cord.



C7 or Cervical prominens

- Longest spinous process which is NOT bifid
- It's the 1st spine to be felt subcutaneously in the root of back of

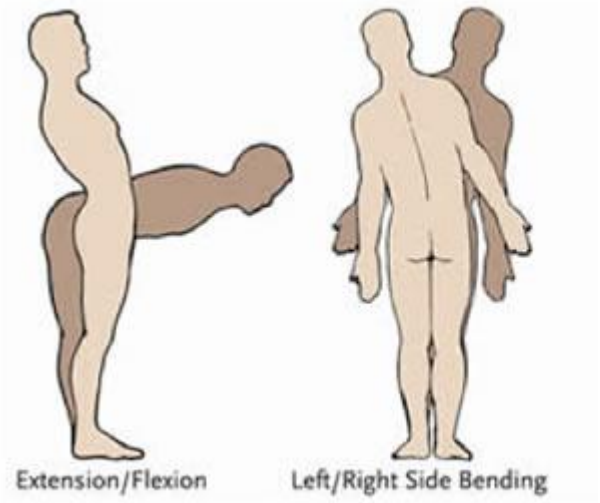
Thoracic & Lumbar vertebra

Thoracic Vertebrae	• The 12 **thoracic vertebrae** (T_1-T_{12}) are almost typical. • They are larger than the cervical vertebrae. • The body is somewhat heart-shaped and has two **costal demifacets** (articulating surfaces) on each side, which receive the heads of the ribs. Demi= not complete • The **spinous process** is long and hooks sharply downward.	
Lumbar Vertebrae	• The 5 **lumbar vertebrae** (L_1-L_5) have massive, block like bodies. • They have short, hatchet-shaped **spinous processes.** • They are the most solid of all vertebrae.	

Movements of the thoracolumbar spine

The following movements are possible on the spine:

flexion, extension, lateral flexion and rotation.



Flexion, extension and lateral flexion

- **Thoracic** spine: the ribs, costal cartilage, and sternum restrict the range of movement
- **Lumbar** spine: allows extensive movement.

Rotation

- **Thoracic** spine: allows extensive movement.
- **Lumbar** region: least extensive movement.

Sacrum & coccyx

- The **sacrum** is formed by fusion of 5 vertebrae.
- Superiorly it articulates with L5, and inferiorly it connects with the coccyx.

Anteriorly:

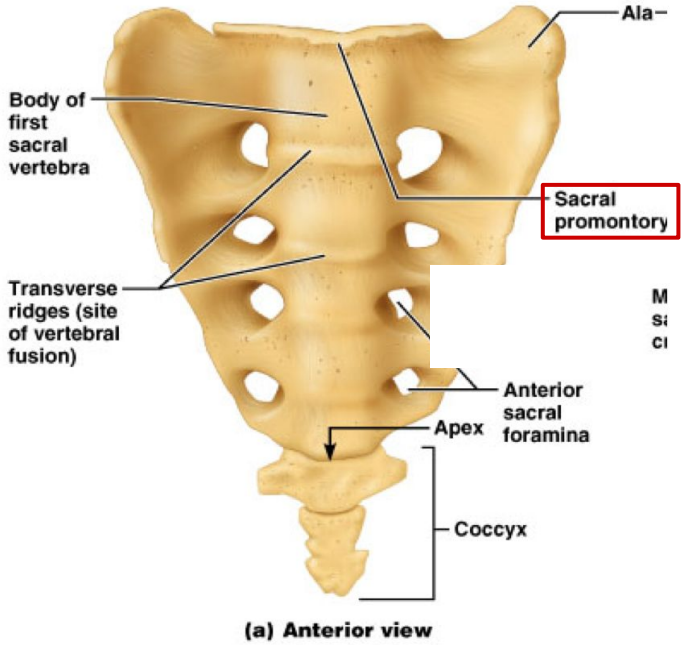
- Sacral promontory is the anterior and upper margin of the first sacral vertebra.
- The wing like **ala** articulate laterally with the hip bones, forming the **sacroiliac joints**.

