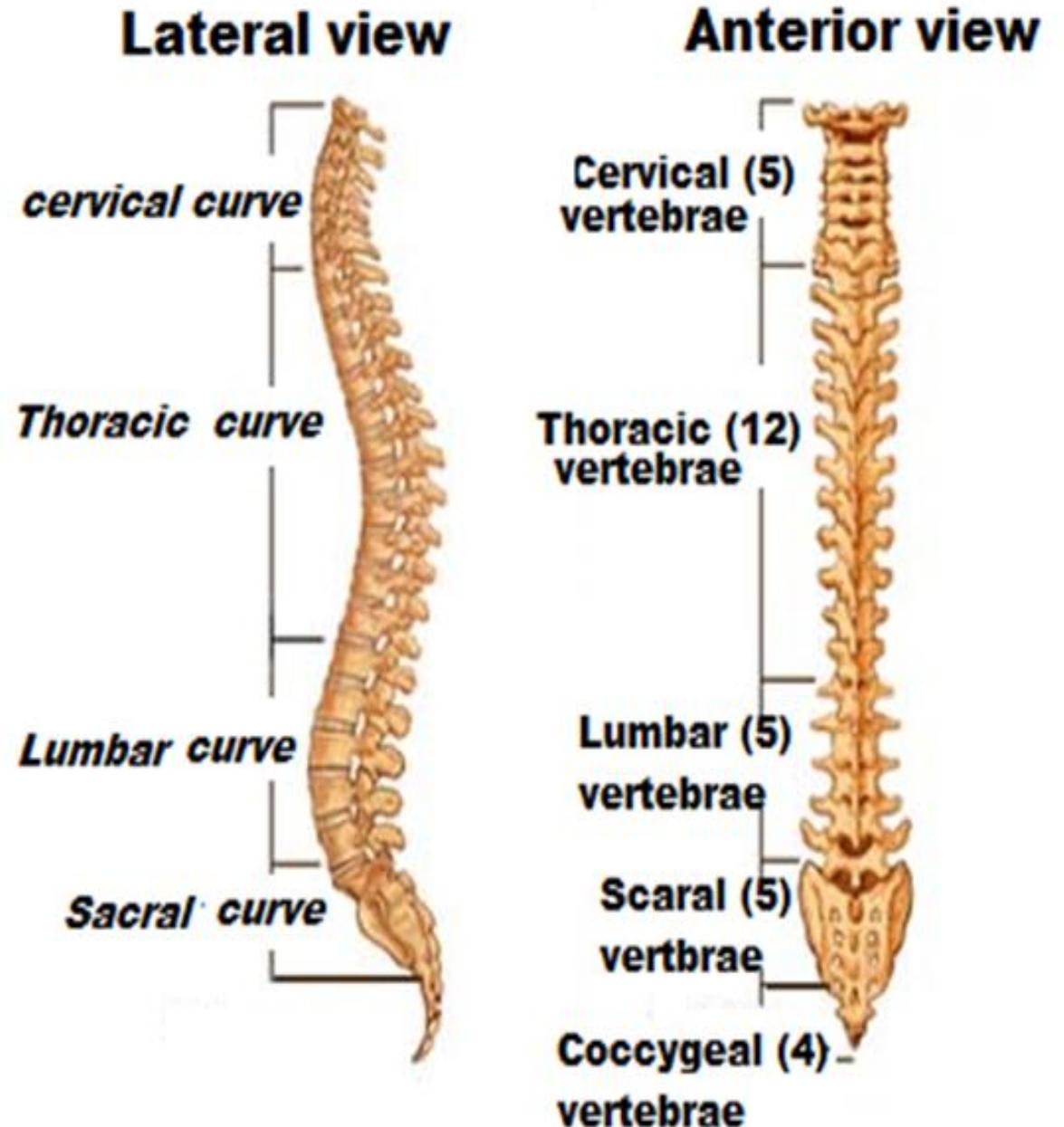


Vertebral Column

DR DALIA M. BIRAM

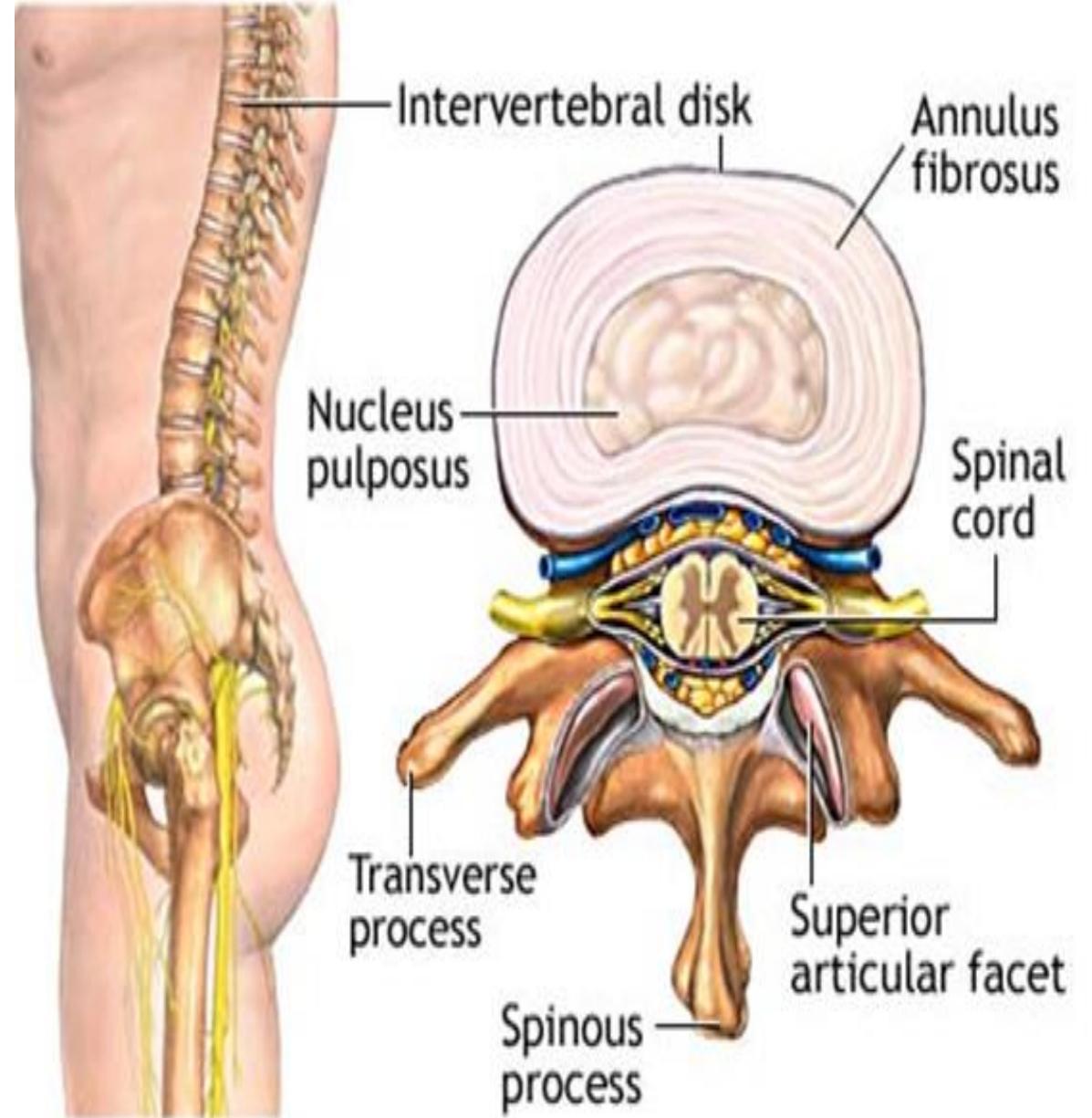
Vertebral Column (Regions and Curvatures)

- Average adult length:
- In male: about 70 cm.
- In female: about 65 cm.
- **Components of vertebral column:**
- **Vertebrae:** comprise about 3/4 of its length. They are divided into:
 - **Separate vertebrae:** 7 cervical, 12 thoracic and 5 lumbar.
 - **Fused vertebrae:** 5 sacral (sacrum) and 3(\pm 1) coccygeal (coccyx).



- **Intervertebral discs:** comprise about 1/4 of the length of the vertebral column, each disc is formed of 2 parts:

- **Annulus fibrosus:** a fibrous ring forming the periphery of the disc.
- **Nucleus pulposus:** a gelatinous material lying in the center of the disc. It acts as a buffer to absorb shocks applied to vertebral column.



