

## VERTEBRAL COLUMN - FEATURES & CURVATURES

### VERTEBRAE

- 7 cervical (atlas, axis & C7 are atypical)
- 12 thoracic
- 5 lumbar
- 5 sacral (fused)
- 4 coccygeal (3-5)

### FUNCTIONS

- Weight bearing
- Movement of trunk
- Support for limbs
- Protection of spinal cord
- Production of blood
- Metabolic reserves (Calcium, etc)

### WEIGHT BEARING

Aided by secondary lordosis

40% bony wedge

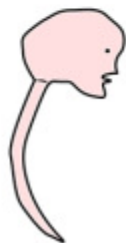
60% disc wedge

Caused/held by

Extensor spinal muscles

Aided by intervertebral discs

Dampeners, resilient, compressible



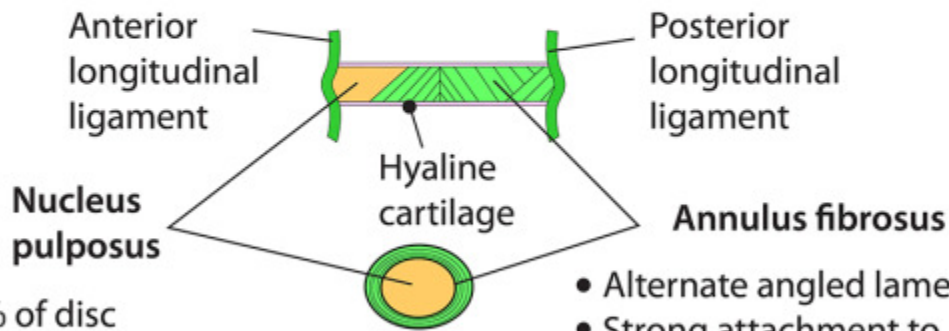
Primary curvature



Neck & lumbar secondary curvatures

# INTERVERTEBRAL DISCS & COSTAL ELEMENTS

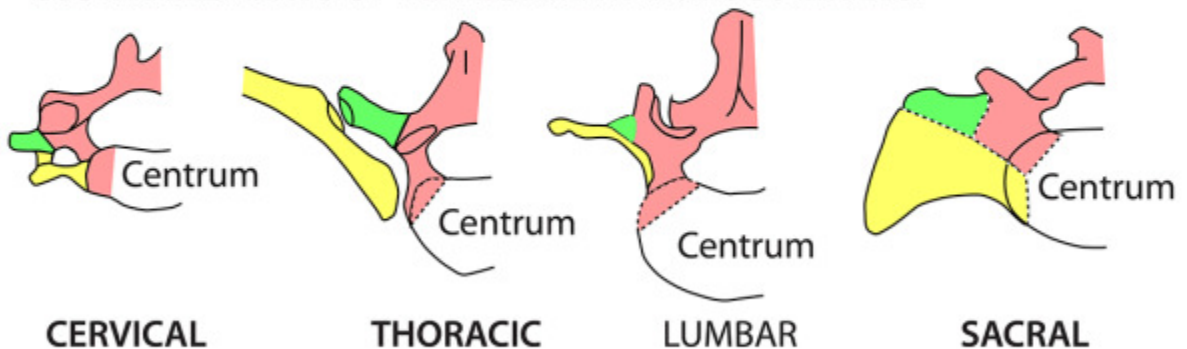
Intervertebral joints are secondary cartilaginous (symphysis)



- 15% of disc
- Gelatinous, occasional cells
- 90% water normally
- 70% in old age
- Increasing collagen with age
- Decreasing elasticity with age
- Notochord remnant
- Towards back in lumbar region
- Herniation damages nerve one below the level of prolapse

- Alternate angled lamellae
- Strong attachment to anterior & posterior longitudinal ligaments
- Fibrocartilage

## COSTAL ELEMENTS OF VERTEBRAE AT VARIOUS LEVELS



## A TYPICAL VERTEBRA

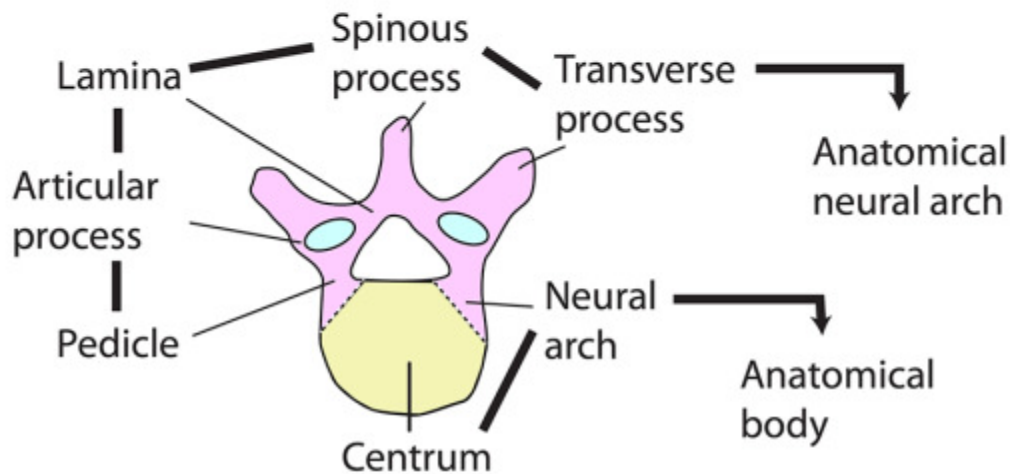
Each vertebra has:

**A BODY:** anteriorly

**A VERTEBRAL ARCH:** posteriorly

Each arch has:

2 pedicles, 2 laminae, a spinous process,  
a transverse process & a vertebral foramen



## OSSIFICATION

**Primary centres** ( ) appear at 8-10 weeks intra-uterine. There are 3: 1 in the centrum & 1 in the base of each transverse process. From the latter, ossification spreads to pedicle, lamina, spinous process, body & facets

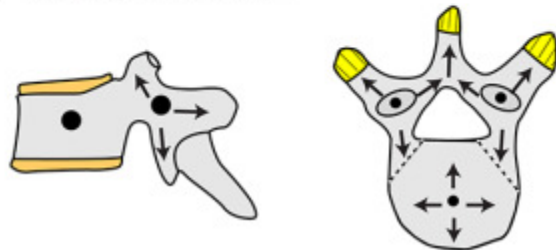
**Secondary centres** ( ) appear at puberty. 5: spinous process, transverse processes, each annular epiphyseal rings