Posteriorly:

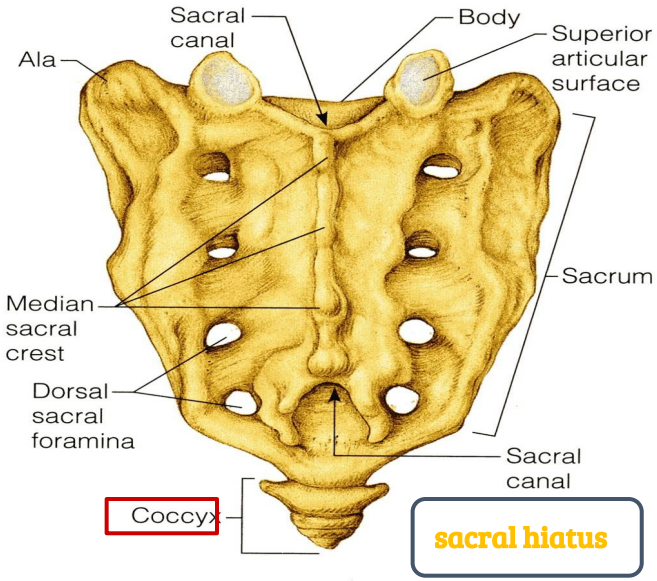
- The sacrum forms the posterior wall of the pelvic cavity.
- Its dorsal midline surface is roughened by the **median sacral crest,** the fused spinous processes of the sacral vertebrae.
- This is flanked laterally by the **dorsal sacral foramina.**
- The vertebral canal continues inside the sacrum as the **sacral canal.**

(holds the cauda equina not the spinal cord)