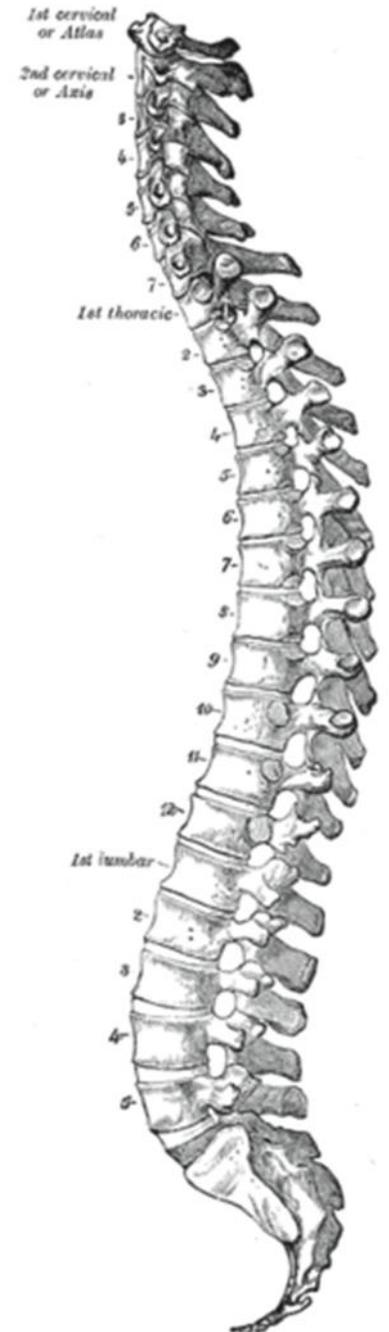
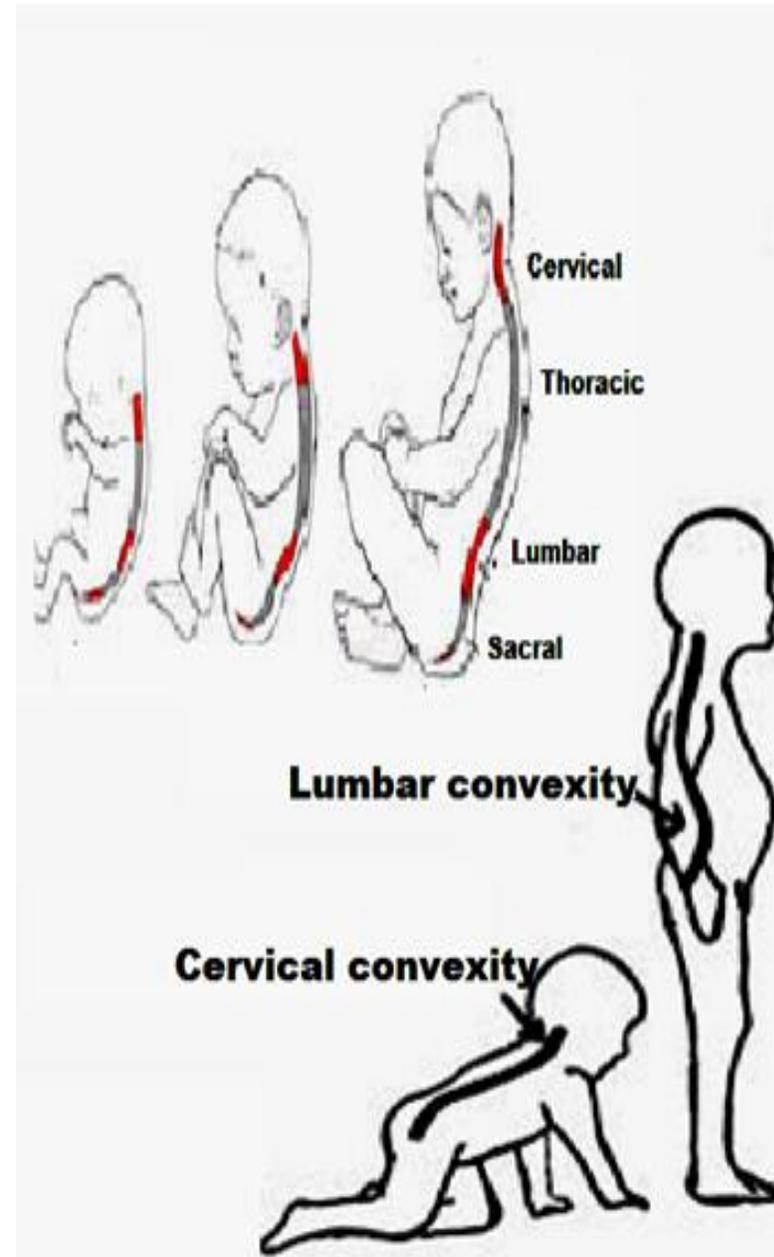
Curvatures of vertebral column

I) Primary curvature: C-shaped; its concavity is directed anteriorly due to the due to the general attitude of flexion of the fetus inside the uterus.

I) Secondary curvatures:

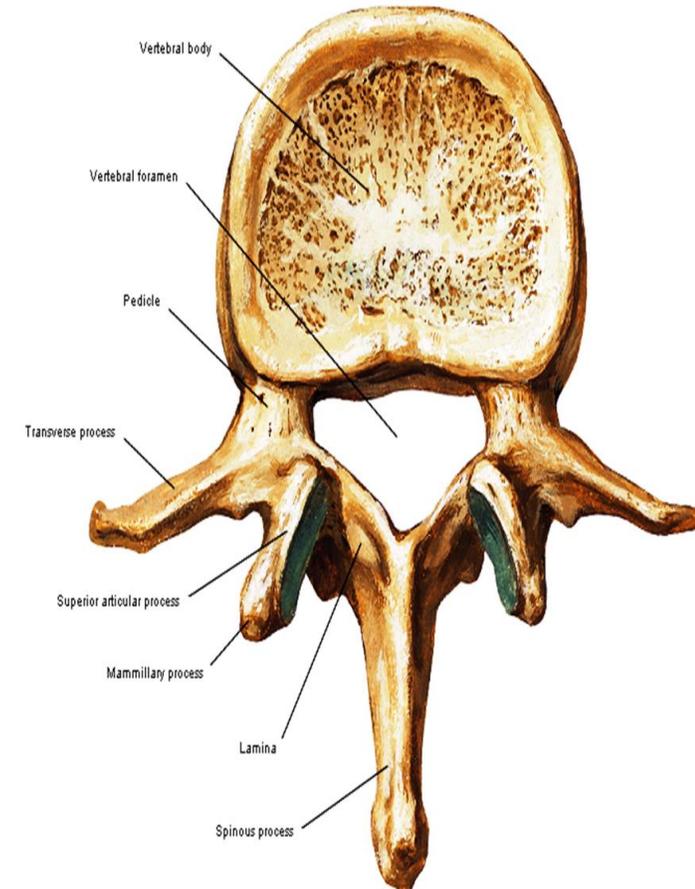
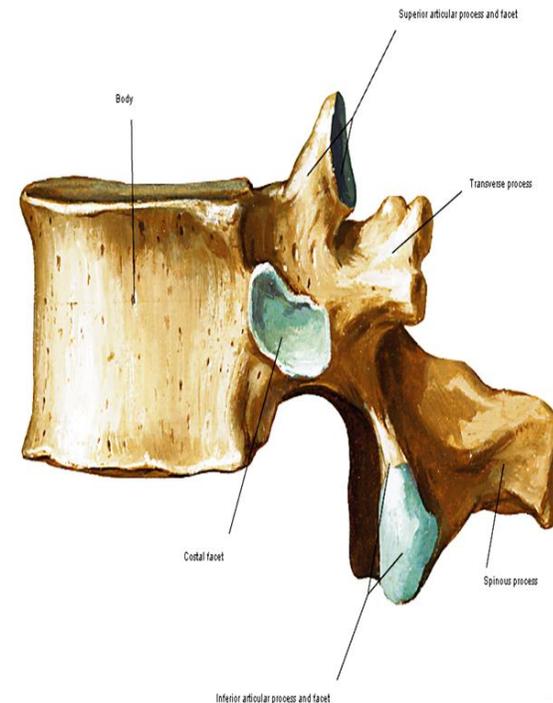
two anterior convexities:

- a. **Cervical convexity:** appears around the age of 3rd to 4th month when the baby starts to raise and support his head.
- b. **Lumbar convexity:** appears at the age of 12th to 18th month when the baby starts to walk.



Parts of typical vertebra

- **Body (Centrum):** variable in size & shape.
- **Two vertebral (neural) arches:** each arch is formed of 2 parts:
- **Pedicle:** lies anteriorly, it is notched above and below to form the **intervertebral foramen** i.e. between the pedicles of the vertebrae, and through which the **spinal nerves** leave the vertebral canal.
- **Lamina:** lies posteriorly.
- **7 processes:**
- **2 Superior articular processes:** each carries a facet to articulate with a facet present on the inferior articular process of the vertebra above.
- **2 Inferior articular processes:** each carries a facet to articulate with a facet present on the superior articular process of the vertebra below.
- **Two transverse processes:** they are directed laterally.
- **A spinous process :** it is directed posteriorly.
- **Vertebral (neural) foramen (or canal):** lies between the 2 vertebral arches and accommodates the spinal cord, vessels and the meninges.