### Fusion

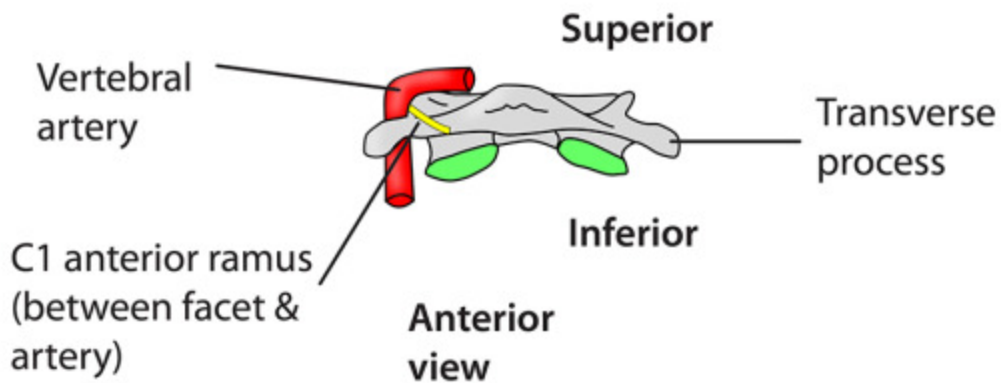
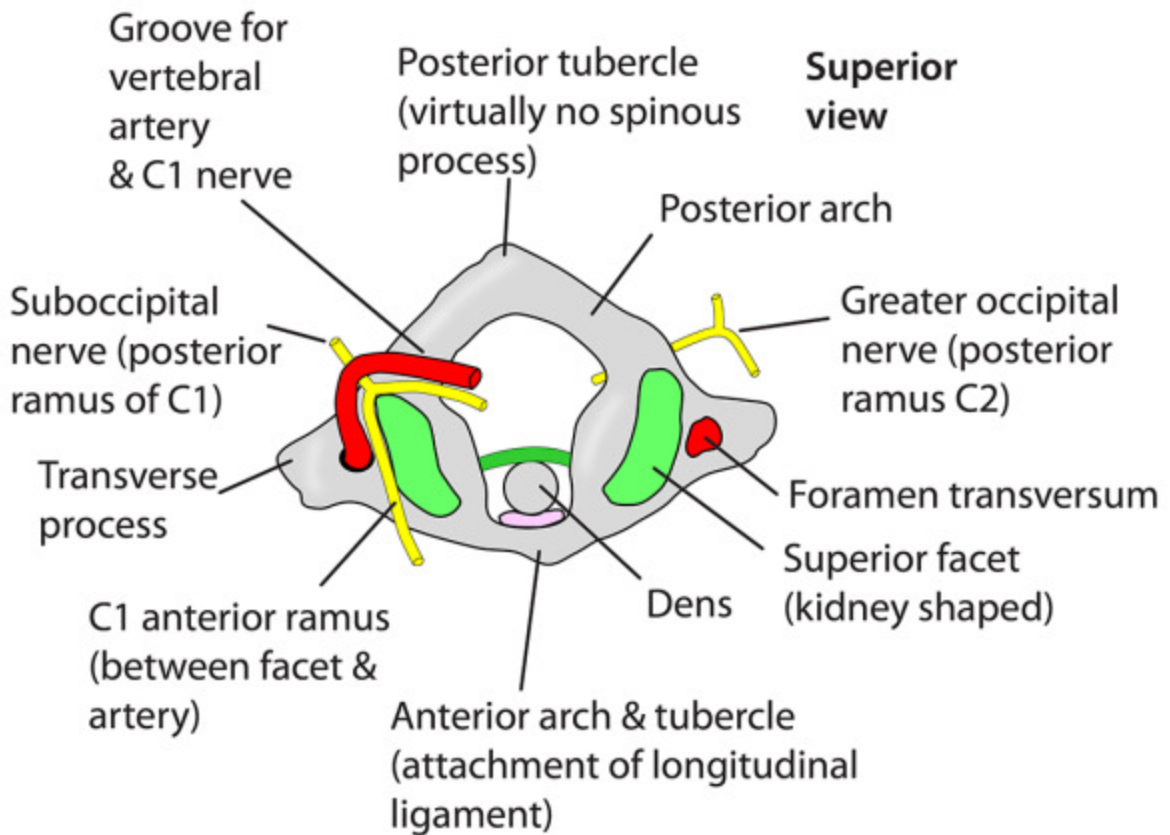
Arches by 2 years