- The canal opens inferiorly in what is called **sacral hiatus.**



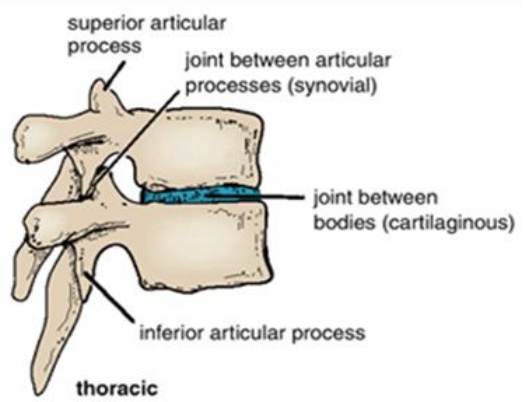
(a) Anterior view

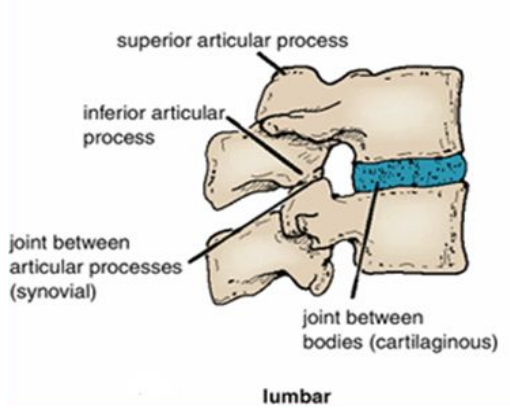


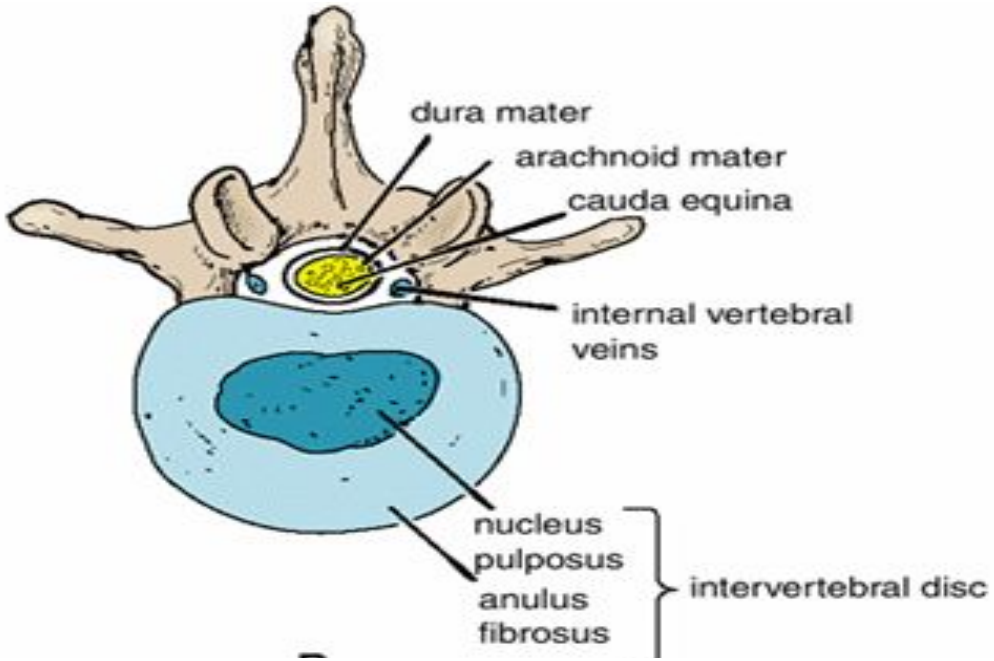
❖ The **coccyx** is formed from the fusion of 4 tiny, irregularly shaped vertebrae.

Joints between two vertebral bodies

- It is a secondary **cartilaginous** joint.
- The **upper** and **lower** surfaces of the **bodies** of 2 adjacent vertebrae are covered by **thin plates** of **hyaline** **cartilage.**
- Sandwiched between the plates of hyaline cartilage is an **intervertebral disc** of **fibrocartilage.**
- The intervertebral discs forms about **one fourth of the whole 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, called** the **anulus fibrosus,** composed of fibrocartilage.
  - **Central part,** the **nucleus pulposus,** a mass of gelatinous material which is made up of water, collagen & chondrocytes.
- **No discs are found between C1&C2 or in the sacrum or coccyx.**

