

SPINE

DH



SKULL

LARYNGEAL
SKELETON

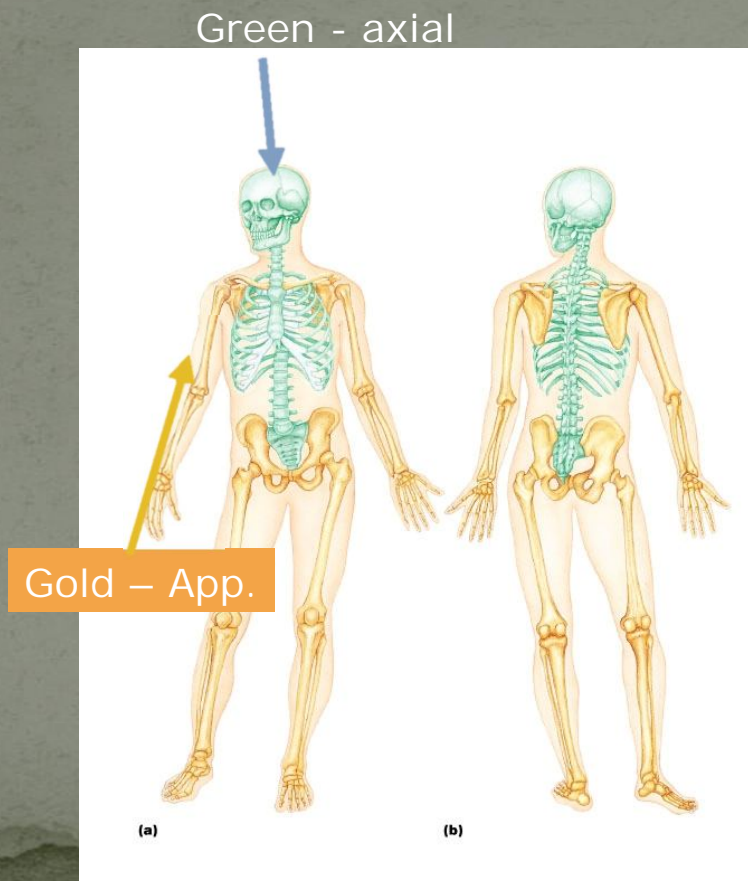
VERTEBRAL
COLUMN

THORACIC
CAGE

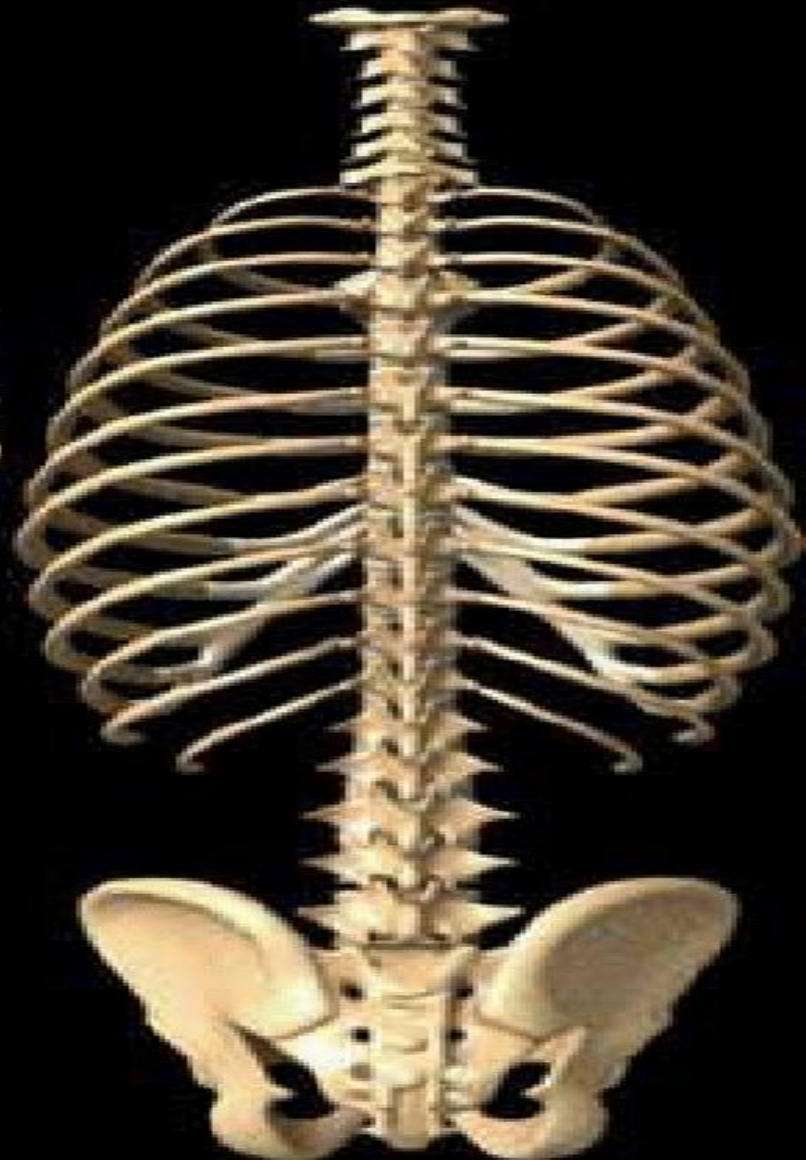
AXIAL SKELETON

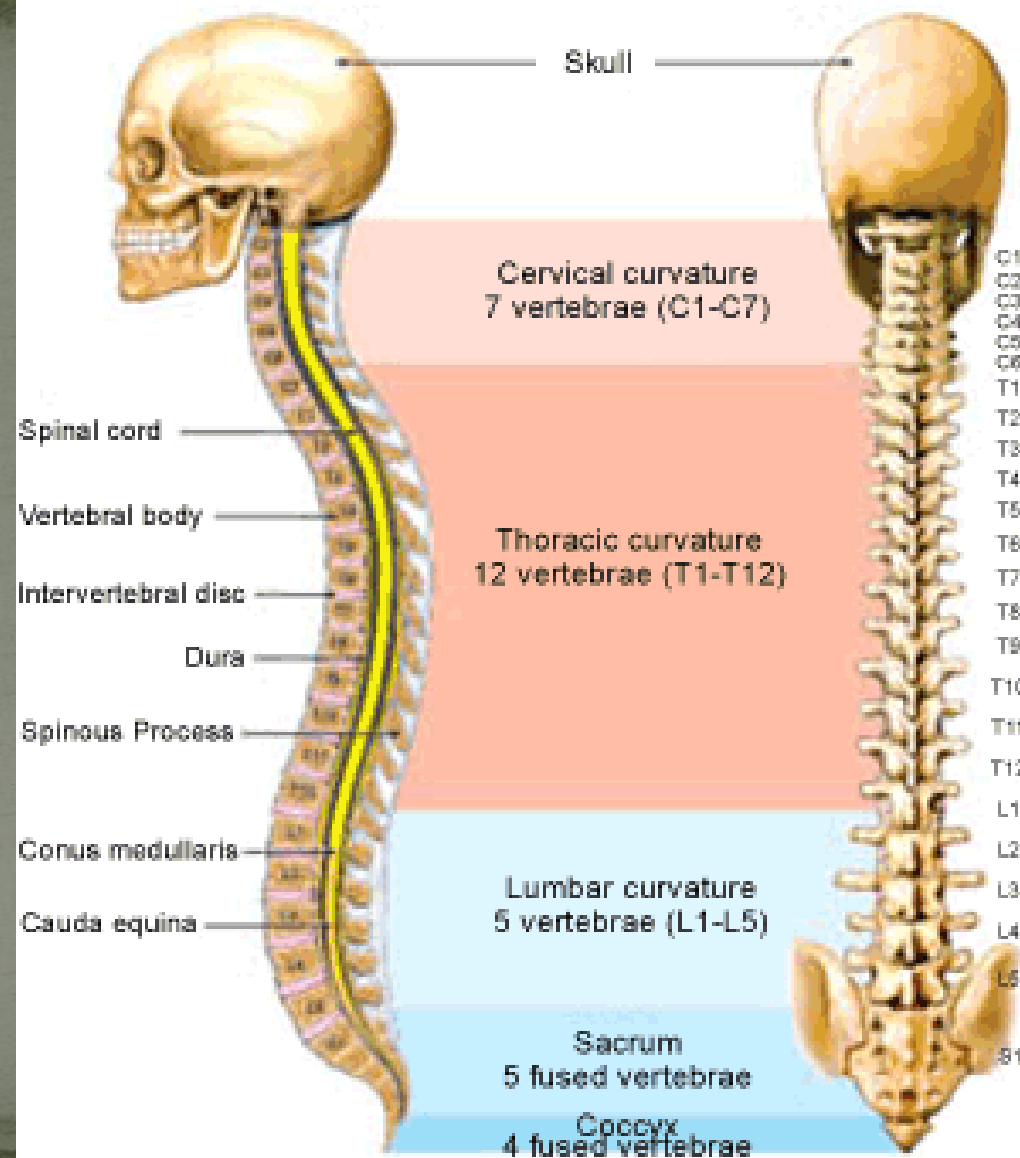
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Axial v. Appendicular Skeleton



- Axial Skeleton
 - Skull
 - Vertebral column
 - Thoracic cage
 - Ribs and sternum
- Appendicular Skeleton
 - Bones of the upper and lower limbs
 - Plus, pectoral and pelvic girdles





The spine, or vertebral column, is composed of 5 main segments:

- *the cervical,*
- *thoracic,*
- *and lumbar curvatures,*
- *the sacrum,*
- *and the coccyx.*

Each of these curvatures is composed of individual vertebrae, which provide structural support and protection for the spinal cord.

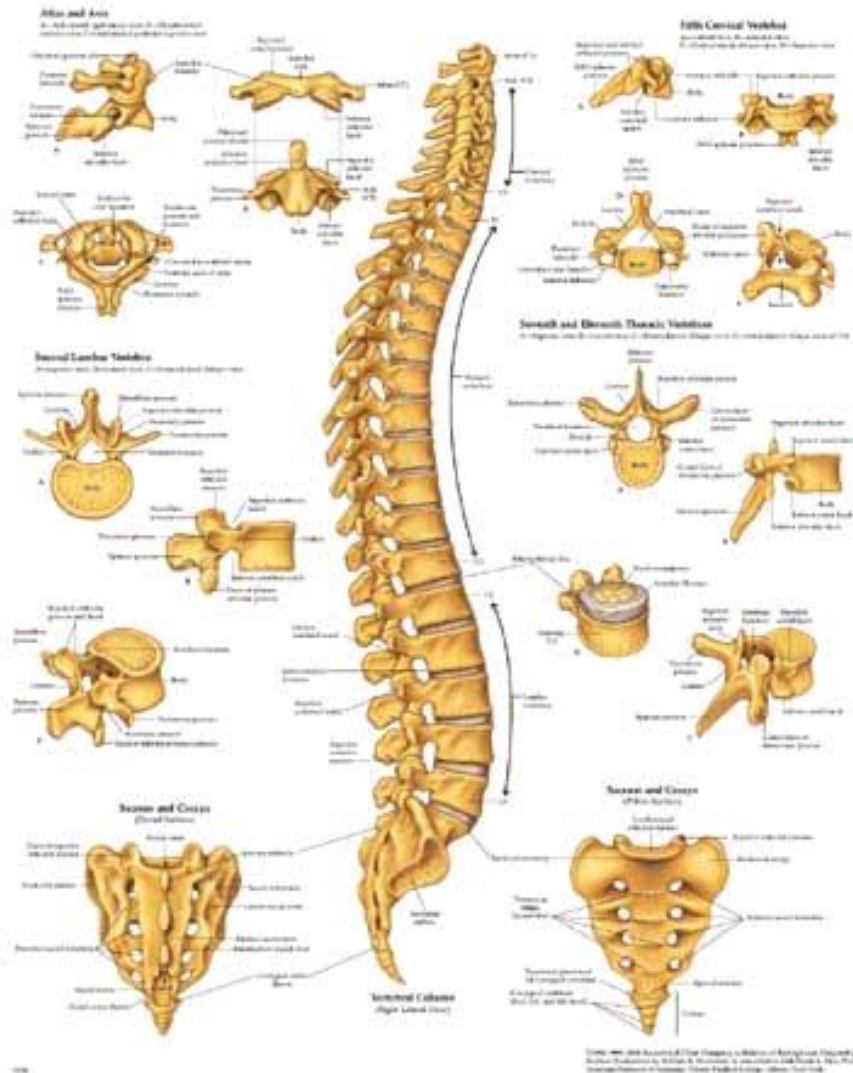
-There are **24 movable** vertebrae in the spine;

- **7** in the cervical curvature,
- **12** in the thoracic curvature,
- **5** in the lumbar curvature.