Arch/centrum by 7yrs

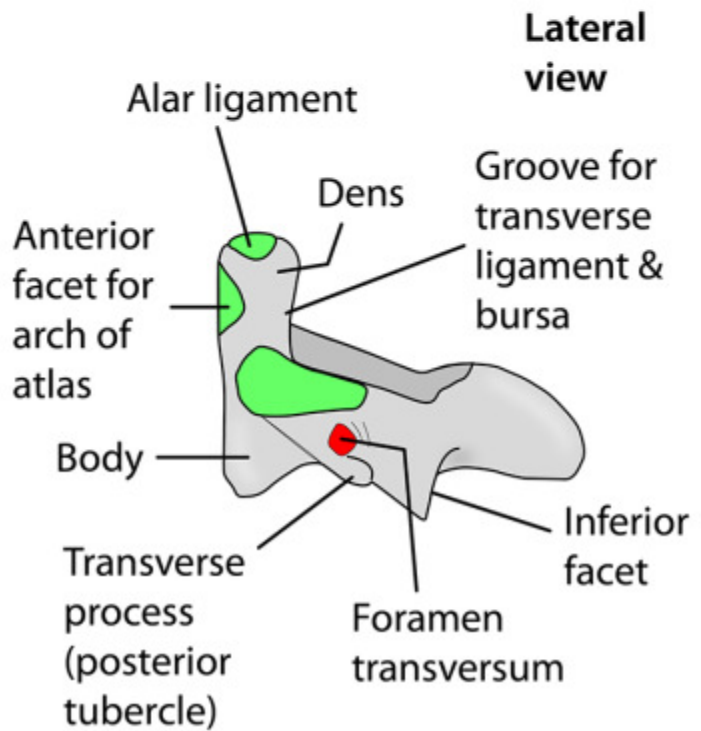
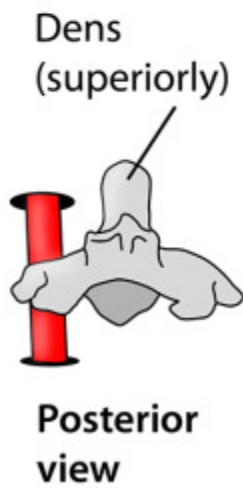
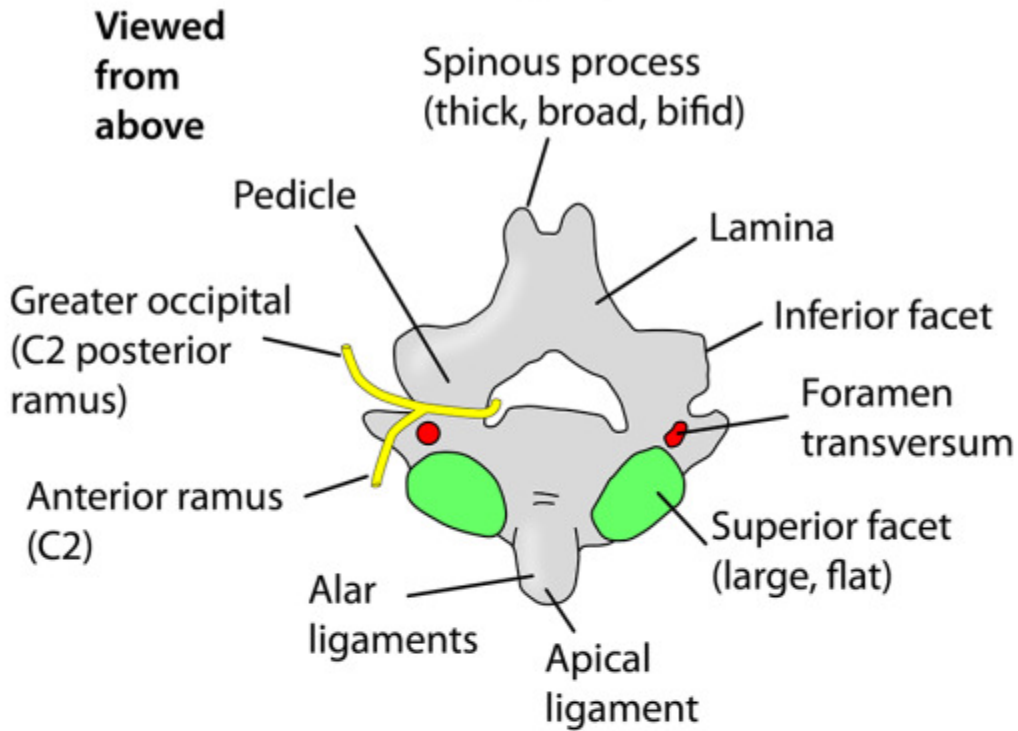
Secondary centres by 25yrs



# ATLAS - C1



# AXIS - C2

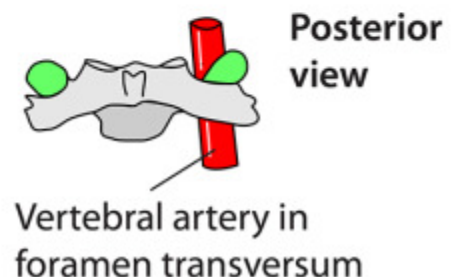
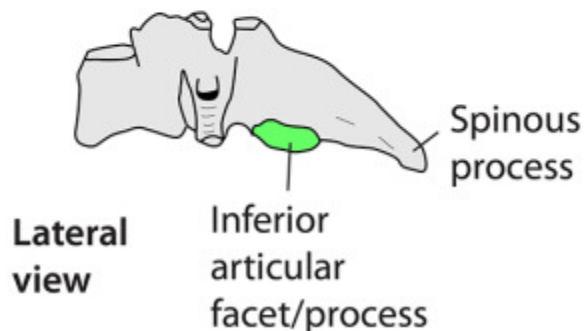
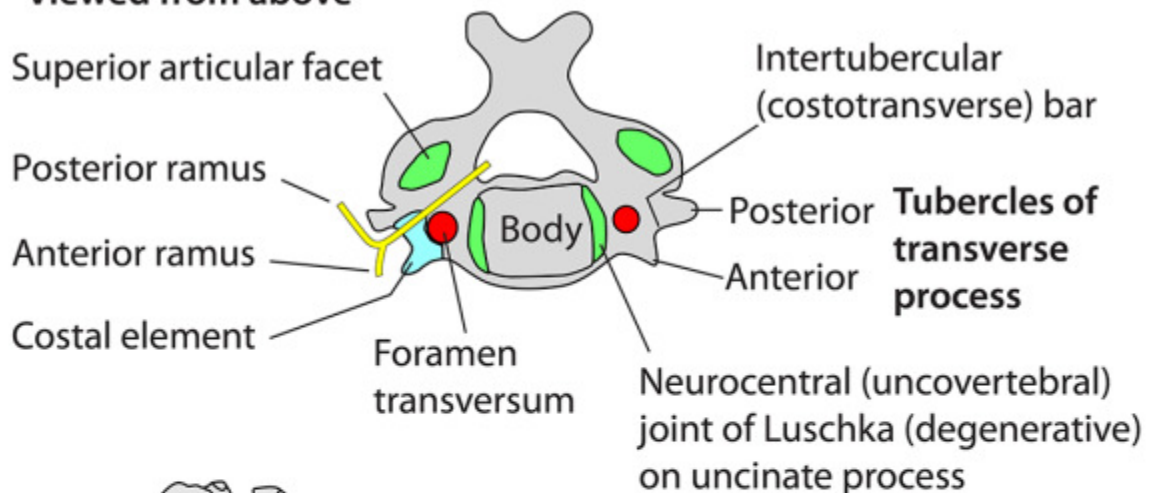