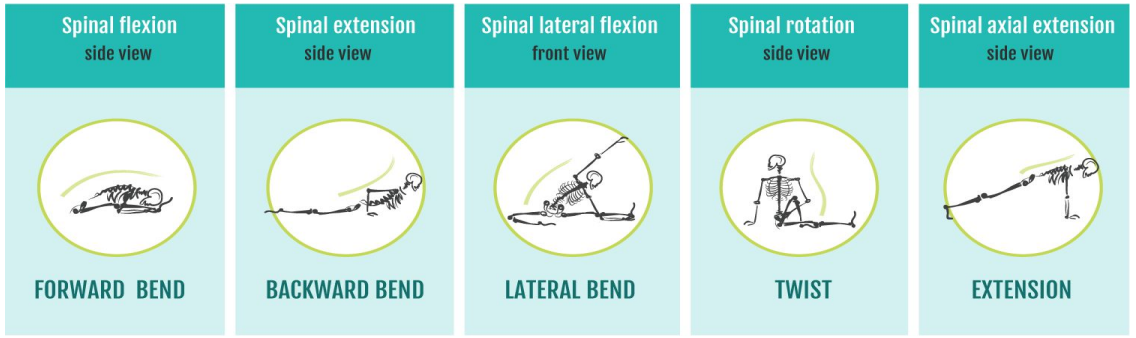




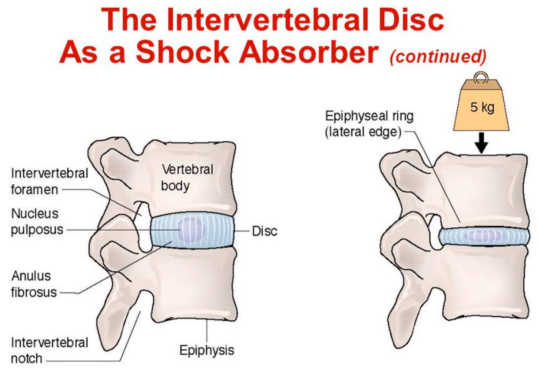


Intervertebral discs function

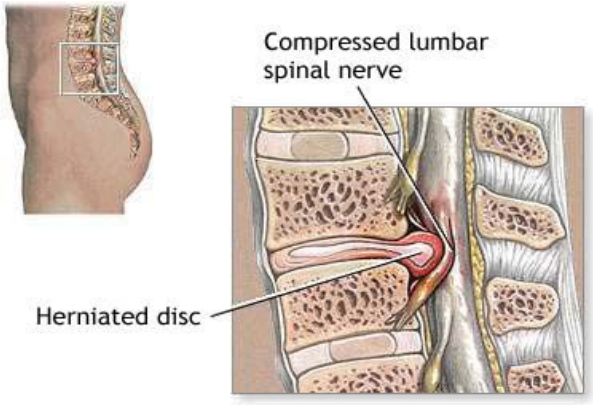
1) Allows the vertebrae to move forward and backward (flexion and extension)



2) Serves as shock absorbers when the load on it suddenly increase (like when you jump)

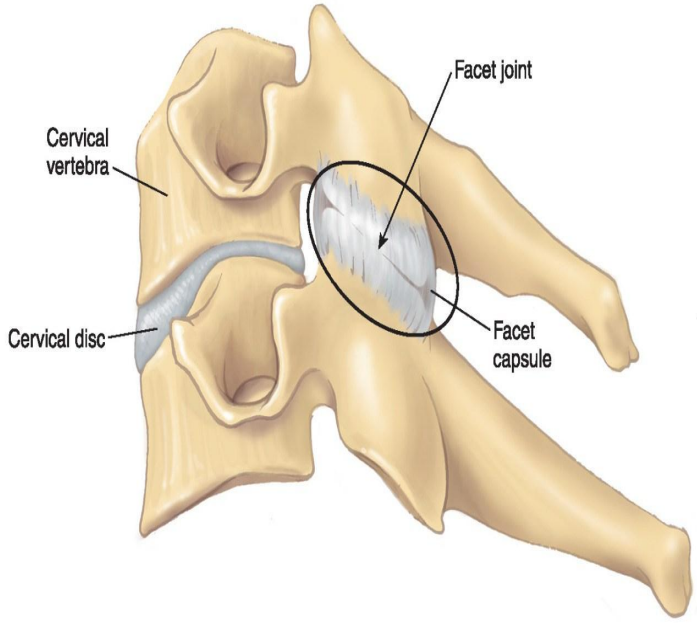


- Sometimes, the **annulus fibrosus** ruptures, **allowing the nucleus pulposus to** herniate and protrude into the vertebral canal.
- where it will press on the spinal nerve roots, or the spinal nerve, or even the spinal cord itself.



Ligaments

- The anterior and posterior longitudinal ligaments run as continuous bands along the anterior & posterior surfaces of the vertebral bodies.
- These ligaments hold the vertebrae firmly together but at the same time permit a small amount of movement to take place.
- There's is a synovial joint between the superior and inferior articular processes that joins two vertebral arches.
- The articular facets are covered with hyaline cartilage and surrounded by a capsule.