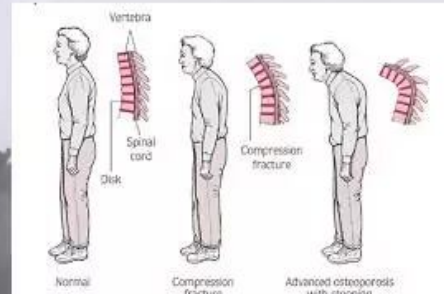
• Additionally, the sacrum consists of **5 fused vertebrae**

• the coccyx is composed of three to five fused vertebrae.

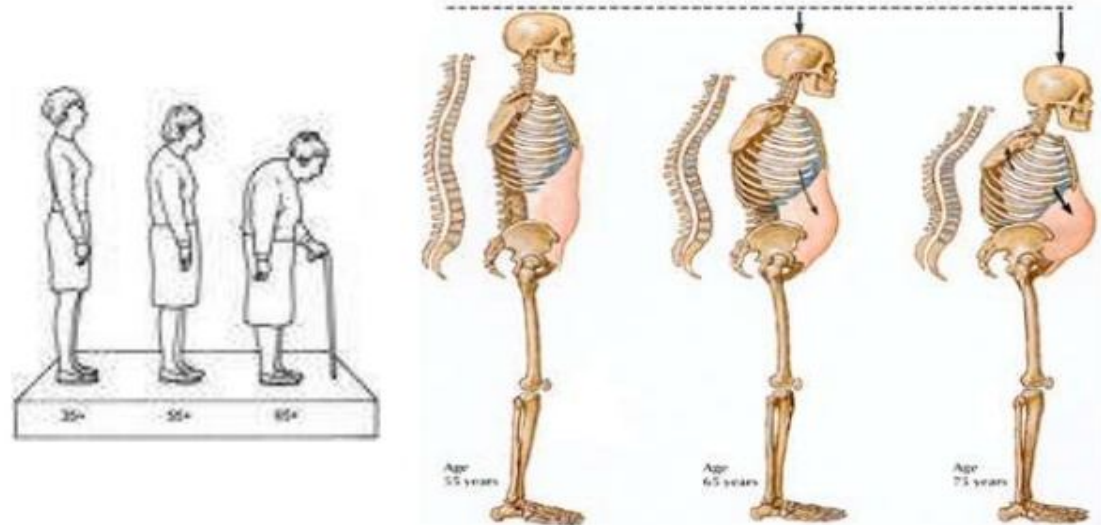
THE VERTEBRAL COLUMN



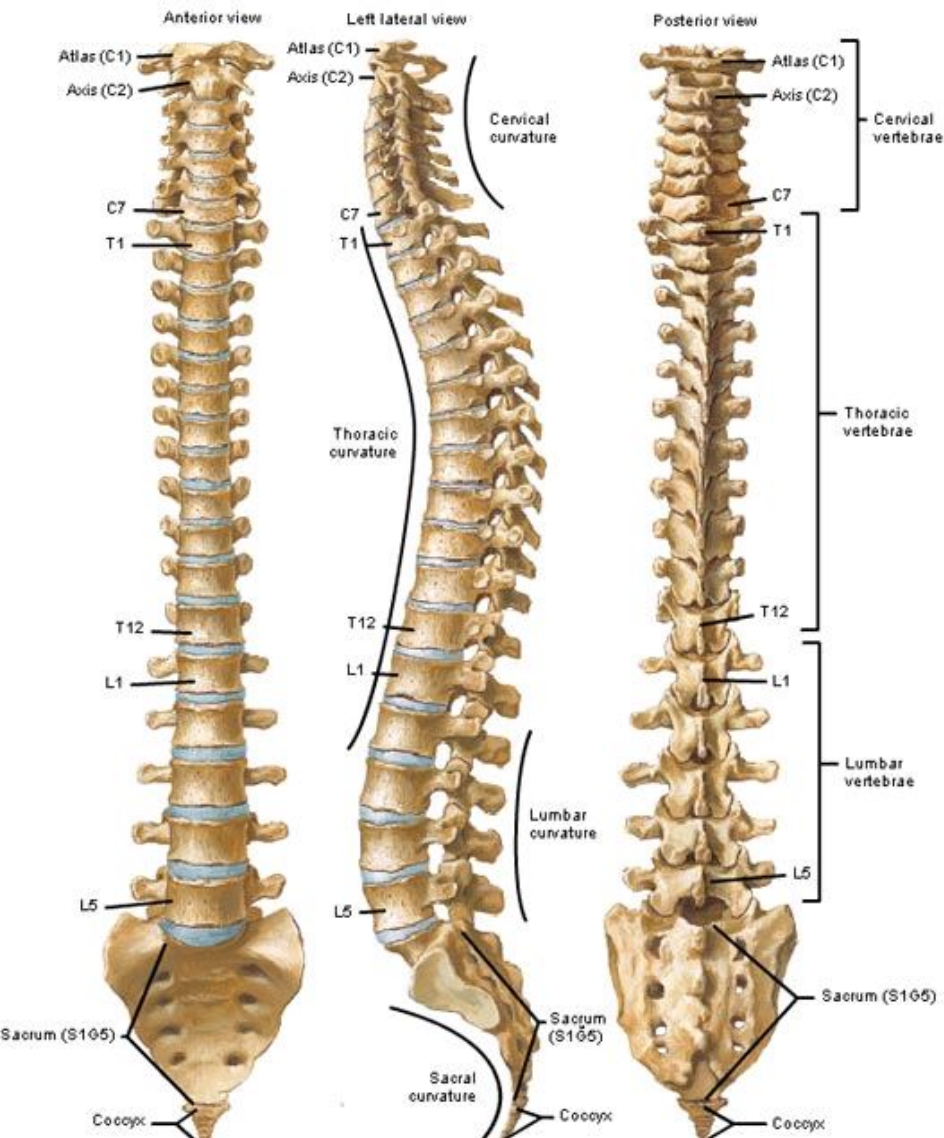
How Osteoporosis Causes Stooping



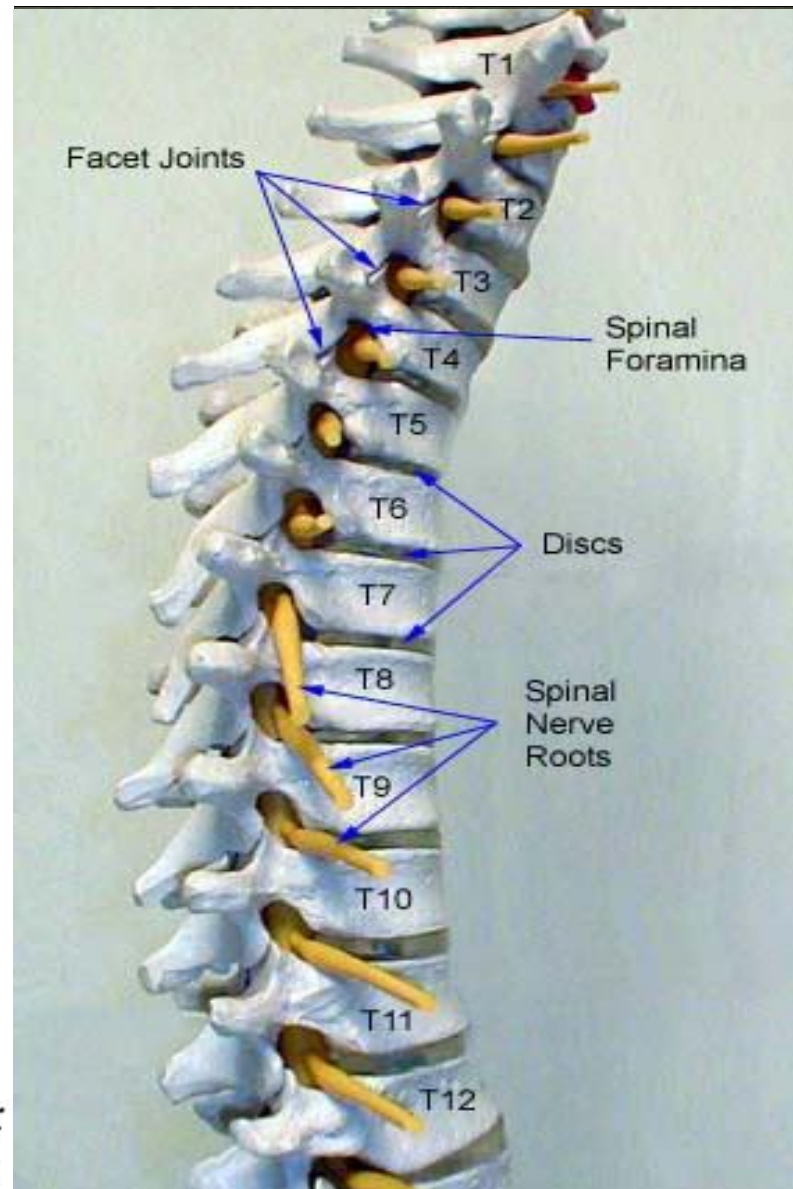
Backbone collapse



Vertebral Column



F. Netter M.D.
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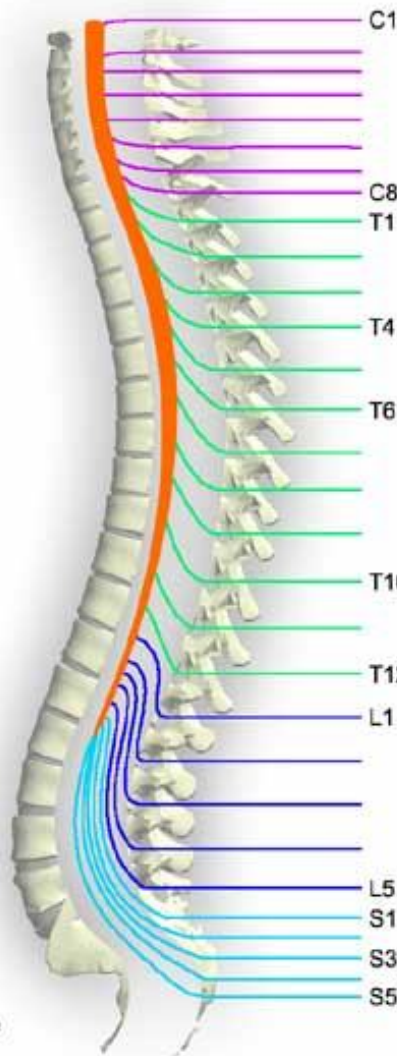
Bone notch at the base of the neck is C7.