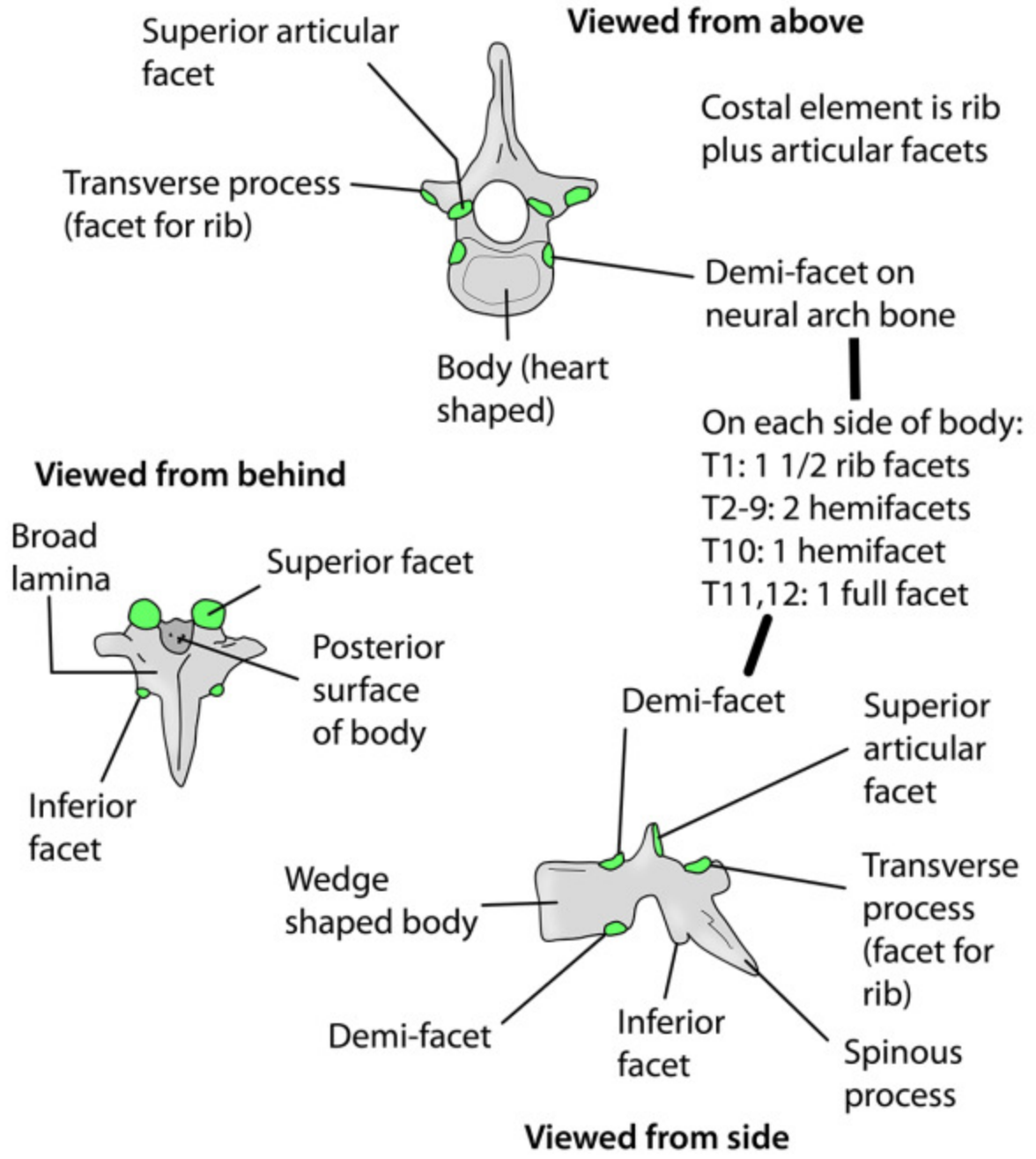
## TYPICAL CERVICAL VERTEBRA

- C3-6
- Bifid spinous process
- Large triangular foramen
- Short wide pedicle
- Small body
- Foramen transversum
  - Artery, vein, sympathetic from C6 to C1
- C6: Has carotid tubercle of Chassaignac (enlarged anterior tubercle over which passes the common carotid artery)
- C7: Vertebra prominens has vestigial anterior tubercle, long, non-bifid spinous process, small foramen transversum containing vein only (no artery). Note that C7 nerve is above C7 vertebra and C8 nerve is below it

### Viewed from above

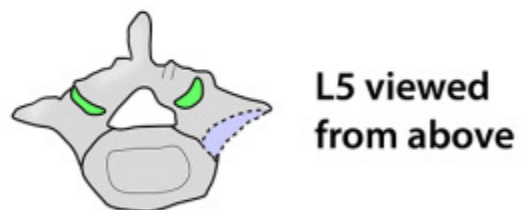
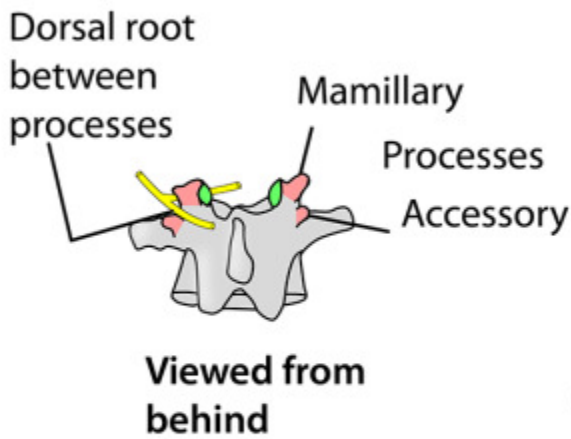
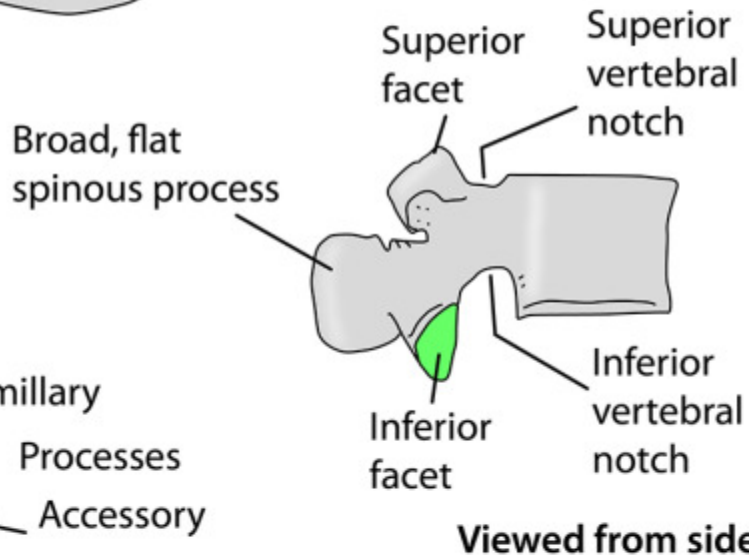
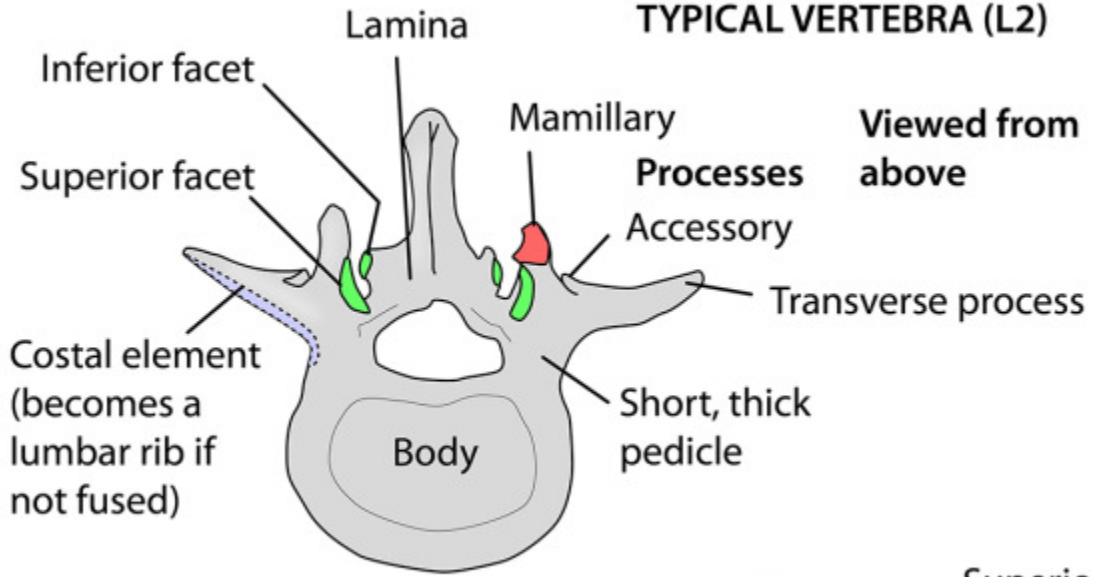