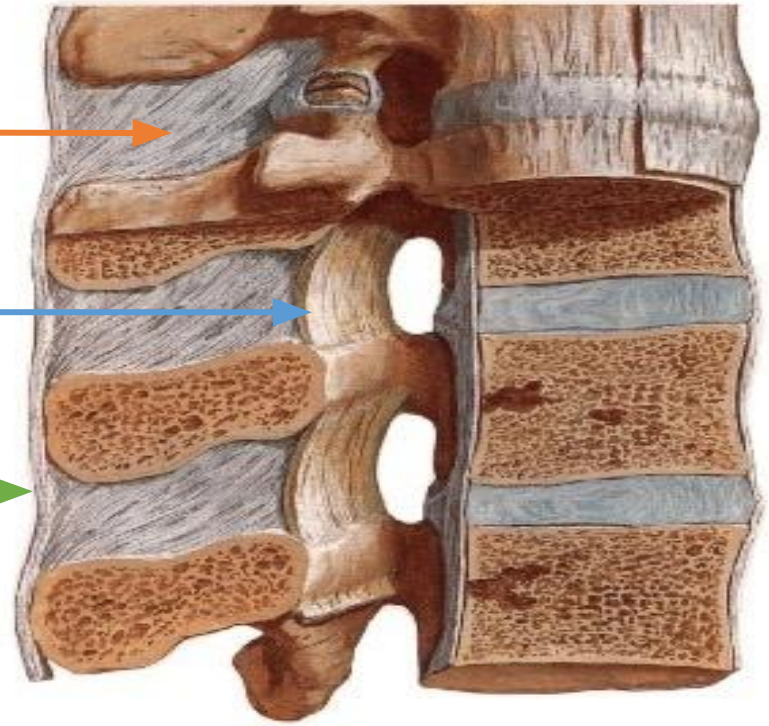


Other Ligaments

Interspinous ligament (connects two spines)

ligamentum flavum (connects two laminae)

Supraspinous ligament (connects two spine tips)



Intertransverse ligament (connects two transverses)