The spinal cord ends approximately between L1 & L2.

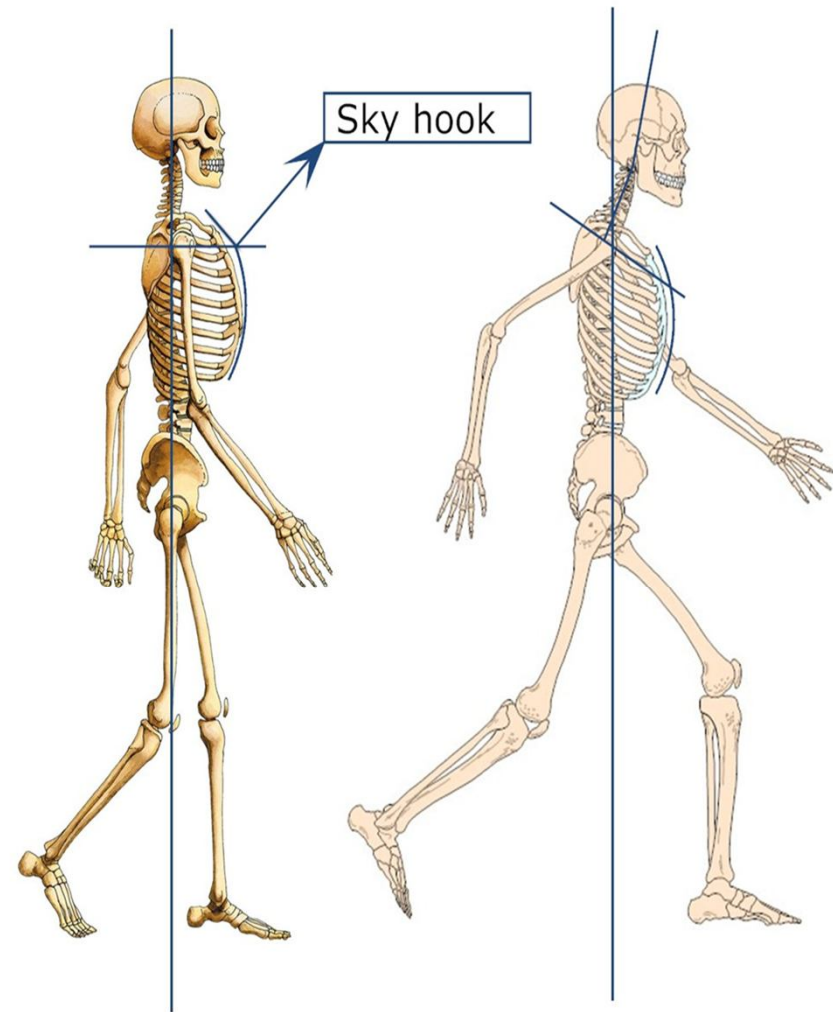
Sacral cord segments (S1-S5 "Cauda Equina") are level with T12-L1 Vertebrae.

The sacral vertebrae are fused to make up the sacrum.

The coccygeal vertebrae are fused to make the coccyx or "tail bone".



- C1 Cervical spinal nerve roots C1 - C7 correspond with upper aspects of vertebral bodies.
- C8 Sensation of C7 nerve is for the middle finger.
- T1 C8 and lower spinal nerve roots leave below the corresponding vertebral body.
- T4 Sensation of T4 spinal nerve is approximately level with the nipple line.
- T6 Sensation of T6 spinal nerve root is approximately level with the bottom of the sternum.
- T10 Sensation of T10 spinal nerve root is approximately level with the abdomen.
- T12 Sensation of T12 spinal nerve root is approximately level with the pubic bone.
- L1 The sensations of lumbar nerves are over the legs.
- L5
- S1
- S3 Sensation of S3, S4 & S5 nerves is the Perineal (genital) area.
- S5



Term	# of Vertebrae	Body Area	Abbreviation
Cervical	7	Neck	C1 – C7
Thoracic	12	Chest	T1 – T12
Lumbar	5 or 6	Low Back	L1 – L5
Sacrum	5 (fused)	Pelvis	S1 – S5
Coccyx	3	Tailbone	None

Functions of the Vertebral or Spinal Column Include:

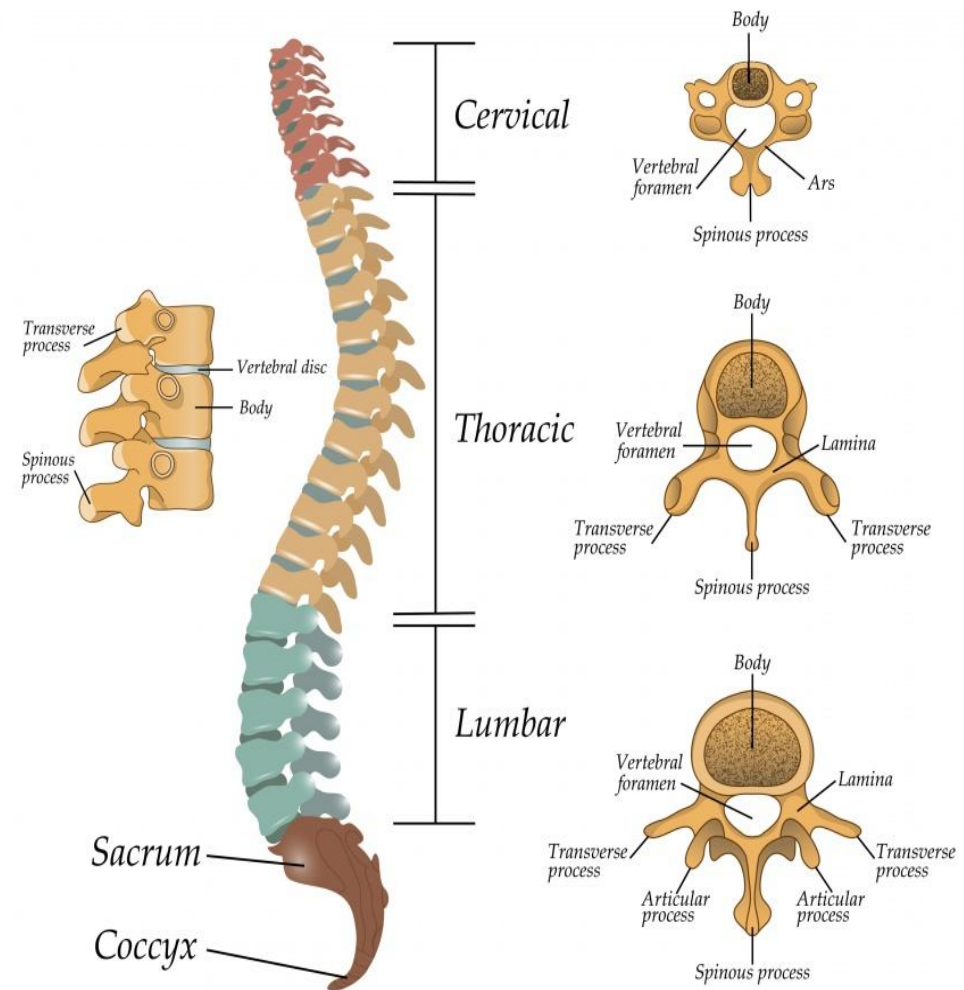
Protection	<ul style="list-style-type: none">•Spinal Cord and Nerve Roots•Many internal organs
Base for Attachment	<ul style="list-style-type: none">•Ligaments•Tendons•Muscles
Structural Support	<ul style="list-style-type: none">•Head, shoulders, chest•Connects upper and lower body•Balance and weight distribution
Flexibility and Mobility	<ul style="list-style-type: none">•Flexion (forward bending)•Extension (backward bending)•Side bending (left and right)•Rotation (left and right)•Combination of above
Other	<ul style="list-style-type: none">•Bones produce red blood cells•Mineral storage

The spine provides attachment for our ribs, muscles and ligaments which make up the trunk.

It is divided into 3 regions:

Neck (cervical) vertebrae	7
Thoracic vertebrae	12
Lumbar vertebrae	5

The structure of the segments of the spine



The primary curvatures (fetal) are the thoracic and sacral curvatures. They are convex posteriorly

The secondary curvatures (develop after birth), are the cervical and lumbar curvatures. They are convex anteriorly.

Kyphosis or hunchback. An increase in the thoracic curvature posteriorly.

Scoliosis. Abnormal lateral curvature, often localized in the thoracic region.