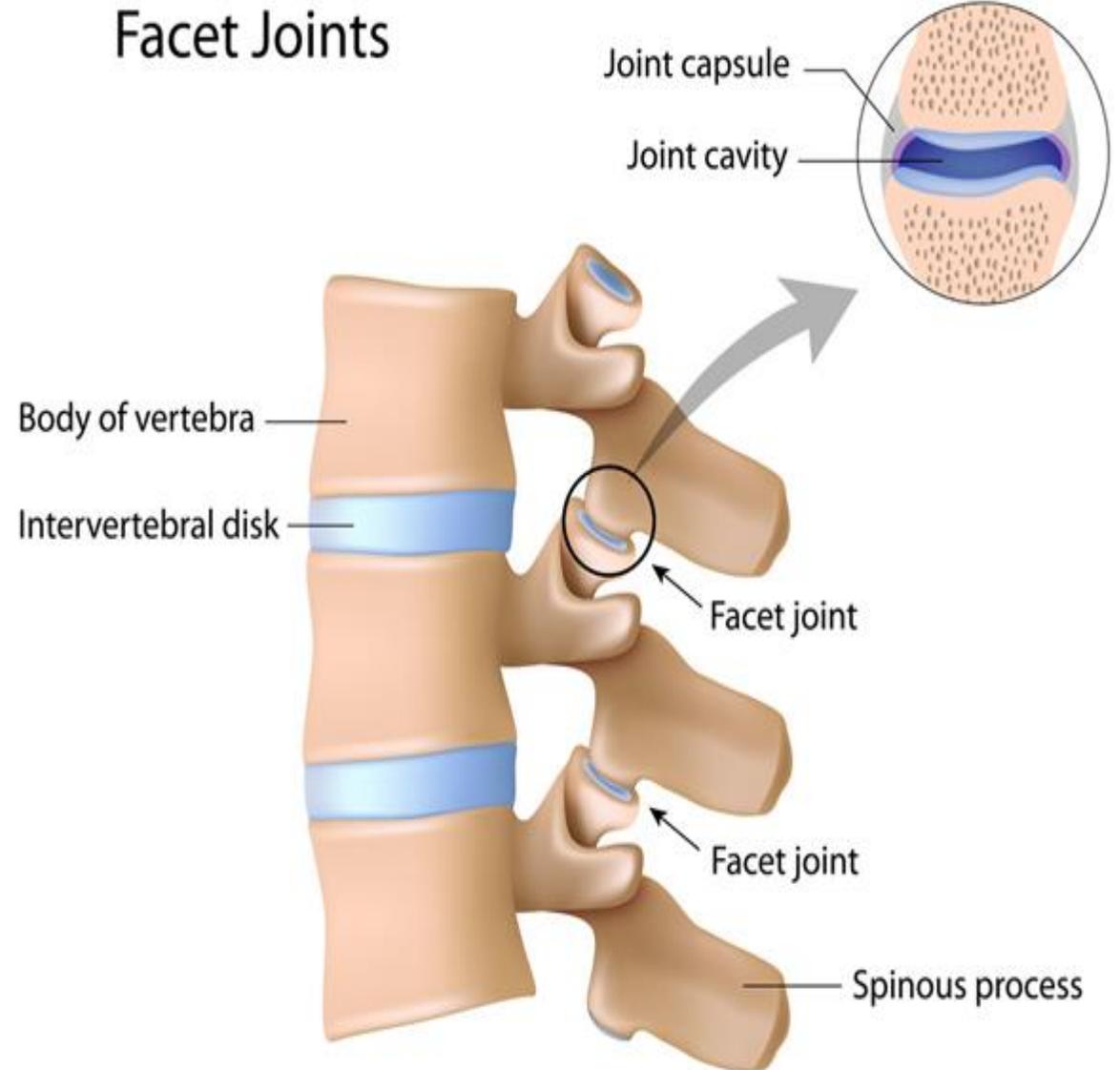
Joints between the vertebrae:

(intervertebral joints)

- 1- intervertebral disc **Secondary cartilaginous joint** between 2 vertebral bodies.

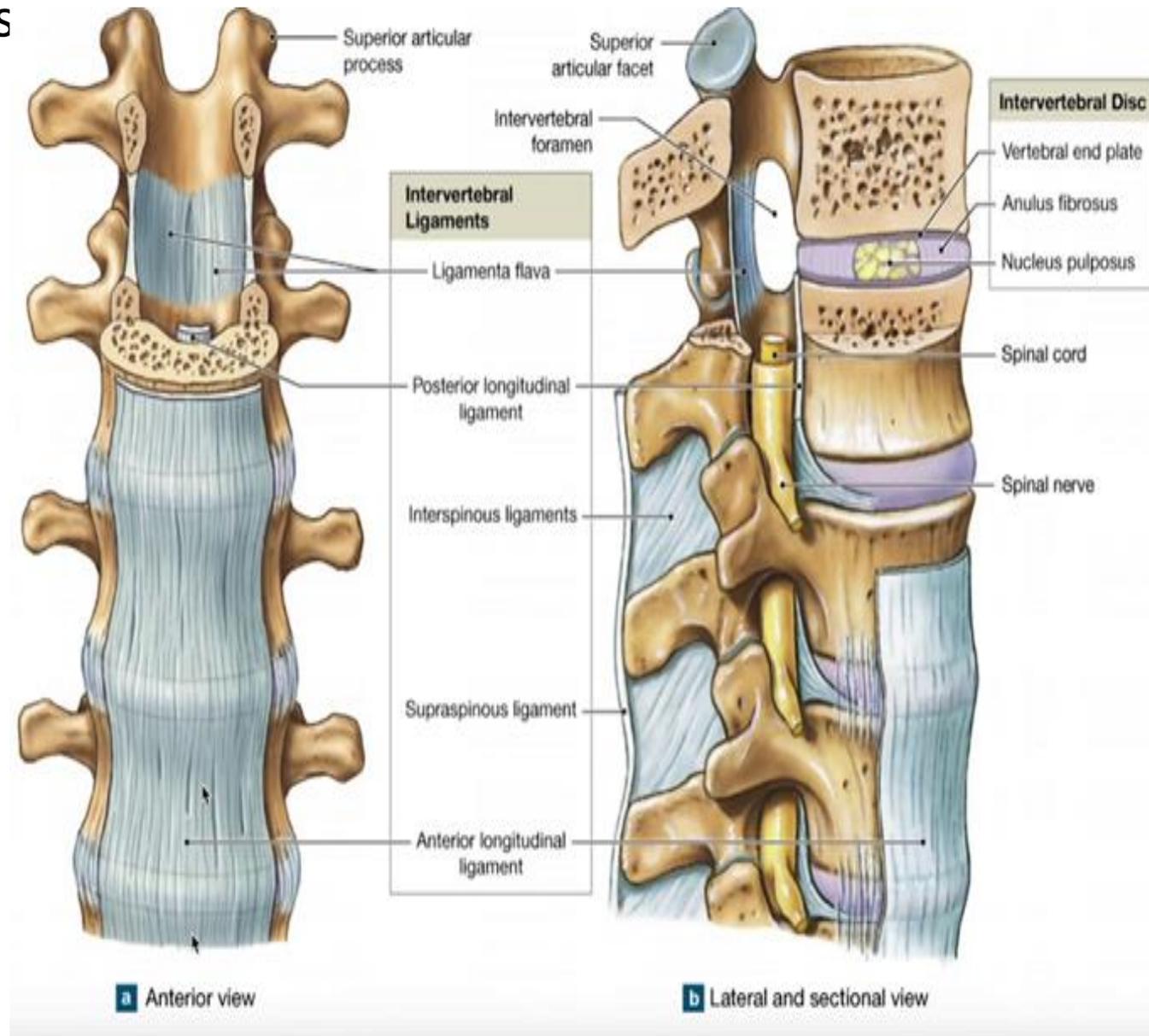
- 2- **facet joint (plane synovial joint)**