# THORACIC VERTEBRAE



# LUMBAR VERTEBRAE

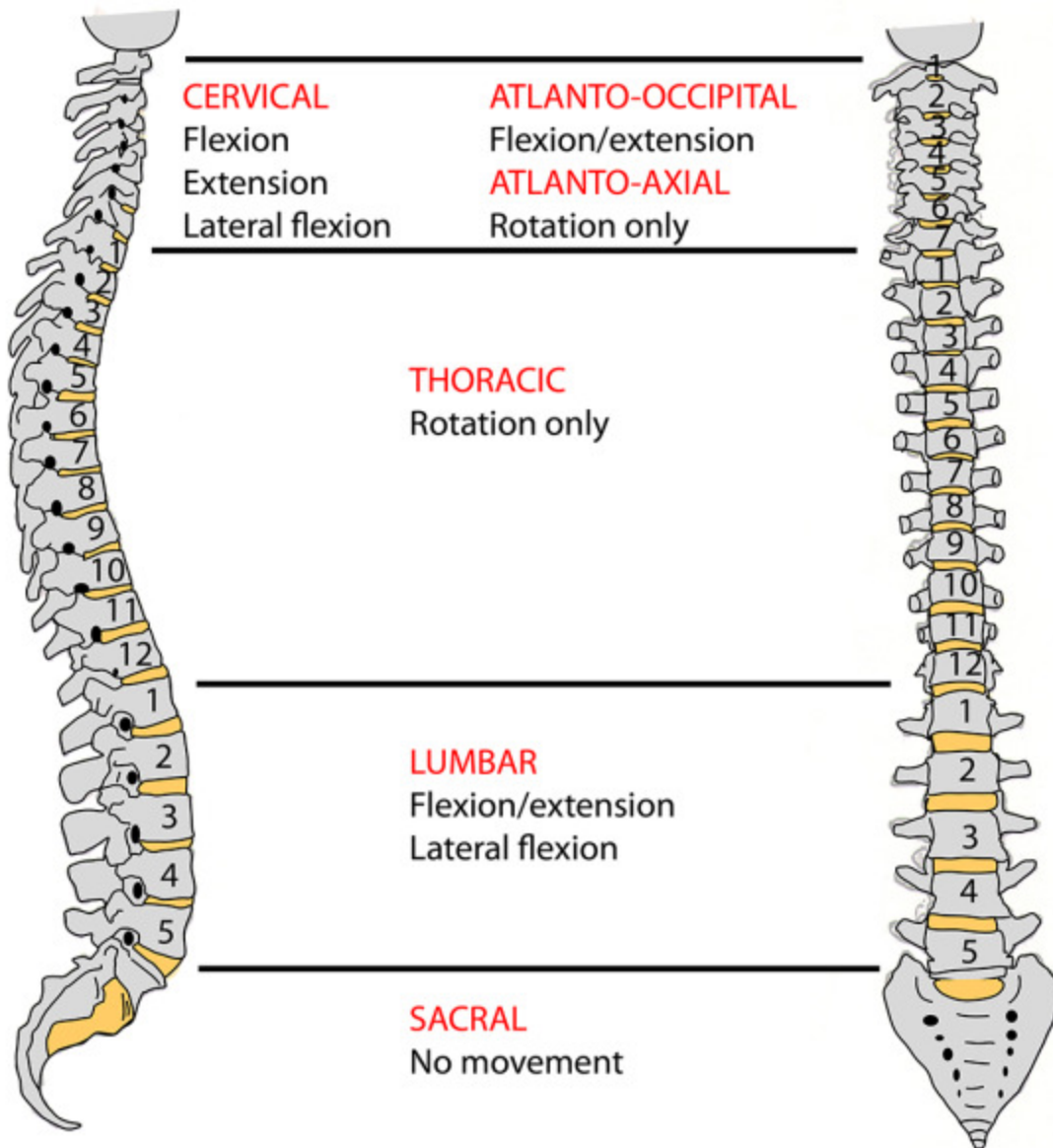
## TYPICAL VERTEBRA (L2)



- Wide, short pedicles
- Forward facing facets
- Thick short transverse process



## VERTEBRAL COLUMN - MOVEMENTS



Movements at facet & intervertebral joints are individually small but accumulatively considerable

## VERTEBRAL COLUMN - JOINTS & LIGAMENTS

### JOINTS

**ARTICULAR FACET** (zygapophyseal)

Plane, synovial, nerve supply by nerves above and below

**NEUROCENTRAL** (uncovertebral) **JOINTS OF LUSCHKA**

Cervical & T1 only, small on lateral side of body, between unciniate process and side of body. Probably degenerative