Lordosis. An increase in the lumbar curvature anteriorly

Regions of Vertebral Column

Cervical	7
Thoracic	12
Lumbar	5
Sacral	5 fused
Coccygeal	4 fused

Lordosis

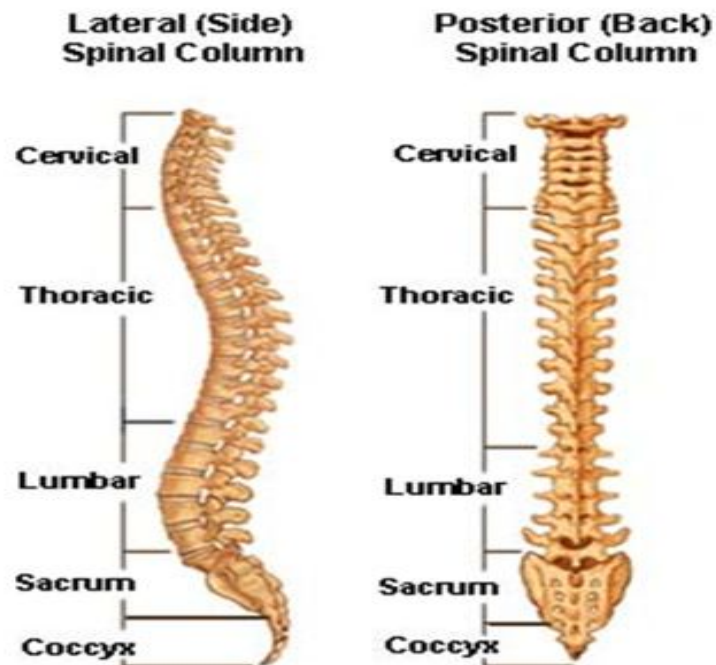
Kyphosis

Lordosis

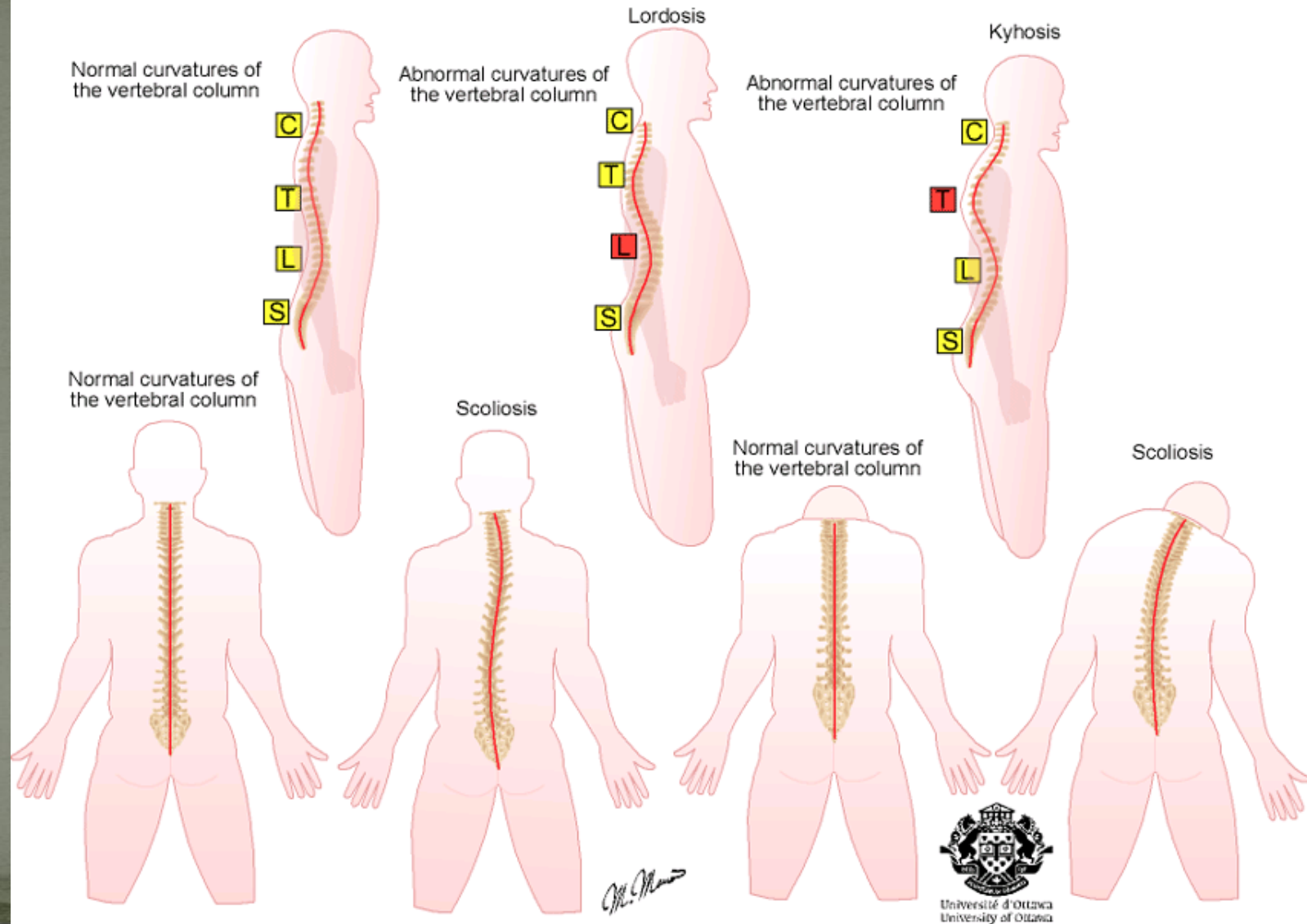
Lordosis

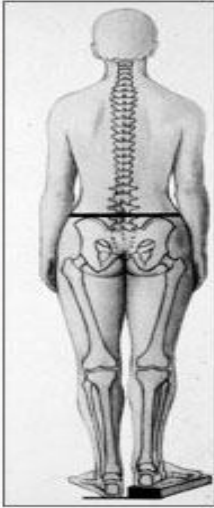
The four curves function to:

- a.increase the strength of the spine
- b.help maintain balance in the upright position
- c.absorb shocks from walking and jumping
- d.help protect the spine from fracture.



Curvatures of the Vertebral Column





A normal spine appears without curves in the frontal plane.



Scoliosis is a lateral deviation in the frontal plane associated with rotation.





Thoracic scoliosis



Lumber scoliosis

Differentiation of curves according to the anatomical region.

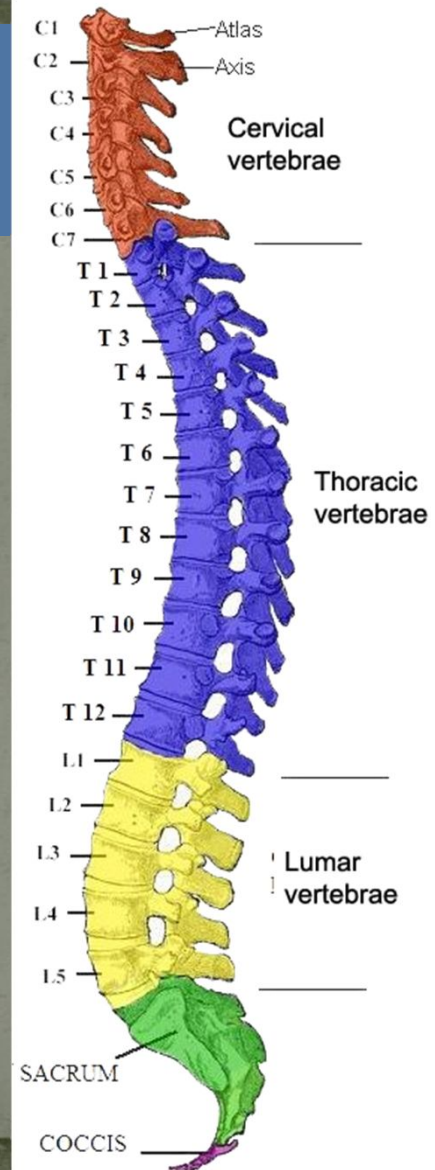


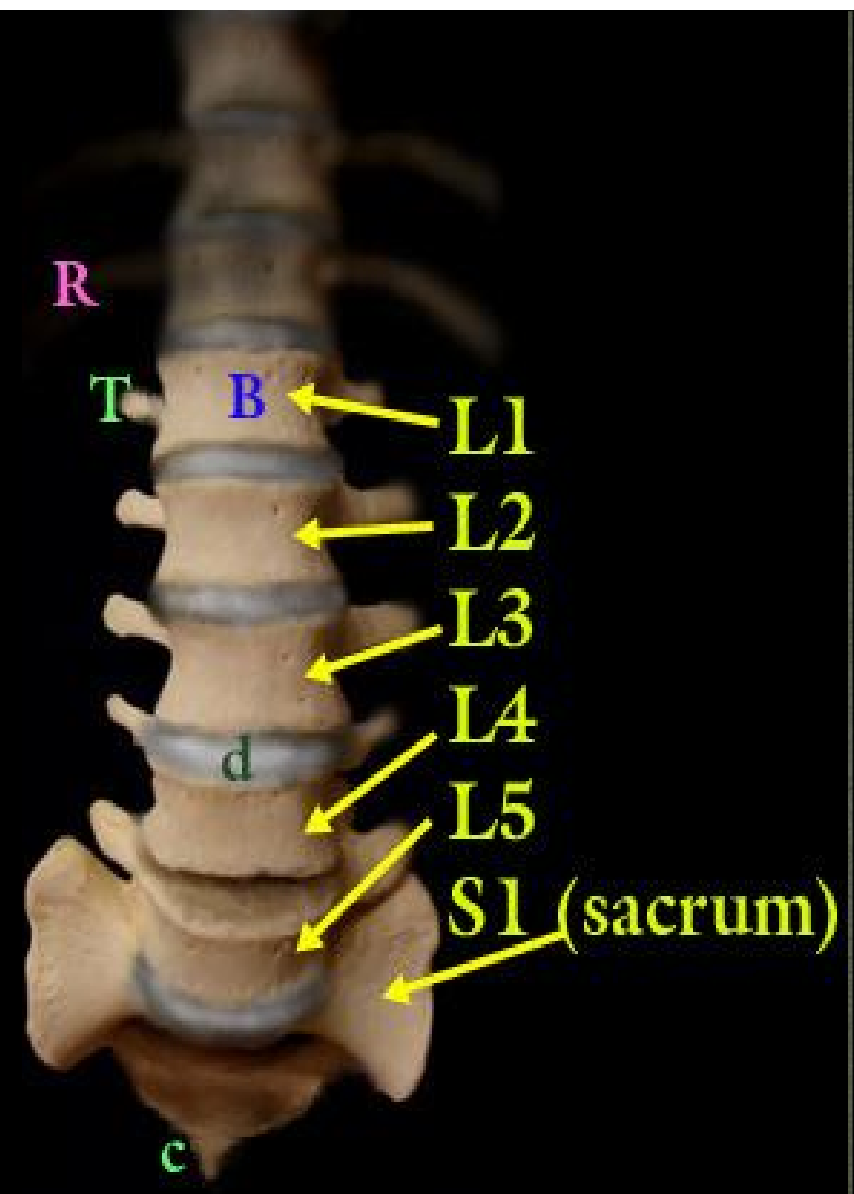
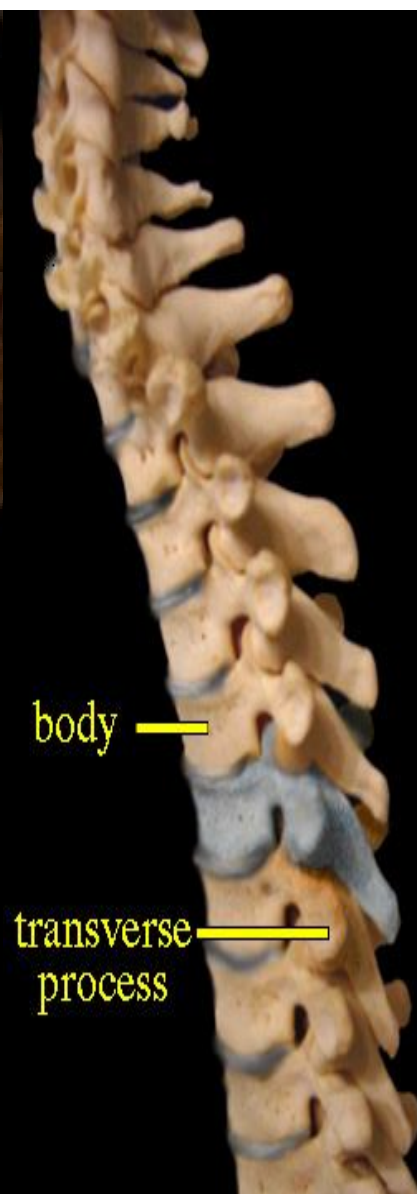
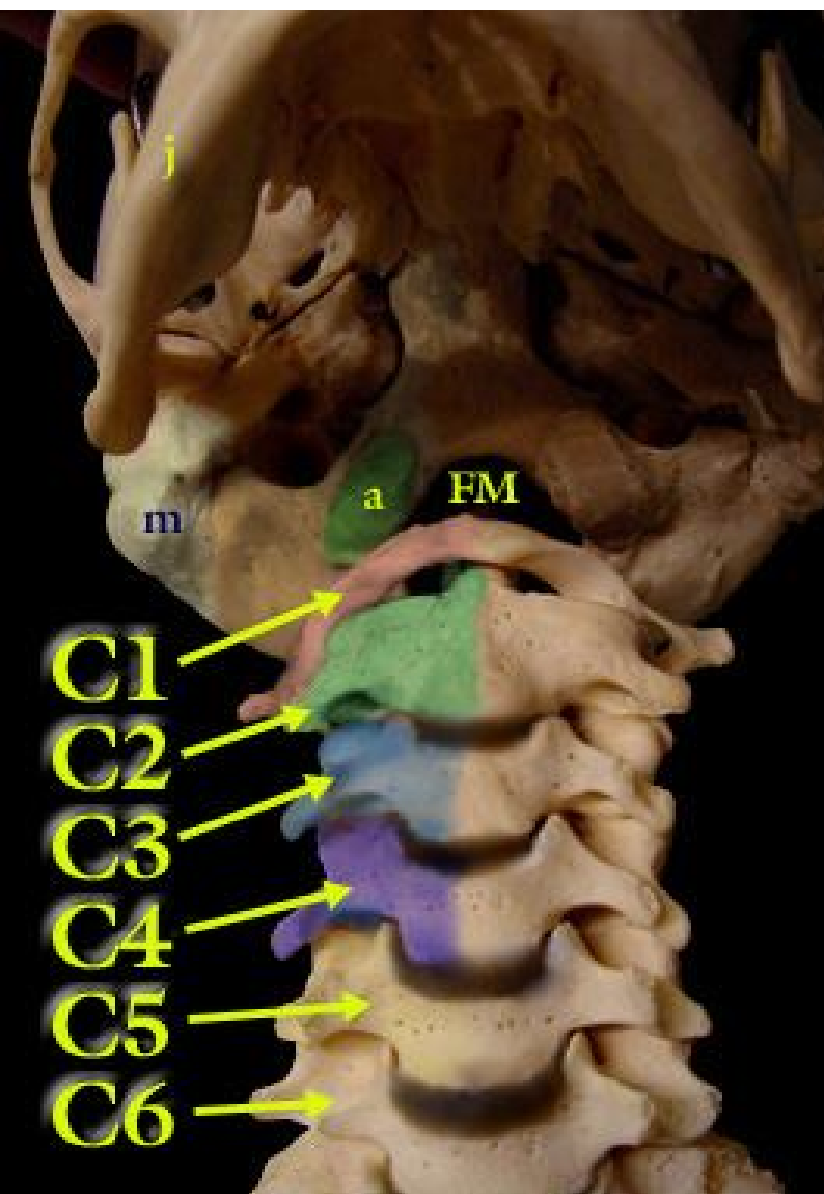
Posterior fusion mass (bone)
Tips of pedicular screws

The surgical strategy aims at correction and immobilization (fusion) of the curve, thus preventing progression.