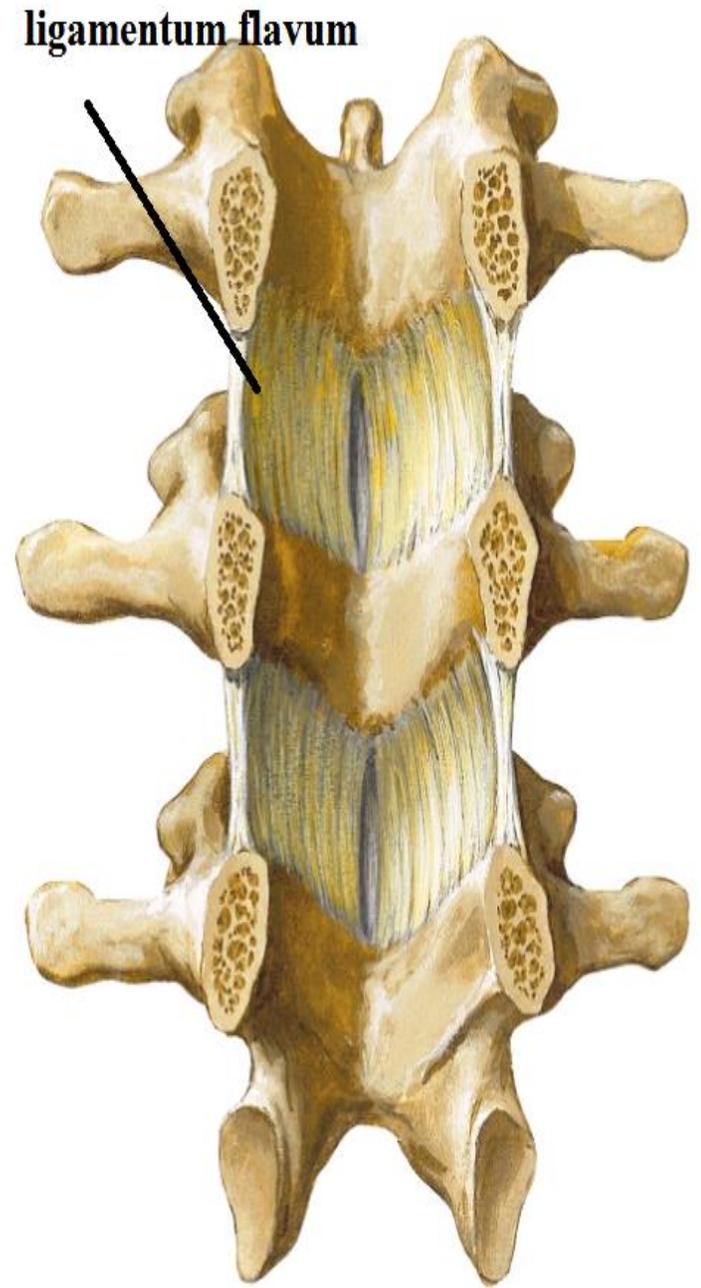
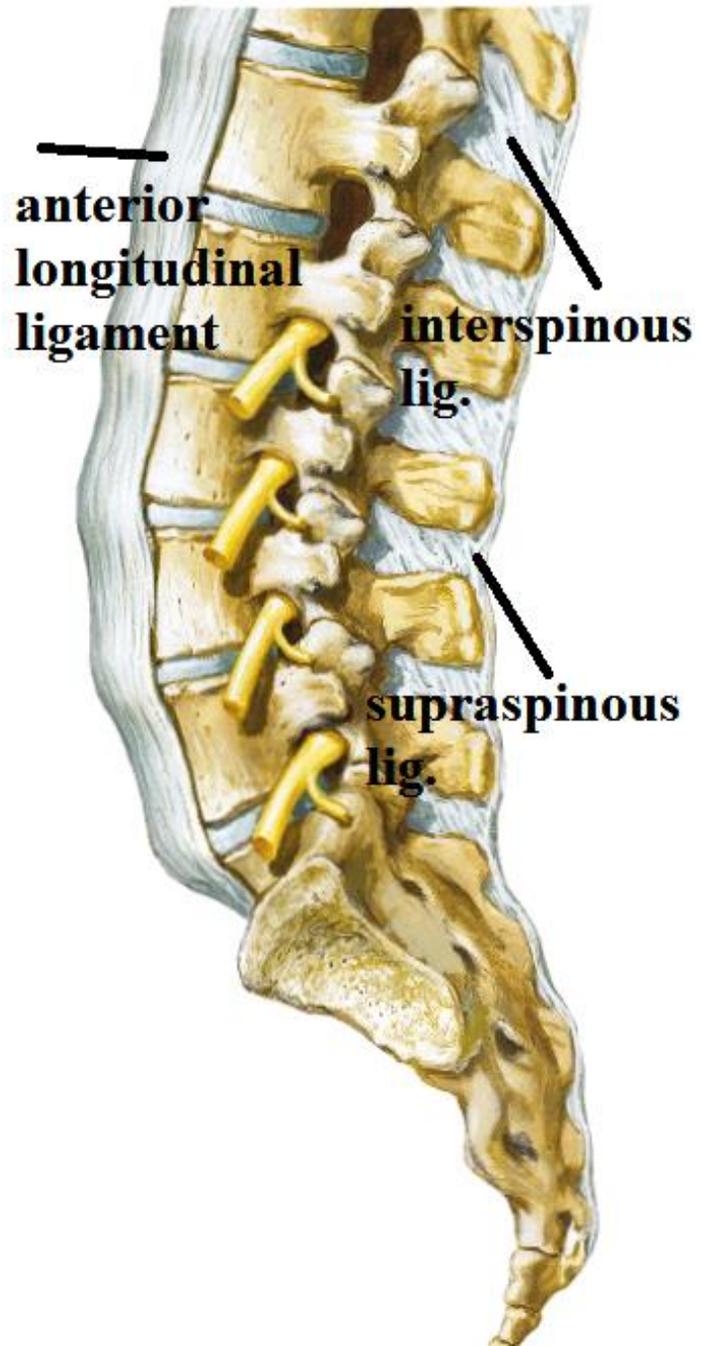
The superior and inferior articular processes of two adjacent vertebrae articulate together



Ligaments between the vertebrae

- **Anterior longitudinal ligament** connects the anterior surfaces of the vertebrae and the intervertebral disc.
- **Posterior longitudinal ligament** connects the posterior surfaces of the vertebrae and the intervertebral disc. It lies inside the vertebral foramen.
- **Ligamentum flavum:** connects the laminae of the vertebrae.
- **Intertransverse ligaments:** between transverse processes of the vertebrae.
- **Interspinous ligaments:** between the spinous processes the vertebrae.
- **Supraspinous ligaments:** between tips of vertebral spinous processes.





Identification of the vertebra:

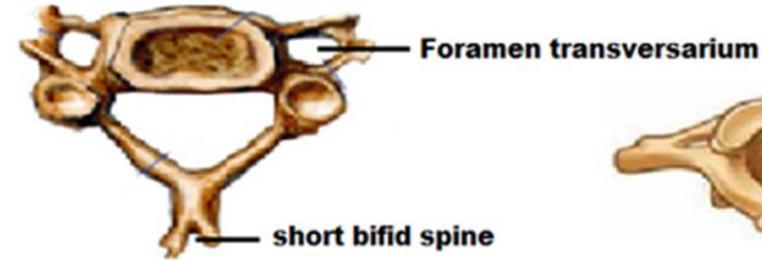
A-If it has a foramen in the transverse process (foramen transversarium): it is a **cervical vertebra**. Look if it has:

1-A short bifid spine..... typical cervical vertebra (3, 4, 5 and 6).

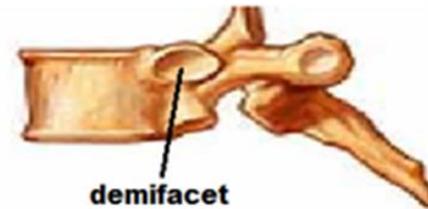
2-No body and is a ring-shaped..... 1st cervical vertebra (atlas).

3-Odontoid process and short thick spine..... 2nd cervical vertebra (axis).

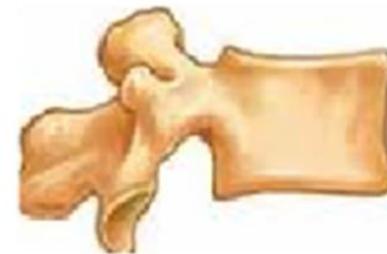
4-A long non bifid spine
7th cervical vertebra (vertebrae prominence)



Typical Thoracic Vertebra



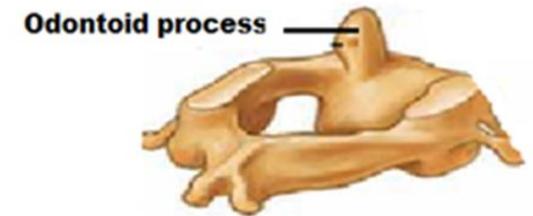
Typical Thoracic Vertebra



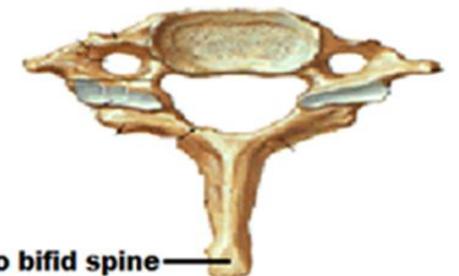
Lumbar Vertebra



C1 Vertebra (Atlas)