**ATLANTO-OCCIPITAL**

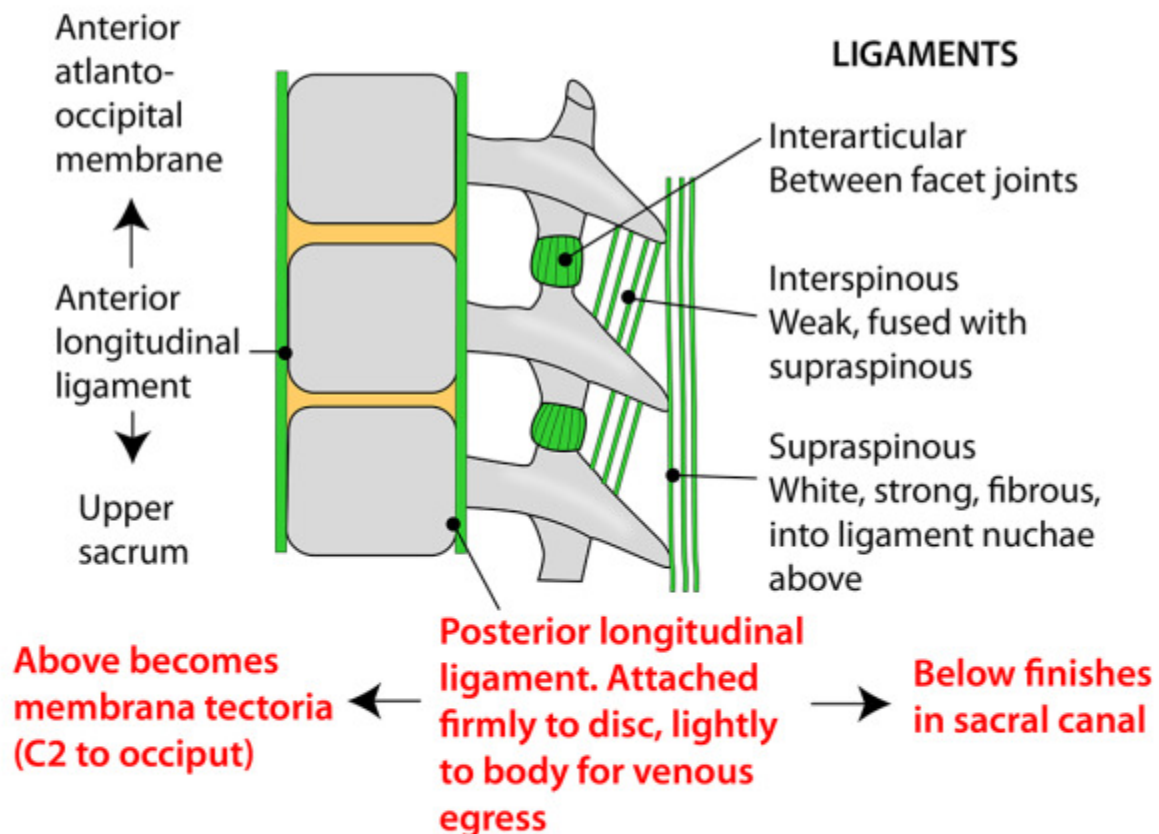
Synovial, weak anterior/posterior atlanto-occipital membrane.

Nodding movement

**ATLANTO-AXIAL**

Synovial, head pivoting. Ligaments are apical, alar, cruciform.

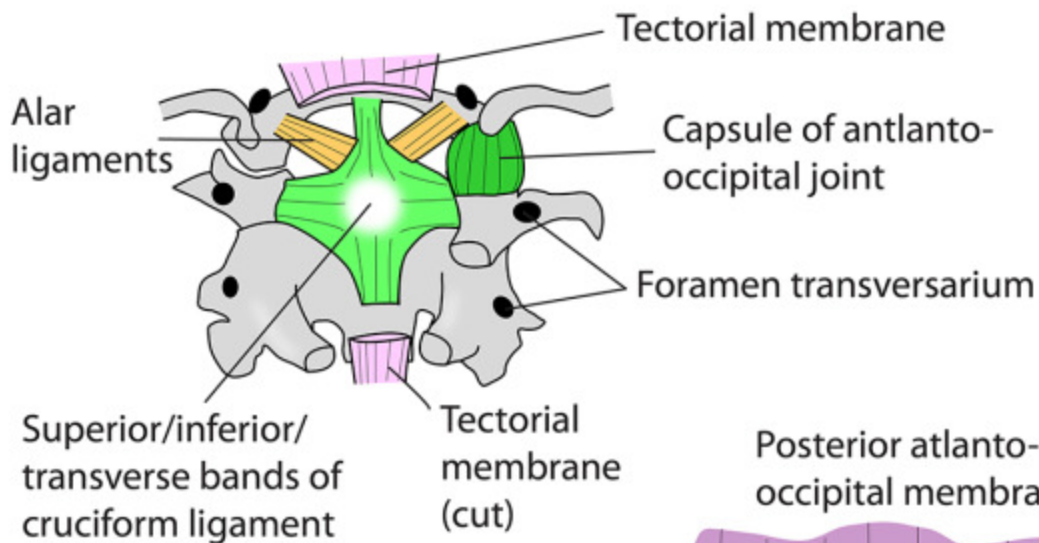
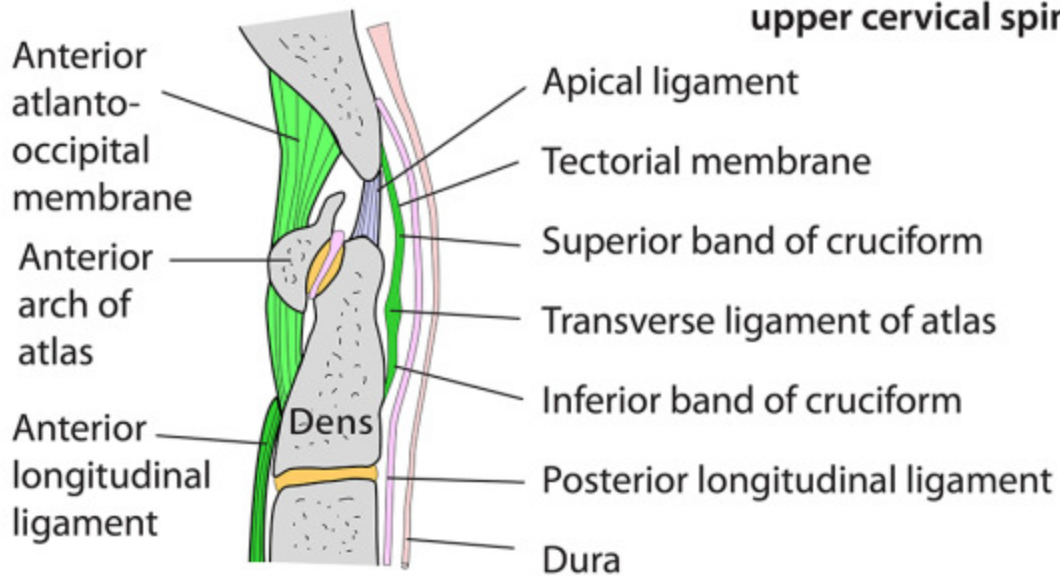
Posterior longitudinal ligament becomes membrana tectoria