Vertebral Column

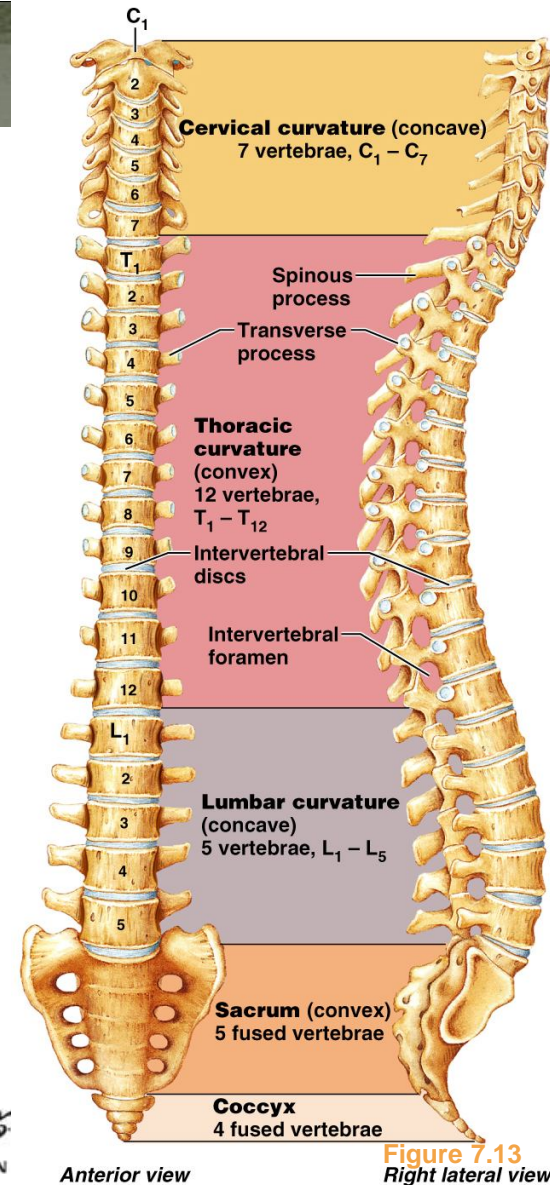
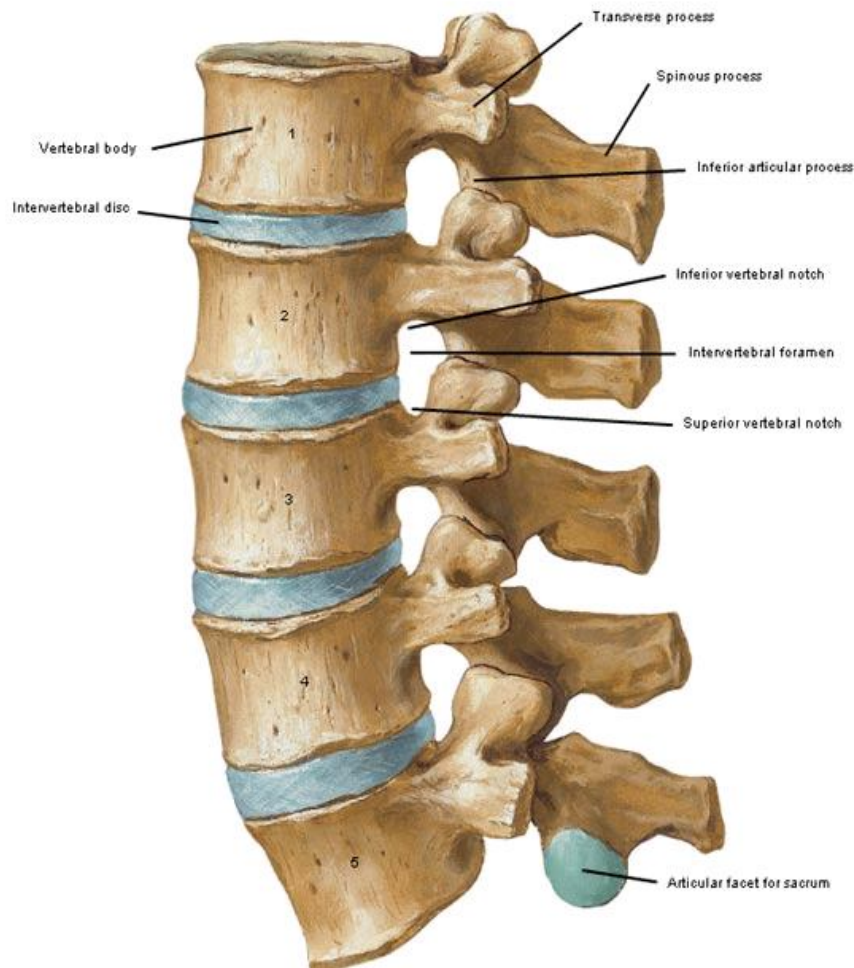
- Formed from 26 irregular bones (vertebrae) connected in such a way that a flexible curved structure results
 - Cervical vertebrae – 7 bones of the neck
 - Thoracic vertebrae – 12 bones of the torso
 - Lumbar vertebrae – 5 bones of the lower back
 - Sacrum – bone inferior to the lumbar vertebrae that articulates with the hip bones