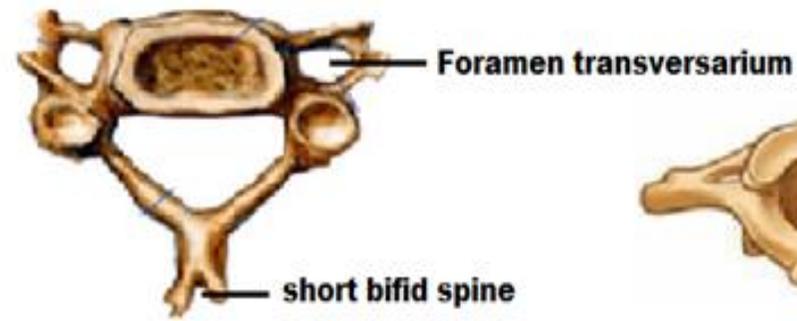


C2 Vertebra (Axis)



C7 (Vertebra Prominence)

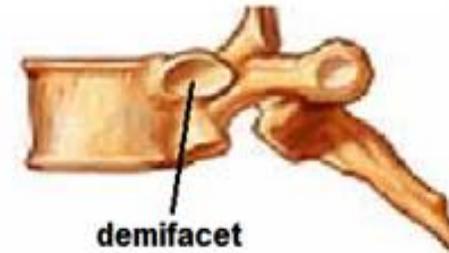
- B- If no foramen transversarium with a facet or demi facet on the side of the body of the vertebra (for articulation with head of a rib and facet on the transverse process (for articulation with tubercle of the rib → **thoracic vertebra**)
- C- If no foramen transversarium and the body is large with no facet or demi facet **lumbar vertebra.**



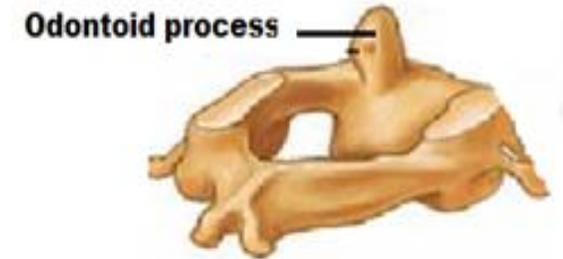
Typical Thoracic Vertebra



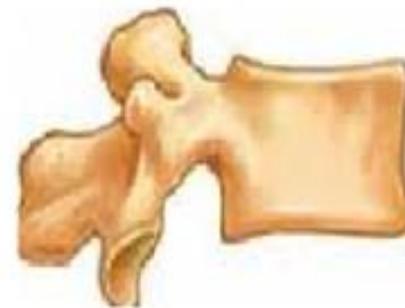
C1 Vertebra (Atlas)



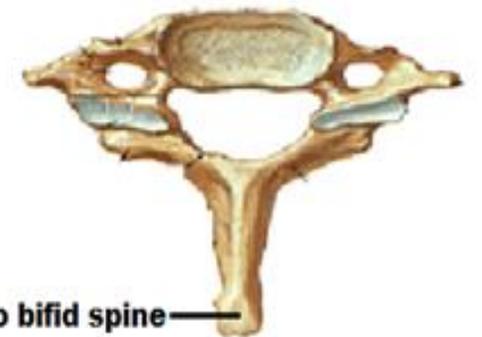
Typical Thoracic Vertebra



C2 Vertebra (Axis)



Lumbar Vertebra



C7 (Vertebra Prominence)

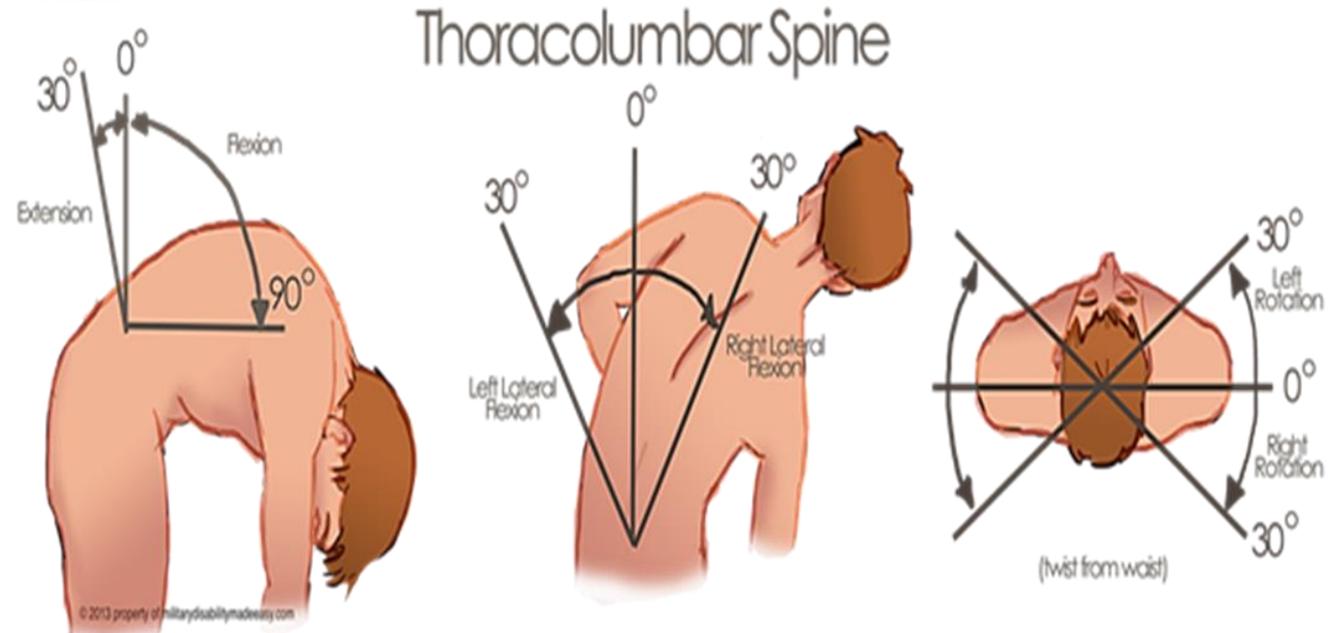
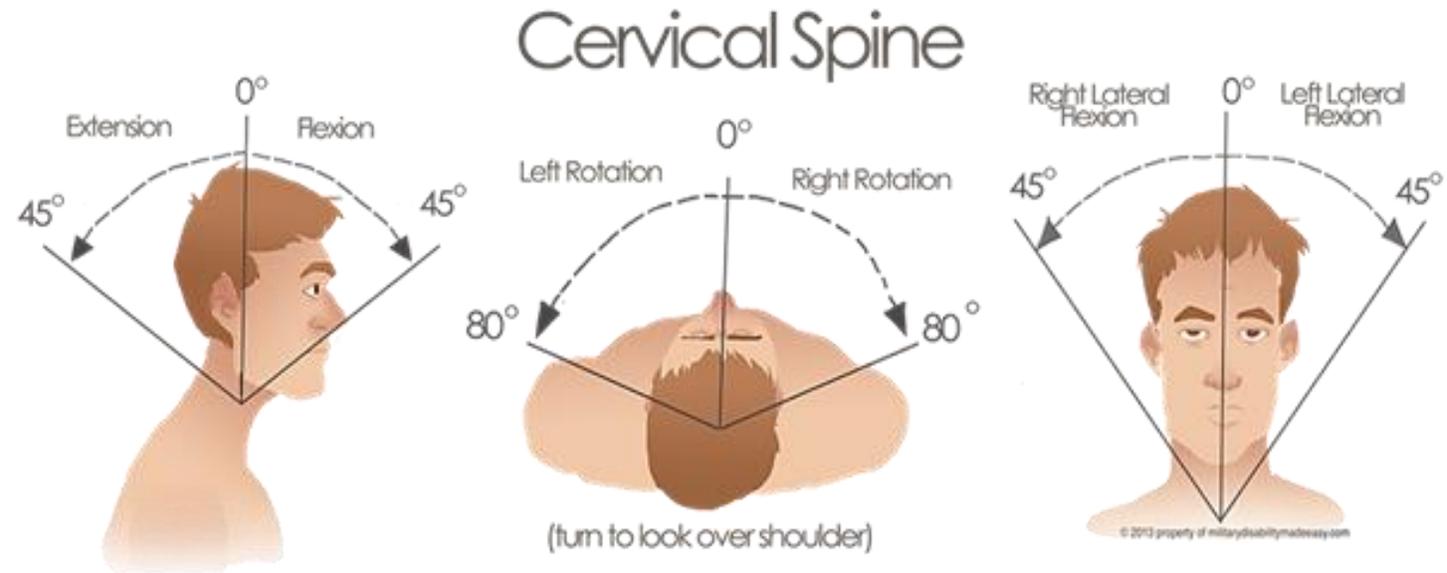
Range of movements of the vertebral column

• I. Cervical region:

- Flexion: 45°
- Extension: 45°
- Lateral flexion: 45°
- Rotation: 80°

• II. Thoracolumbar region:

- Flexion: 90°
- Extension: 30°
- Lateral flexion: 30°
- Rotation: 30°



CERVICAL VERTEBRÆ

C1 ATLAS

-a bony ring formed of

2 lateral masses connected by small anterior arch and a larger posterior arch.