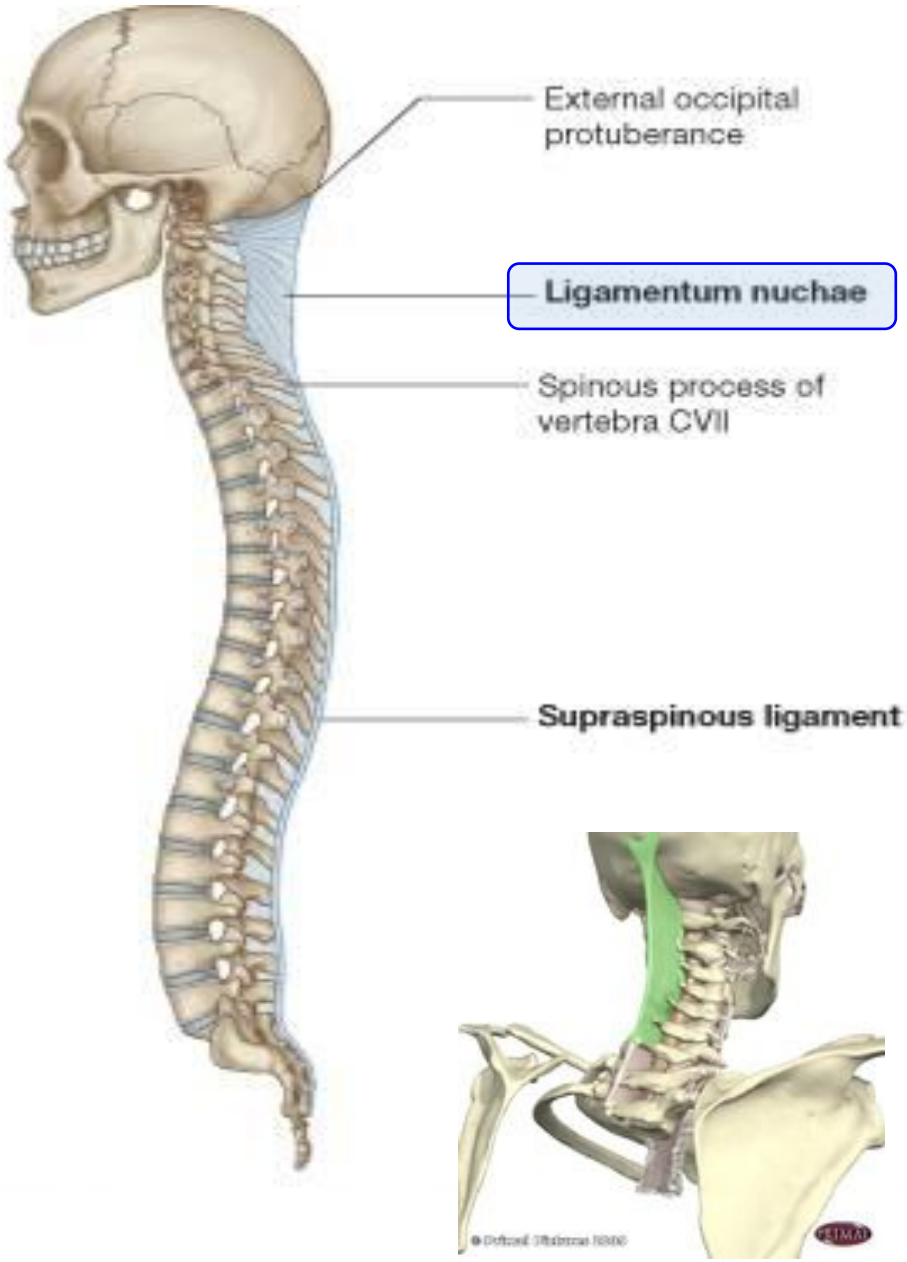
Ligamentum Nuchae

- In the cervical region, the **Supraspinous and Interspinous** ligaments are thickened to form the strong **ligamentum nuchae.**

- It extends from the external occipital protuberance of the skull to the spine of the **seventh** cervical vertebra.

- Its anterior border is strongly attached to the cervical spines in between.

Note: C1-C6 is covered by this strong ligament that why they are not felt subcutaneously.



MCQs

Question 1: Which one of the following is a continuous ligament ?

A. Ligamentum flavum

B. Posterior ligament

C. Supraspinous ligament

D. Interspinous ligament

Question 2: Which region of the thoracolumbar spine is most movable.

A. Thoracic

B. Lumbar

C. Both A and B

D. None of the above

Question 3: Which cervical spine can be felt subcutaneously first

A. C1

B. C2

C. C6

D. C7

Question 4: The ala articulates with the hip bones to form

A. Sacroiliac joint

B. Intervertebral discs

C. Sacral hiatus

D. Epicondylar sacral joint

Question 5: Rotational movement is extensive in:

A. Thoracic region

B. Lumbar region

C. Sacral region

D. coccygeal region

Question 6: Which vertebrae has a kidney-shaped body with shirt spines?

A. Thoracic

B. Cervical

C. Lumbar

D.Sacral

Question 7: Which joint allows you to say: "NO"?

A. Atlanto-occipital joint

B. Atlantoaxial joint

C. Atlantic synovial joint

D. Axial synovial joint

Question 8: Scenoday curvatures are:

A. Convex forward

B. Concave forward

C. Both

D. None of the above

Answers: Q1.B- Q2.B -Q3.D -Q4.A- Q5.A- Q6.C-Q7.B- Q8.A

Team members

Boys team:

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- Salman Alagla
- Ziyad Al-jofan
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★ =This lecture done by

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- Alhanouf Al-haluli
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- Reema Al Masoud
- Renad Al Haqbani
- Nouf Al Humaidhi
- Fay Al Buqami
- Jude Al Khalifah
- Nouf Al Hussaini
- Alwateen Al Balawi
- Rahaf Al Shabri
- Danah Al Halees
- Haifa Al Waily
- Rema Al Mutawa
- Amirah Al Dakhilallah
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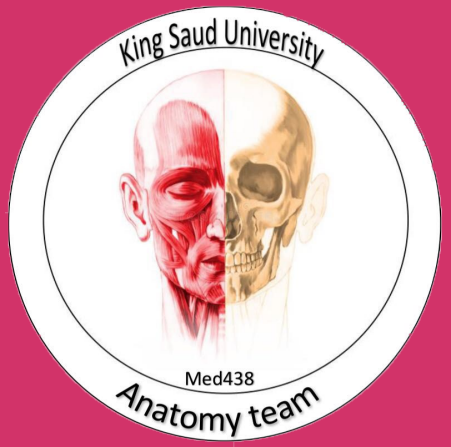
- Renad Al Mutawa
- Ghaida Al Braithen
- Reham Yousef

Special thank for Anatomy team 436



Good luck

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