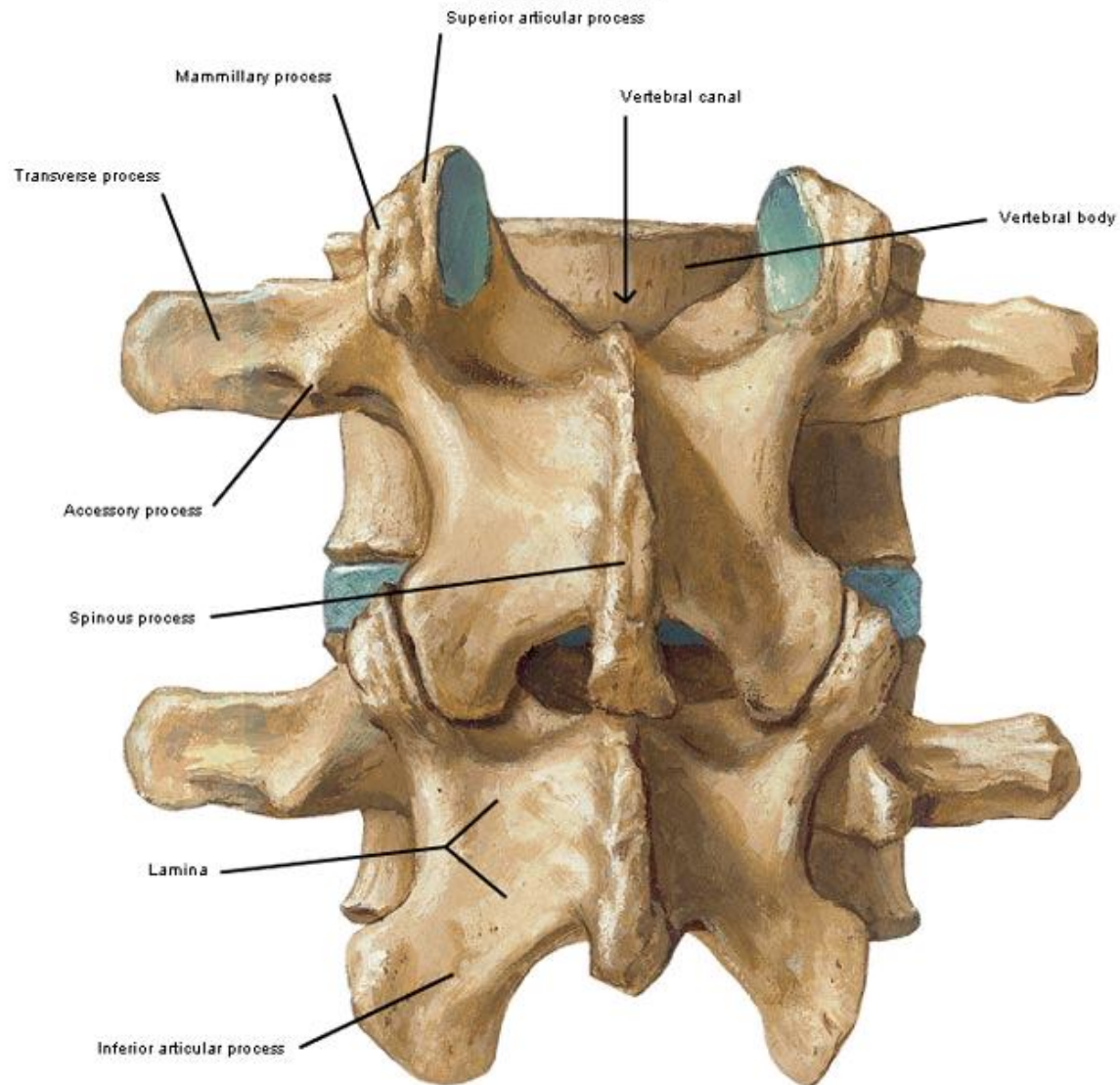


Vertebral Column

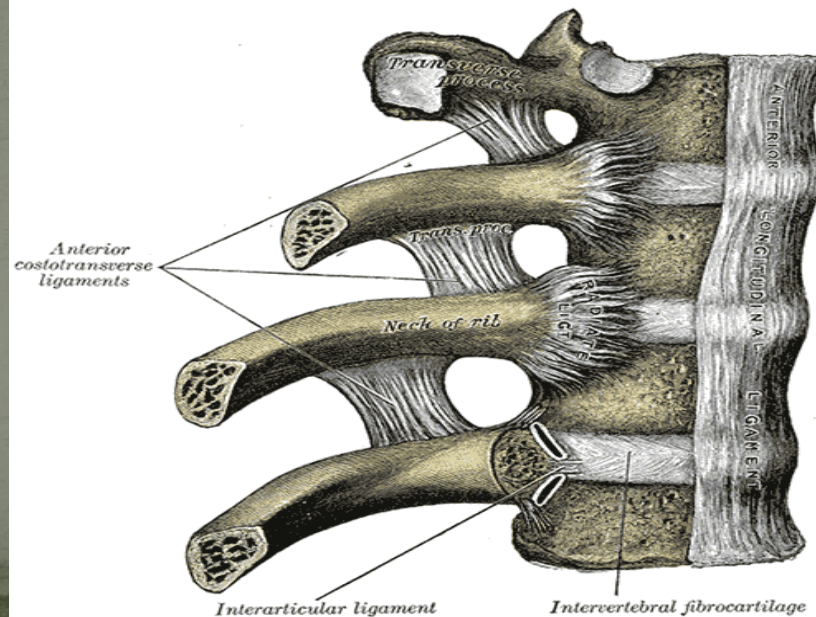
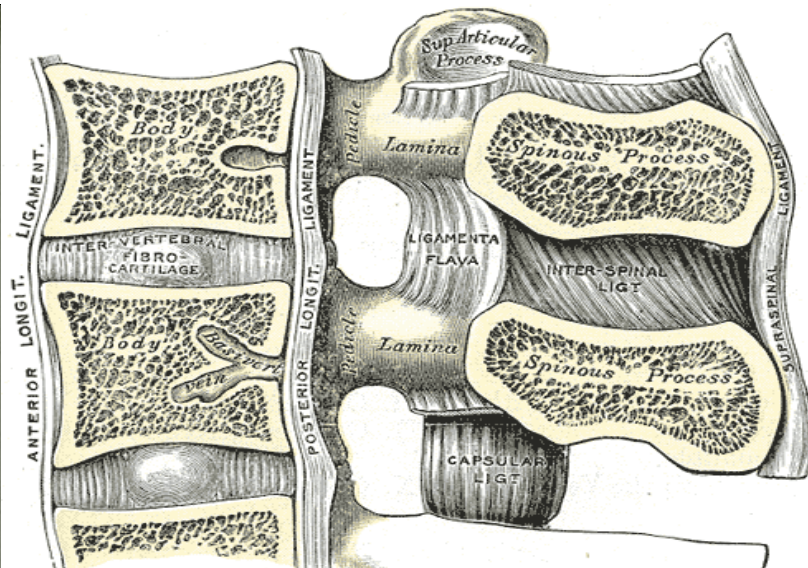
Lumbar Vertebrae (L1-5) Left Lateral View



Lumbar Vertebrae (L3-4) - Assembled Posterior View

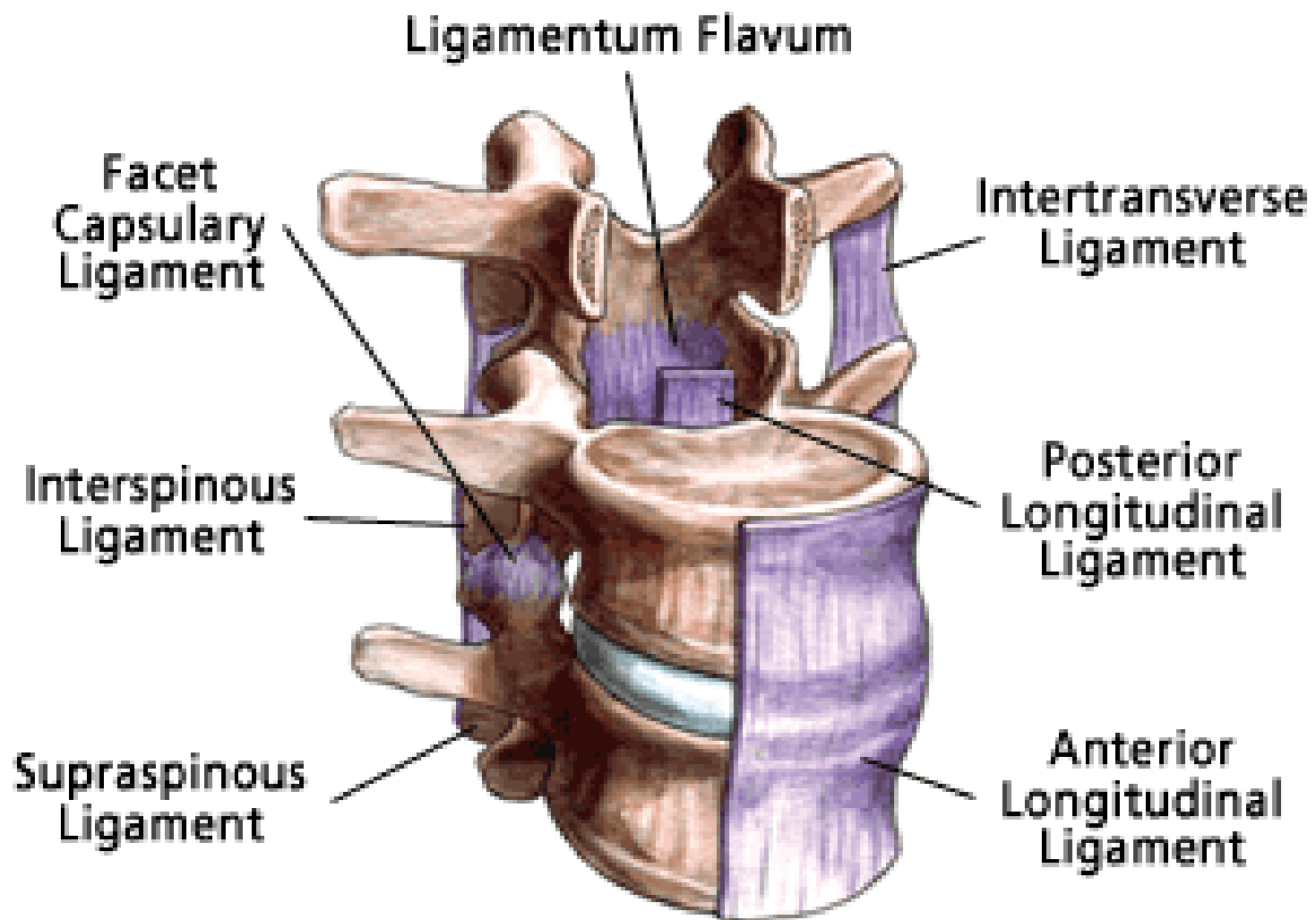


F. Netter
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Vertebral Column: Ligaments

- **Anterior and posterior longitudinal ligaments** – continuous bands down the front and back of the spine from the neck to the sacrum
- **Short ligaments connect** adjoining vertebrae together



Vertebral Column: Ligaments

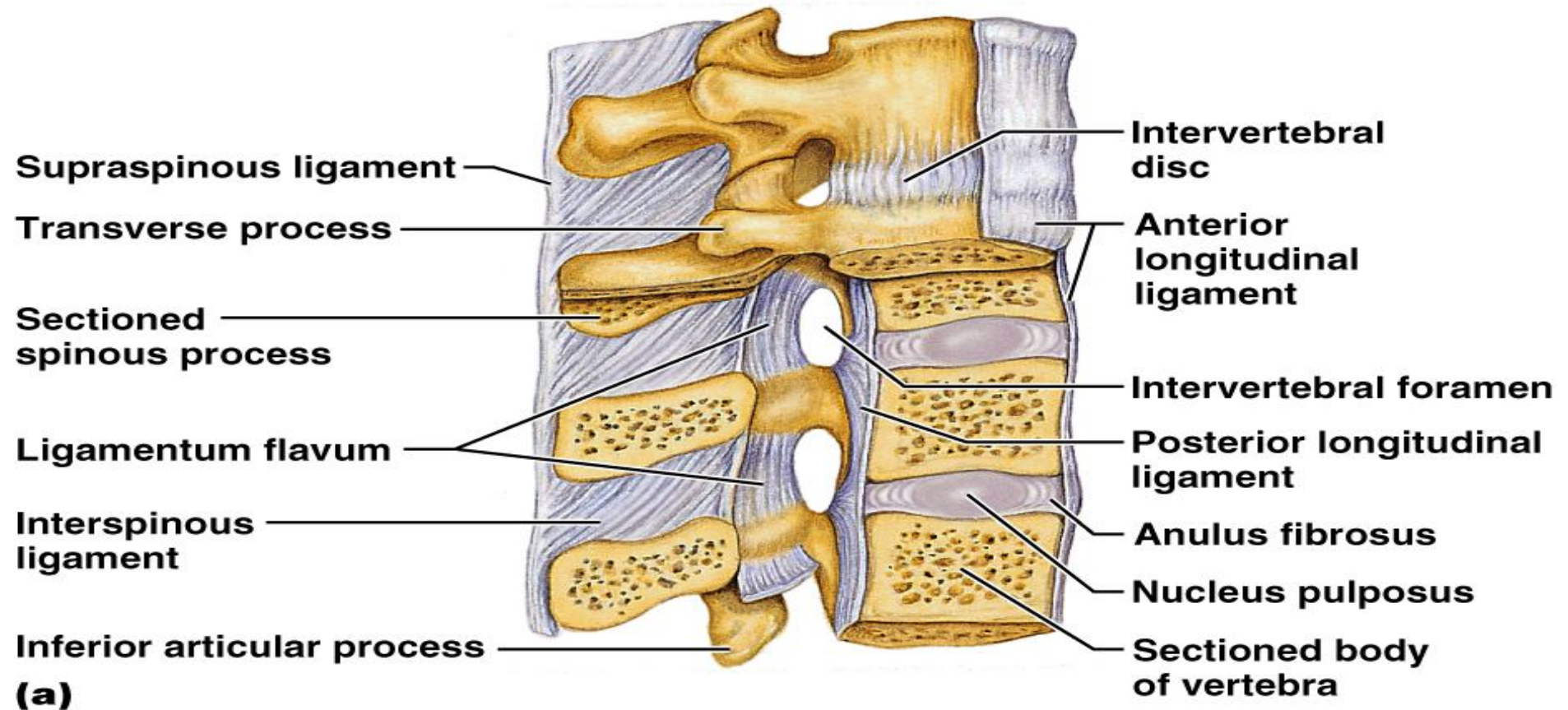


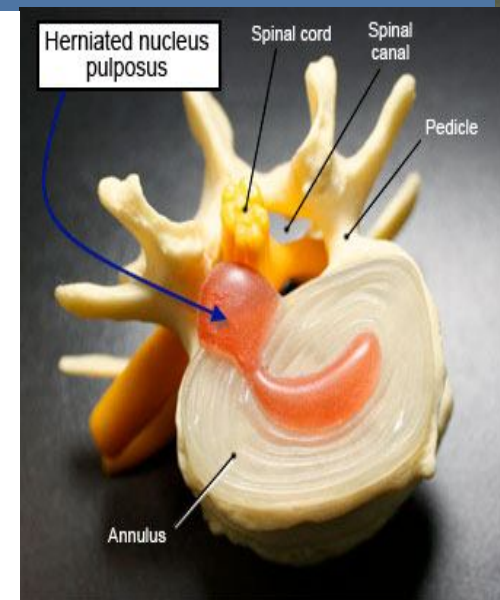
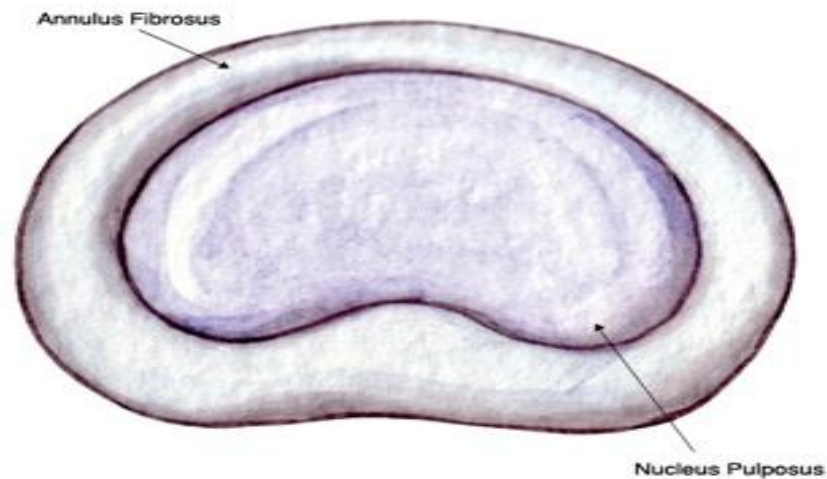
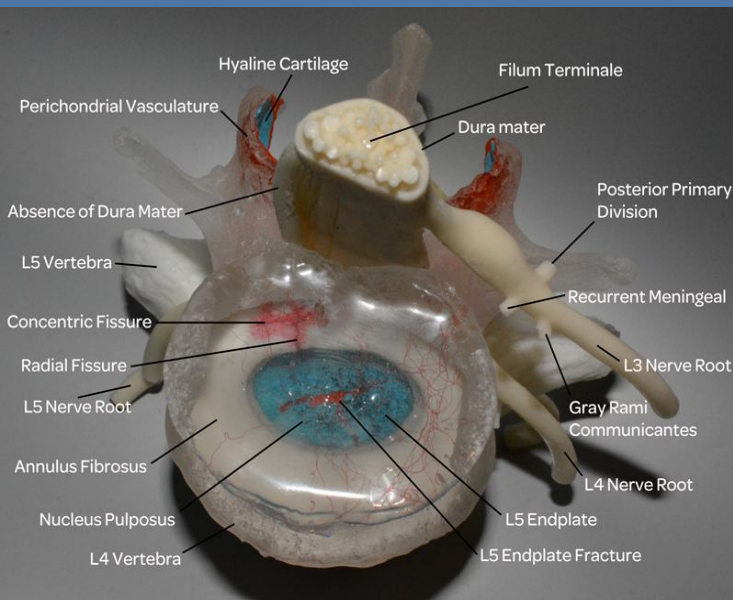
Figure 7.14a