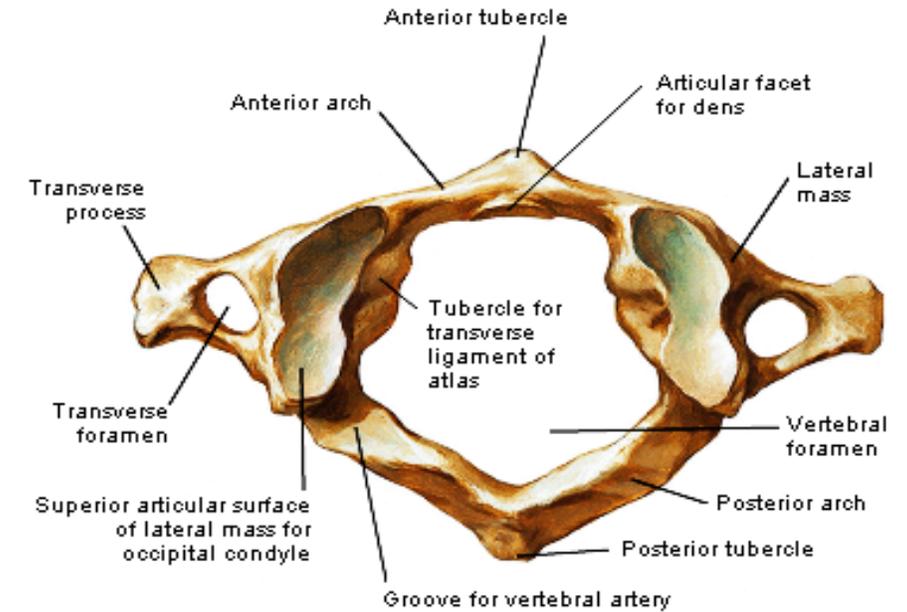
-the 2 Lateral mass carries

a kidney-shaped superior articular facet, articulates with occipital condyle

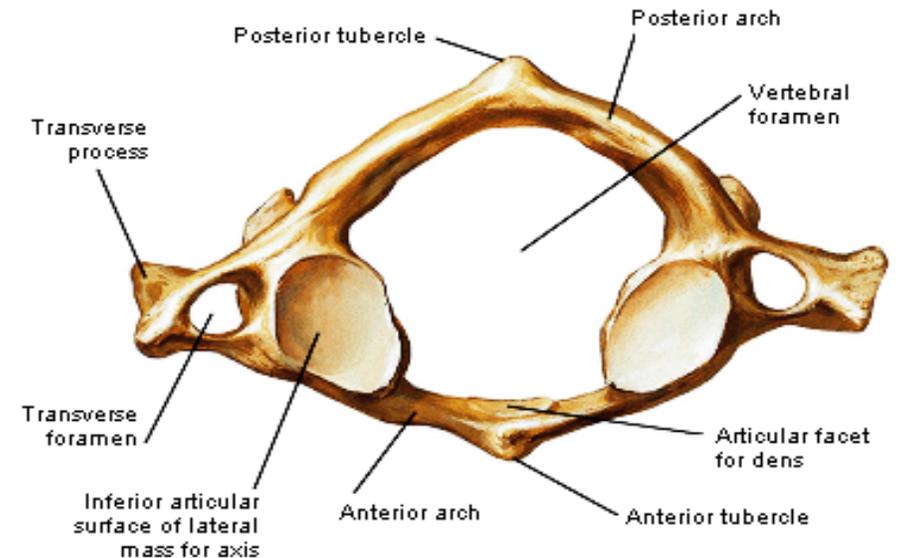
to **form atlanto-occipital joint**

and a nearly circular inferior articular facet, articulates with Body of axis

to form the **lateral atlanto-axial joints**



Atlas (C1): superior view

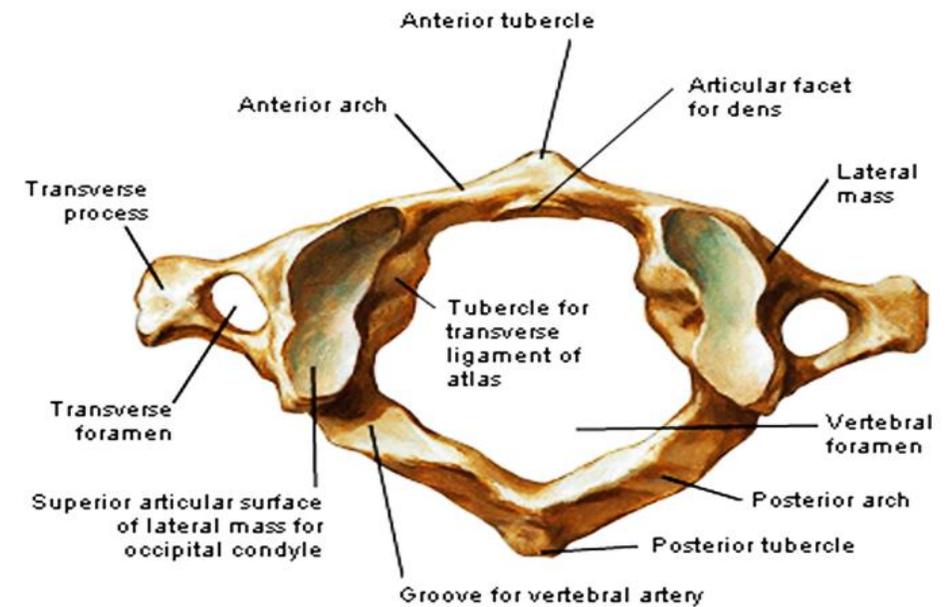


Atlas (C1): inferior view

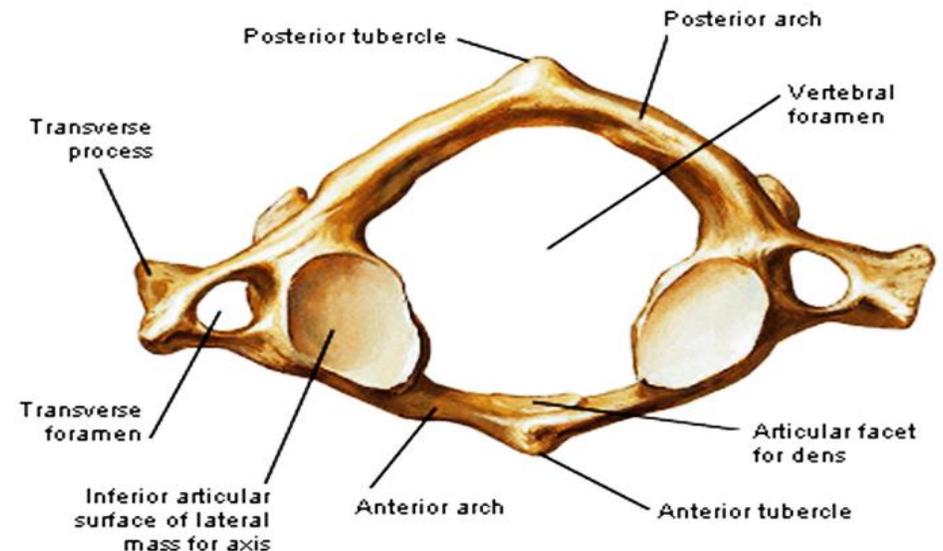
CERVICAL VERTEBRAE

C1 ATLAS

- The sides of the lateral masses give rise to a pair of transverse processes. Each transverse process presents a foramen transversarium.
- The medial side of each lateral mass presents a tubercle for attachment of the **transverse ligament** of the atlas.
- The anterior arch carries an anterior tubercle. Posteriorly, the anterior arch carries an articular facet articulates with the facet on the front of the dens of the axis to form **the median atlanto-axial joint**.
- Posterior arch presents a groove on its upper surface behind lateral mass on each side for the **3rd part of vertebral artery**. Its back shows a posterior tubercle in the middle