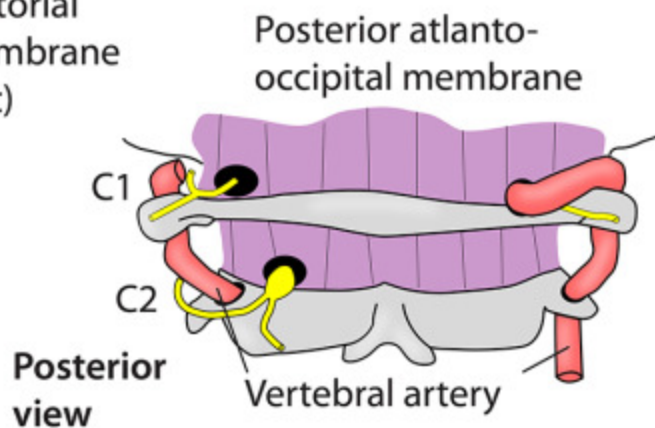
2 other ligaments are: **LIGAMENTUM FLAVUM** between laminae like tiles on a roof - under surface of one above to outer surface of one below. Also **INTERTRANSVERSE** - between transverse processes - weak

# ATLANTO-AXIAL & ATLANTO-OCCIPITAL JOINTS

Sagittal section of upper cervical spine



Looking into upper spinal canal from behind



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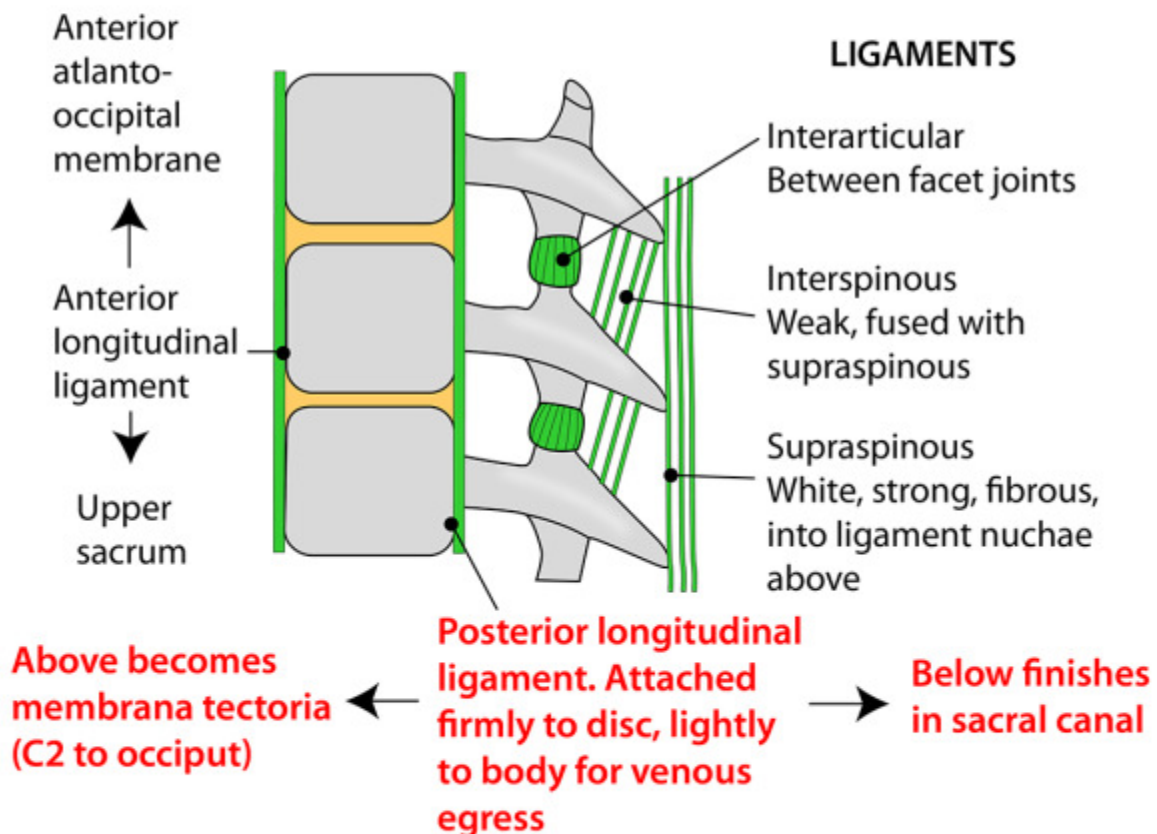
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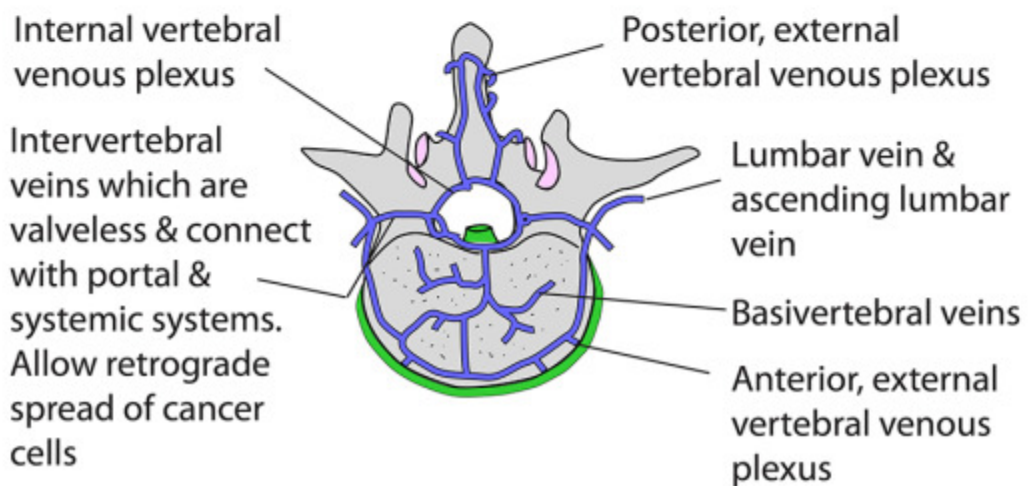
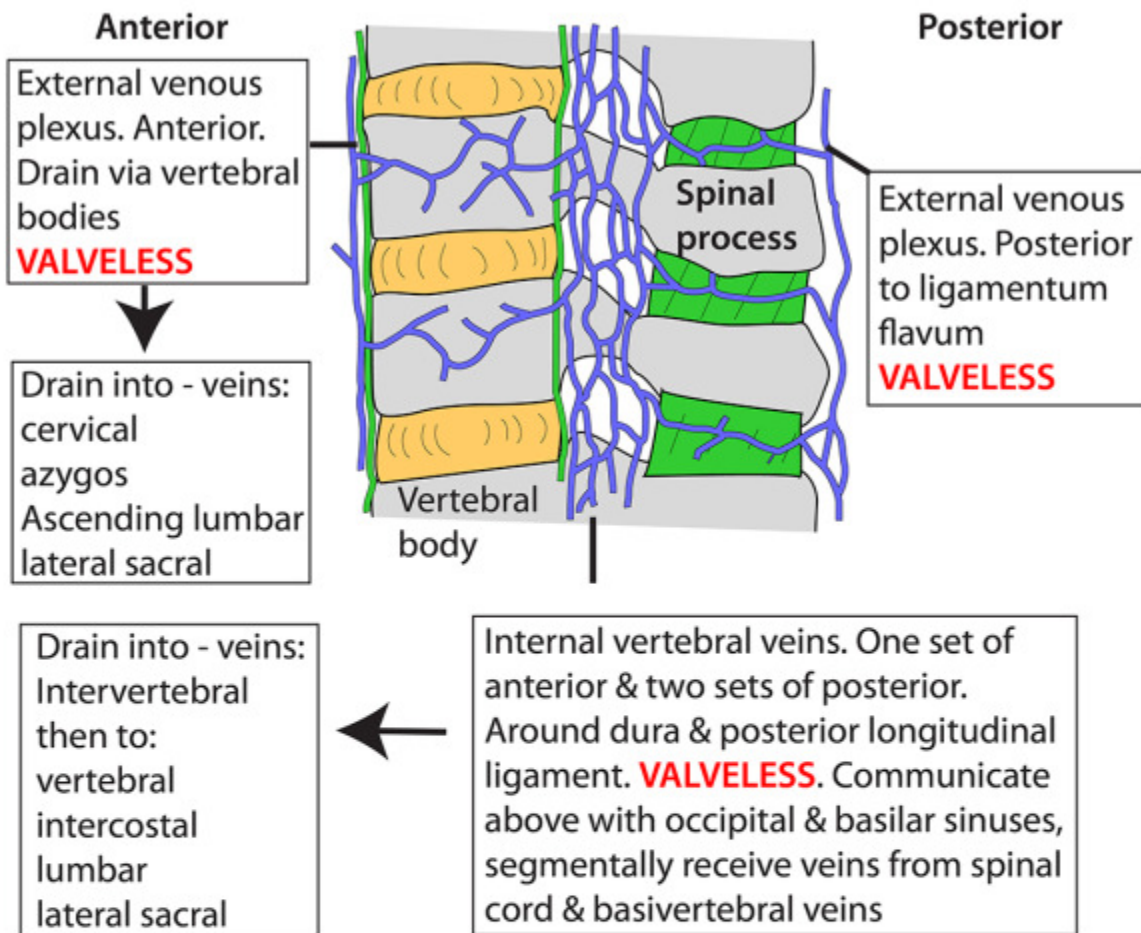
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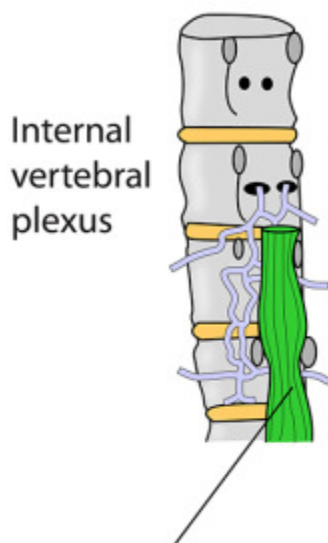


## VERTEBRAL VENOUS PLEXUSES





## SPINAL CORD - VEINS & SOME LIGAMENTS

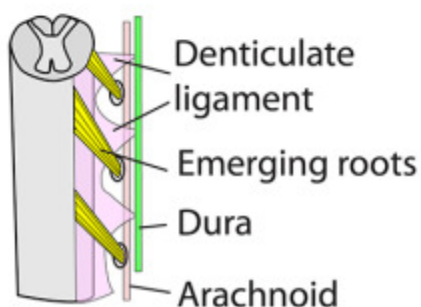


**Basivertebral veins** emerge from foramina (•) in posterior vertebral bodies & drain into the **internal vertebral plexus** (anterior/posterior) which drains via the **intervertebral segmental veins** (with the nerve roots) into the **external vertebral plexuses** which, in turn connect above & below the diaphragm to the inferior & superior vena cavae via vertebral, azygos, lumbar & lateral sacral veins. These veins are **VALVELESS** and thus cancer cells from thyroid, breast, kidney & prostate can easily enter the bones

The **posterior longitudinal ligament** attaches to discs only & not to the vertebral bodies so that there is free drainage of the basivertebral veins

The dural sac finishes at S2 but the PIA MATER in the form of the filum terminale continues below S2 and attaches to the back of the coccyx

The **DENTICULATE (dentate) ligament** is pia mater that connects the cord to the dura mater laterally between the exits sites for the nerves. It pierces the arachnoid mater. Note that the spinal roots of the accessory nerve (C1-5) emerge dorsal to the denticulate ligament, whereas the sensory roots emerge dorsal and the motor roots ventral to it.



### SPINAL SUBARCHNOID SPACE

- Volume 75ml
- Tapped during spinal puncture or anaesthetic below L2

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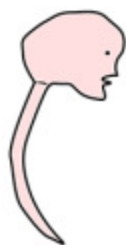
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Primary curvature



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