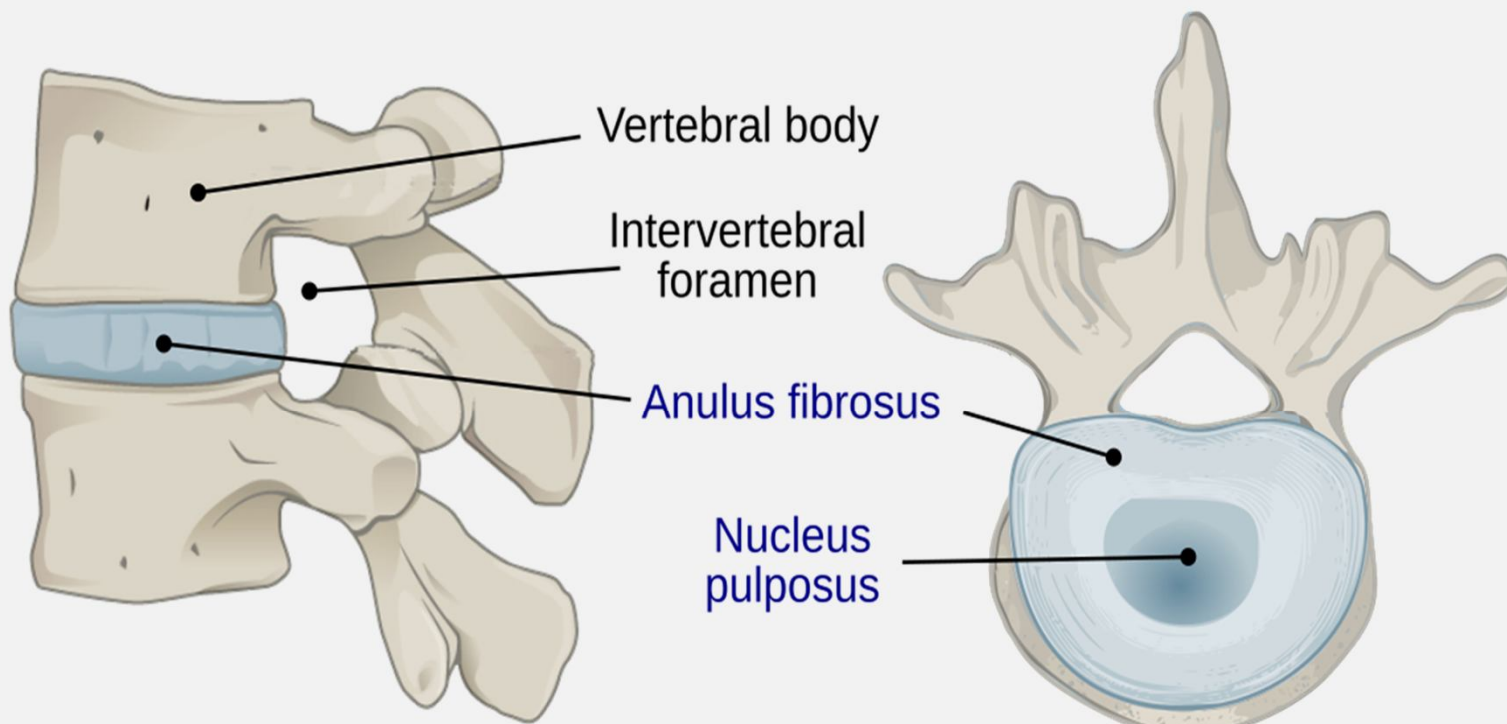
Muscles and Tendons

Ligament Name	Description
Anterior Longitudinal Ligament (ALL) <i>A primary spine stabilizer</i>	About one-inch wide, the ALL runs the entire length of the spine from the base of the skull to the sacrum. It connects the front (anterior) of the vertebral body to the front of the annulus fibrosis.
Posterior Longitudinal Ligament (PLL) <i>A primary spine stabilizer</i>	About one-inch wide, the PLL runs the entire length of the spine from the base of the skull to sacrum. It connects the back (posterior) of the vertebral body to the back of the annulus fibrosis.
Supraspinous Ligament	This ligament attaches the tip of each spinous process to the other.
Interspinous Ligament	This thin ligament attaches to another ligament, called the ligamentum flavum that runs deep into the spinal column.
Ligamentum Flavum <i>The strongest ligament</i>	This yellow ligament is the strongest one. It runs from the base of the skull to the pelvis, in front of and behind the lamina, and protects the spinal cord and nerves. The ligamentum flavum also surrounds the facet joint capsules.

Vertebral Column: Intervertebral Discs

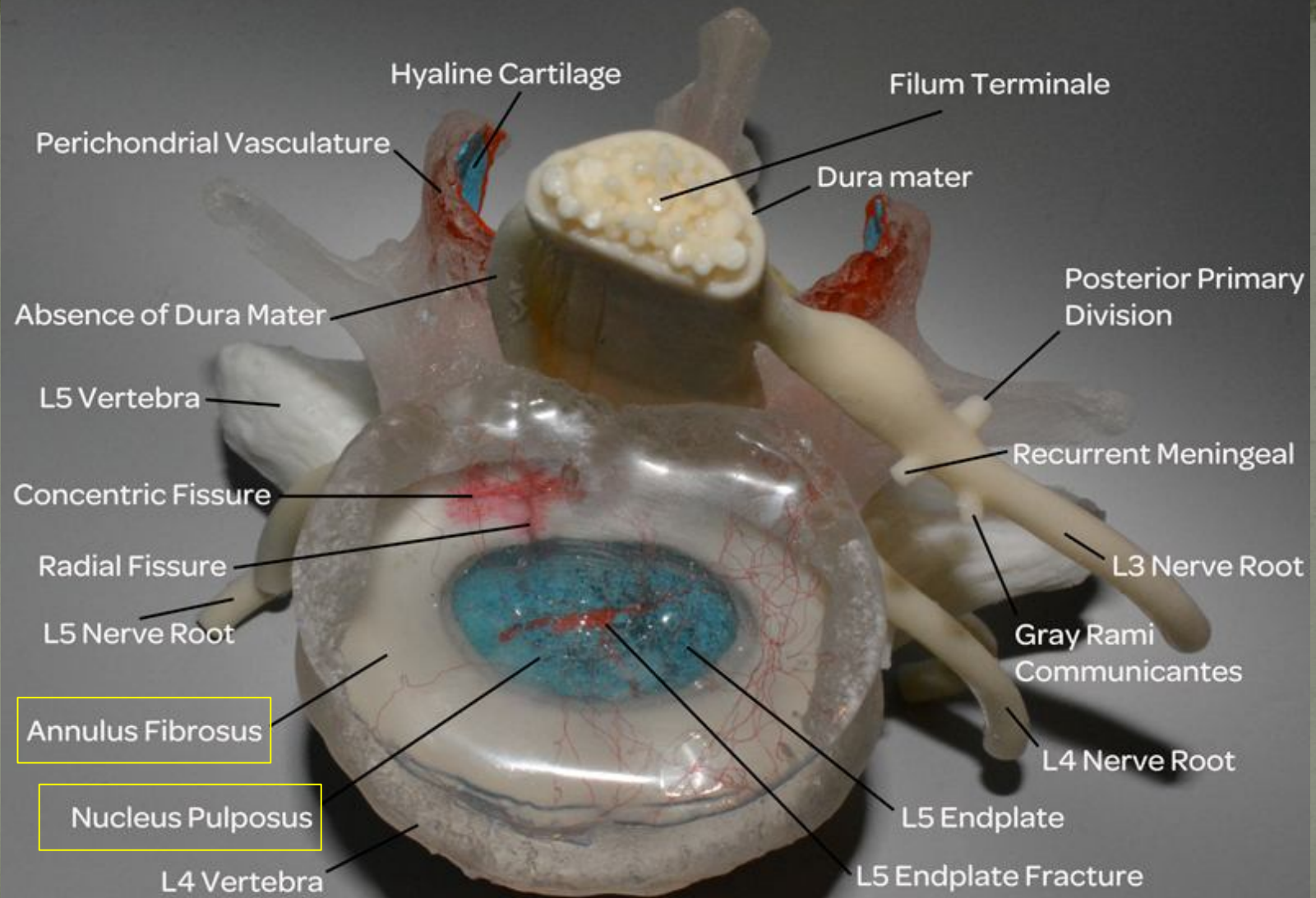
- Cushion-like pad composed of two parts
 - **Nucleus pulposus** – inner gelatinous nucleus that gives the disc its elasticity and compressibility
 - **Annulus fibrosus** – surrounds the nucleus pulposus with a collar composed of collagen and fibrocartilage