Atlas (C1): superior view



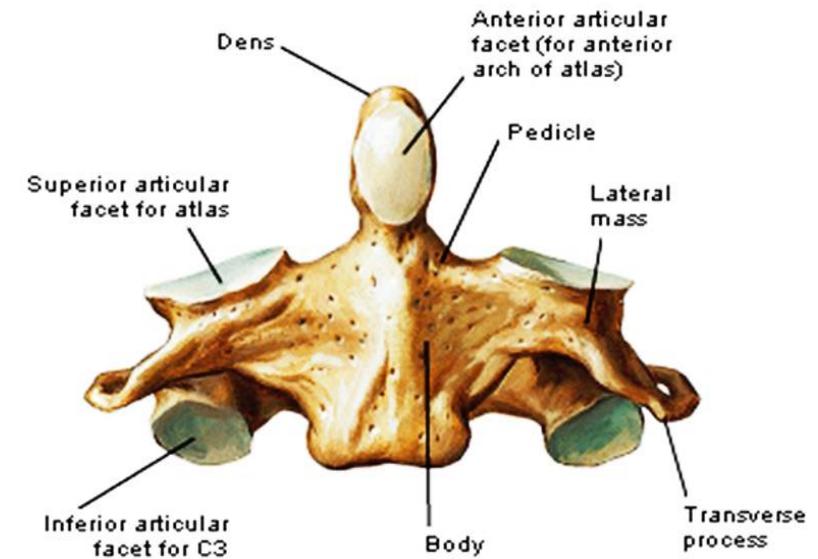
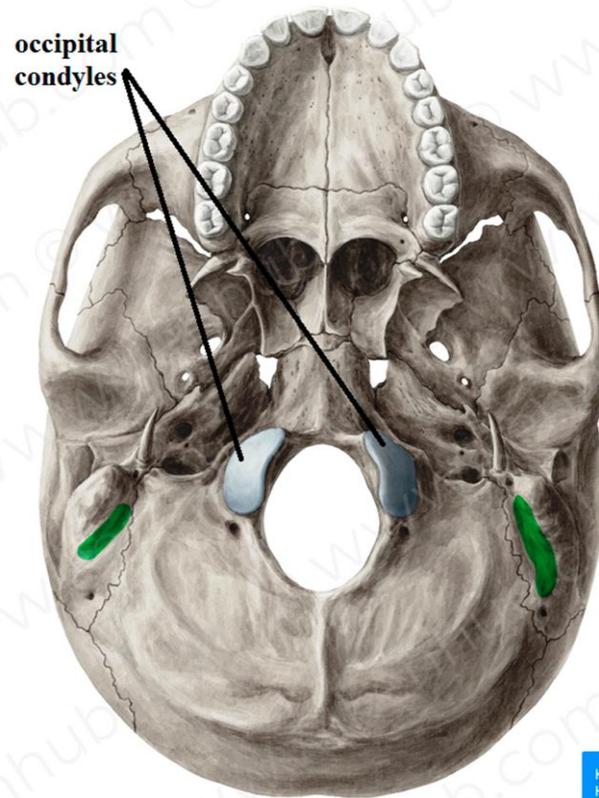
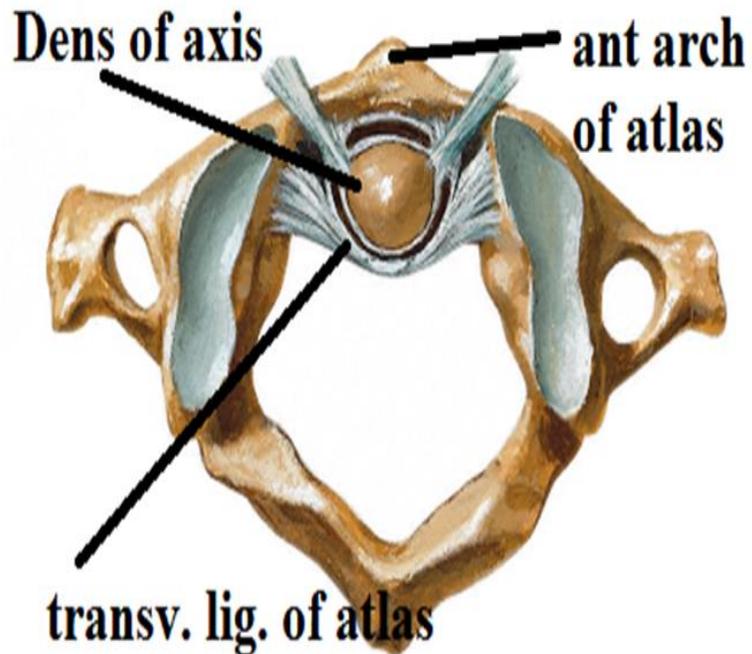
Atlas (C1): inferior view

CERVICAL VERTEBRAE

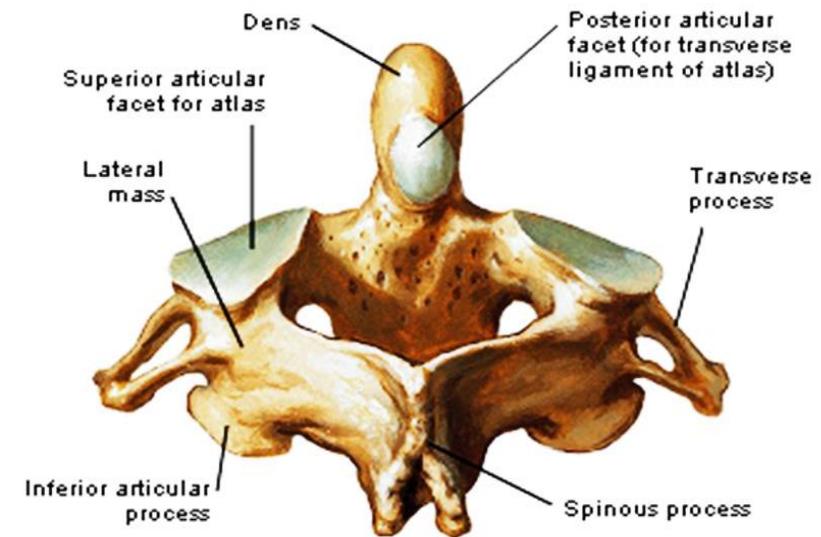
C2 AXIS

It is characterized by the presence of dens or odontoid process which projects from the upper part of the body.

The dens show a facet posteriorly for the transverse ligament of atlas.



Axis (C2): anterior view



Axis (C2): posterosuperior view

ATLANTO OCCIPITAL JOINT

Type: synovial. biaxial.

Articular surfaces:

Above: occipital condyles of the skull

Below: the kidney shaped articular facet of C1 (atlas)

Movements: - (head nodding = saying yes)

1- Flexion.

2- Extension

3-permit sideways tilting of the head

Ligaments:

1- Anterior Atlanto-occipital membrane.

From: upper border of anterior arch of atlas

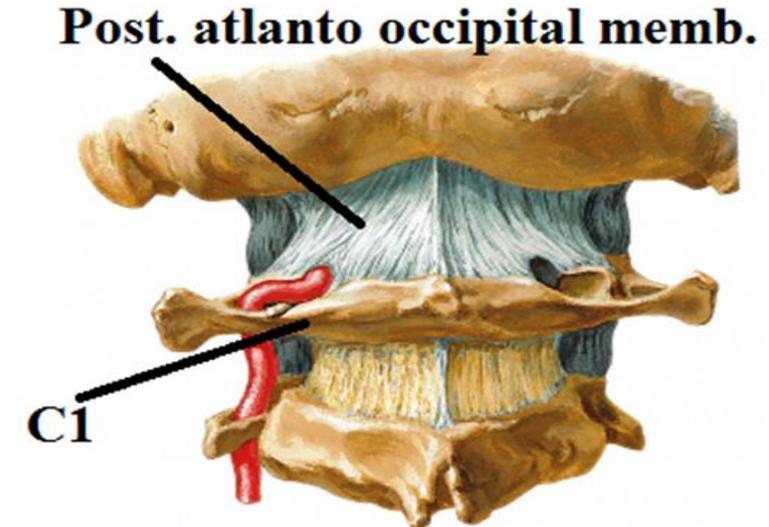
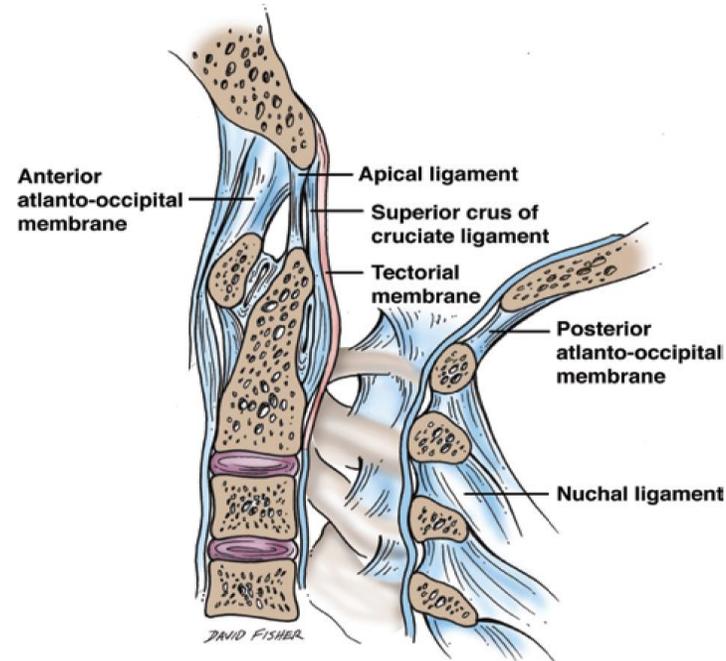
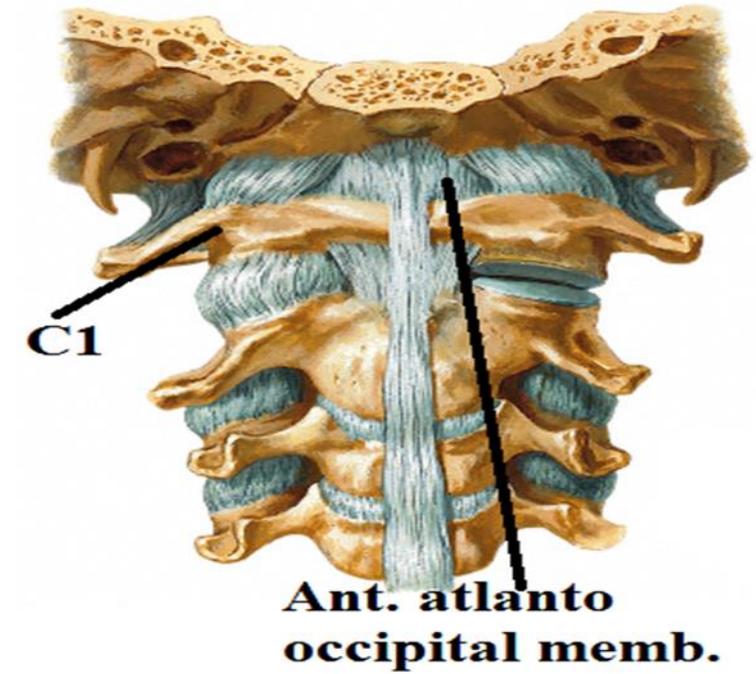
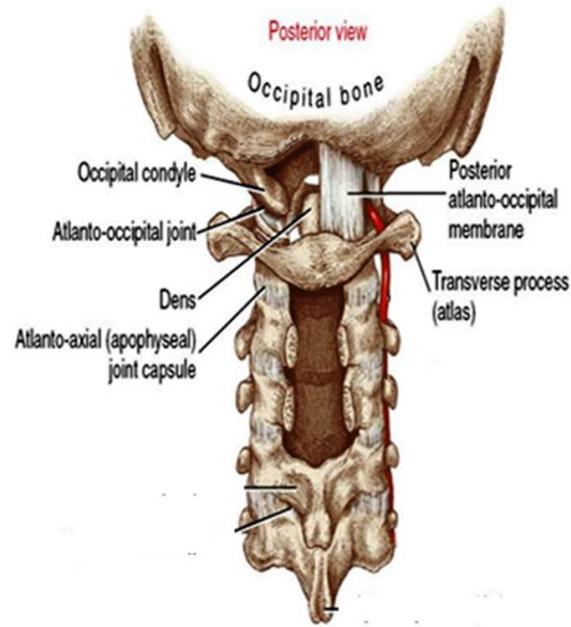
To : anterior margin of foramen magnum

centrally they are continuous with the anterior longitudinal ligament

2- Posterior Atlanto-occipital membrane.

From: upper border of posterior arch of atlas

To : posterior margin of foramen magnum



ATLANTO AXIAL JOINTS

3 joints (1 median & 2 lateral Atlanto axial)

Type: synovial

Variety: the median is pivot while the 2 lateral are plane

Articular surfaces:

The median Atlanto axial:

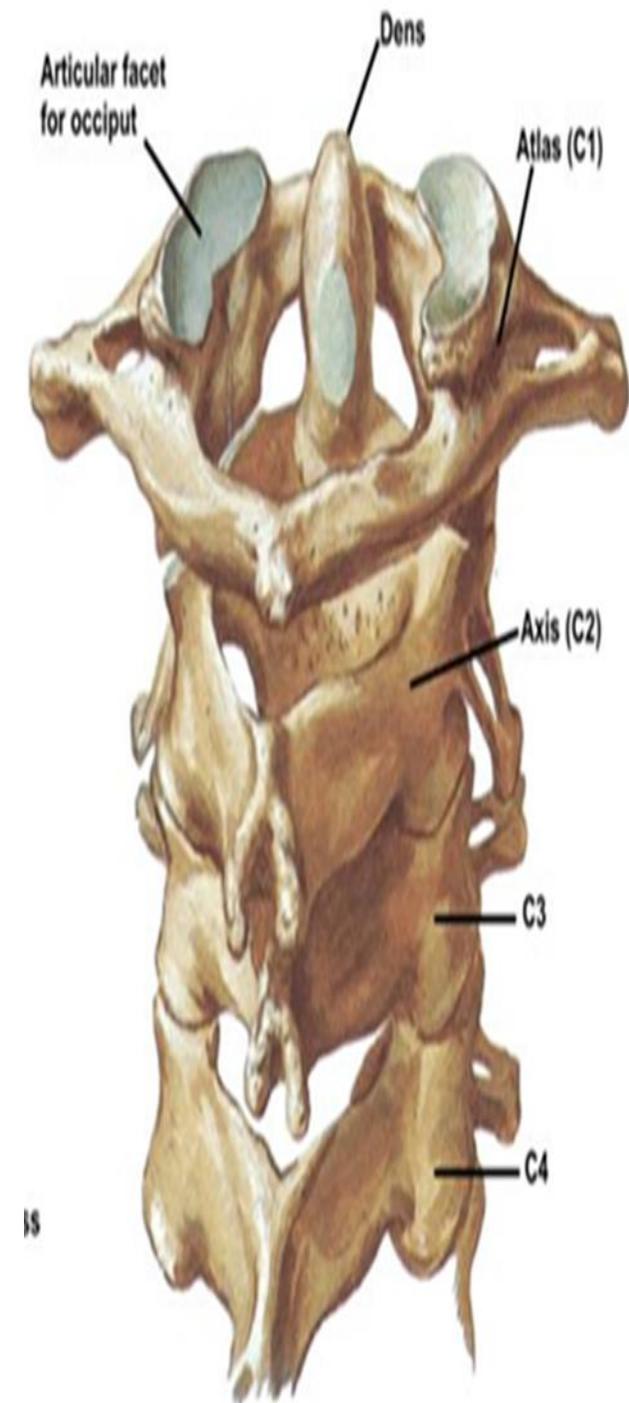
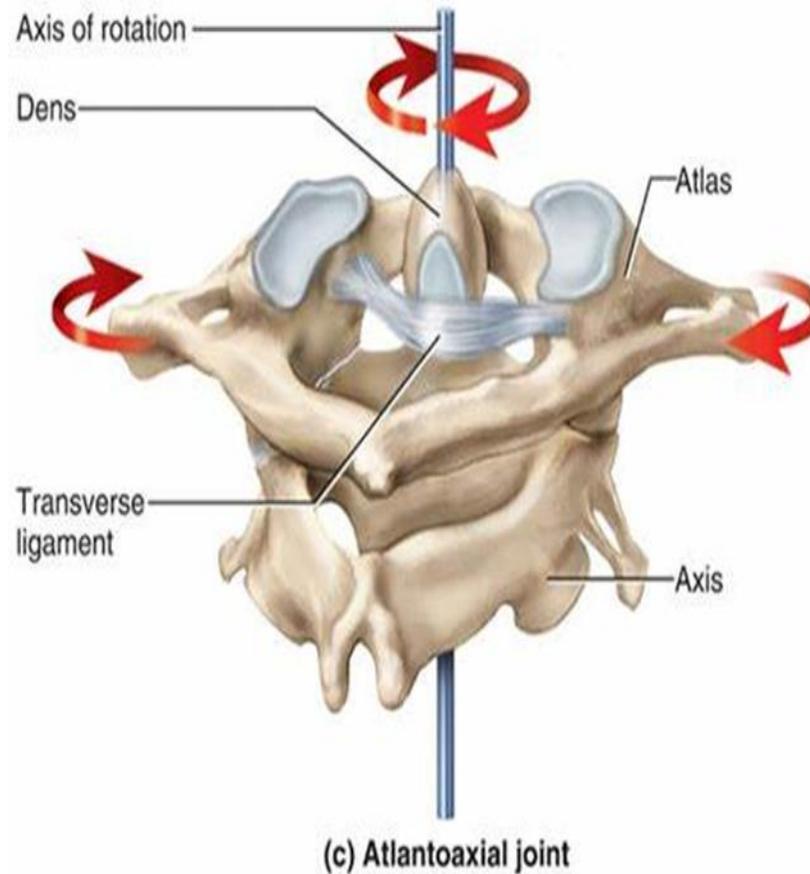
Between the odontoid process of axis

& anterior arch of atlas and transverse ligament of atlas

The lateral Atlanto axial joints:

Between the articular facets of atlas & axis

Movements: - (head rotation = saying no)



Ligaments:

1- Apical ligament.

From: tip of odontoid process of C2
To : anterior margin of foramen magnum.

2- Alar ligament.

From: sides of odontoid process of C2
To : medial sides of occipital condyle.

3-Cruciate ligament:

- Transverse ligament between two tubercles on the atlas.

Vertical ligament, upper band, from transverse ligament to the basilar part of occipital bone, lower band from transverse ligament to the body of the axis

4- Membrana tectoria

the continuation of post. Long. ligament

From: back of body of C2

To : clivus in front of foramen magnum