Lateral view

Superior view



Vertebral Column: Intervertebral Discs

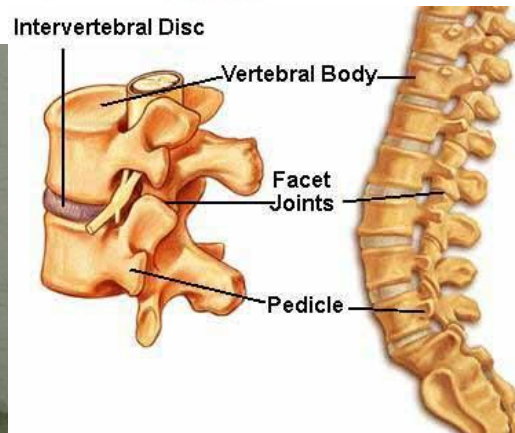
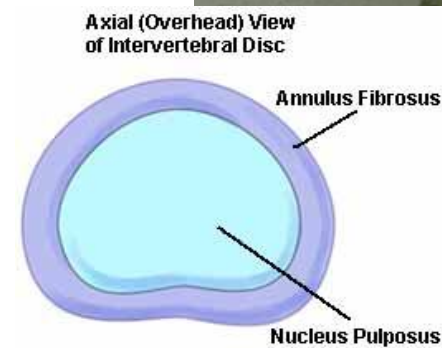
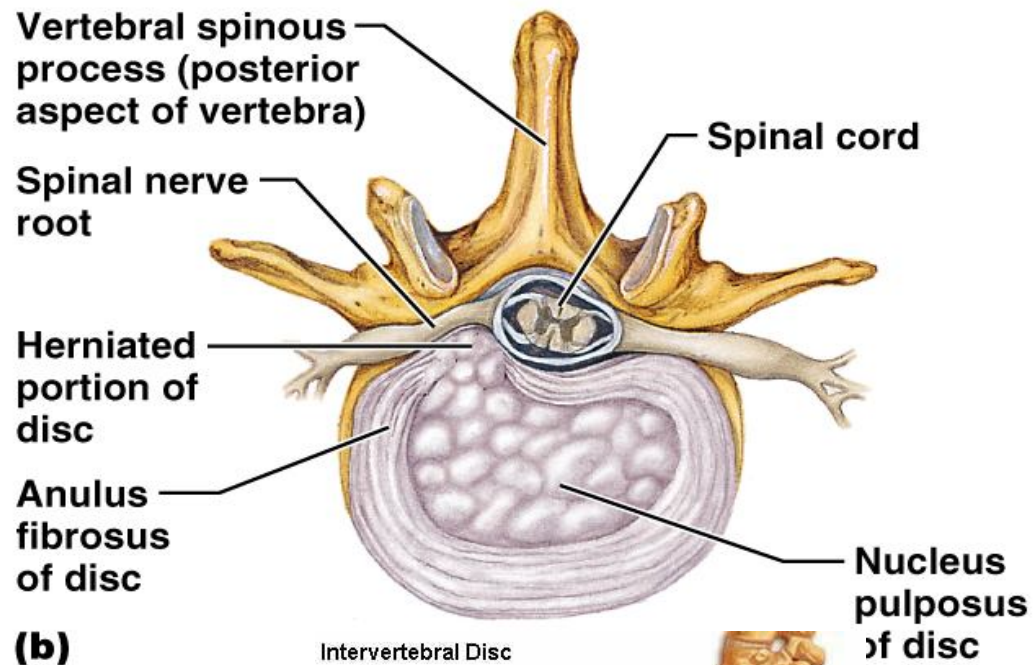


Figure 7.14b

General Structure of Vertebrae

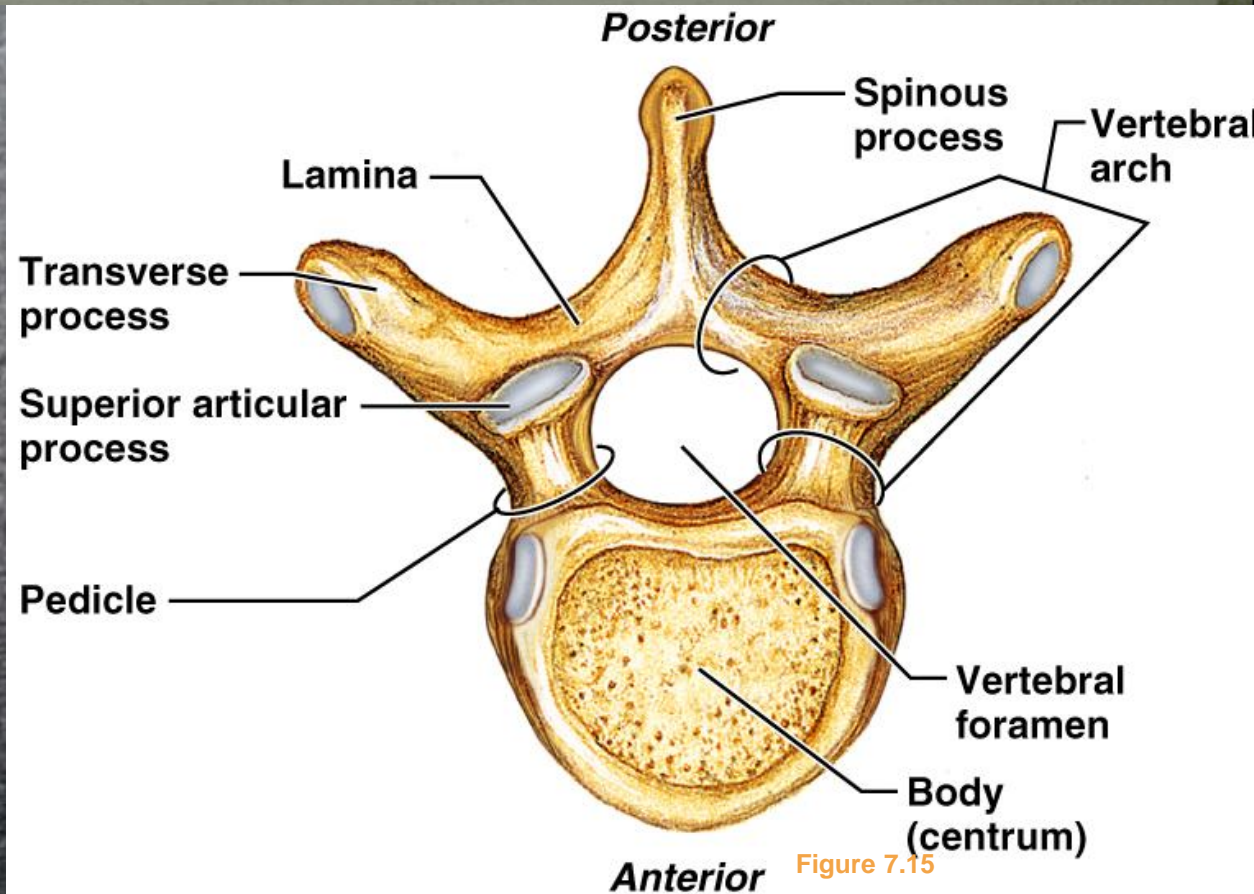
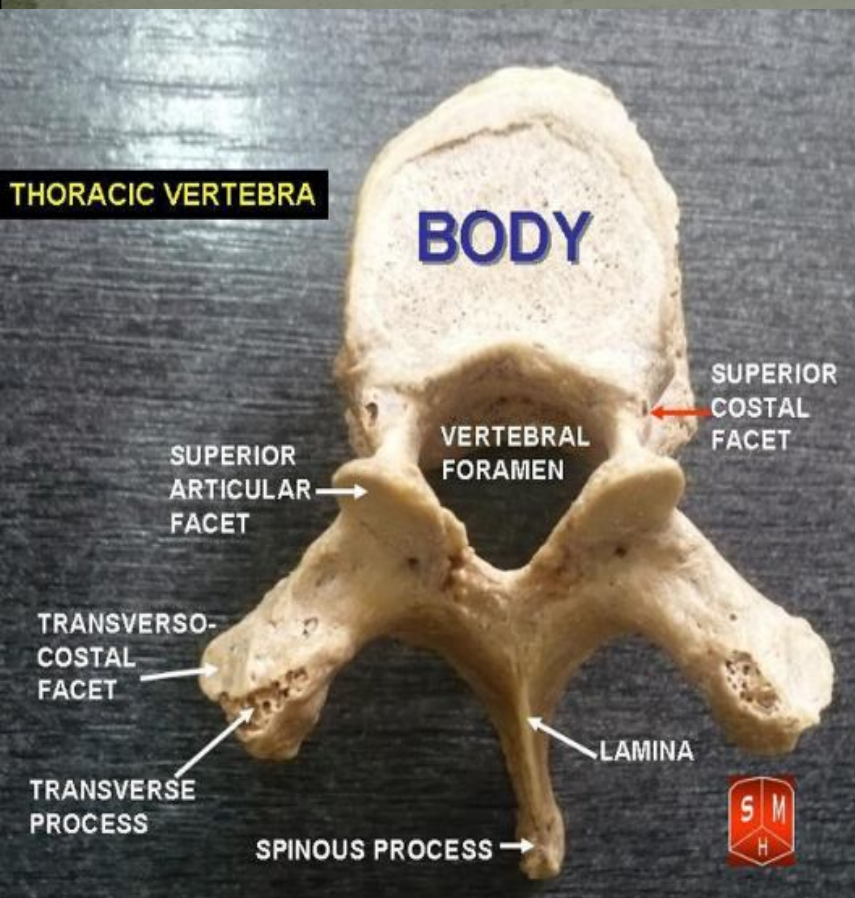
A typical vertebra has the following structural features:

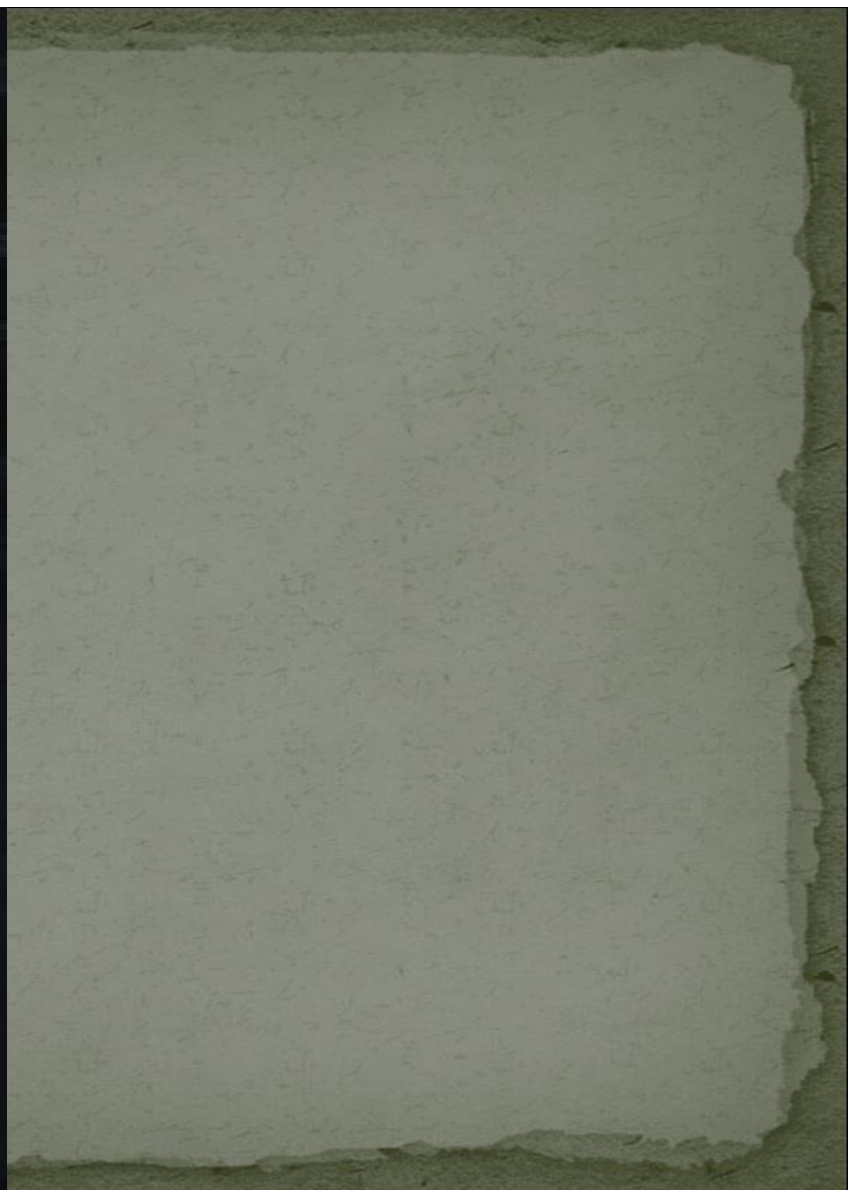
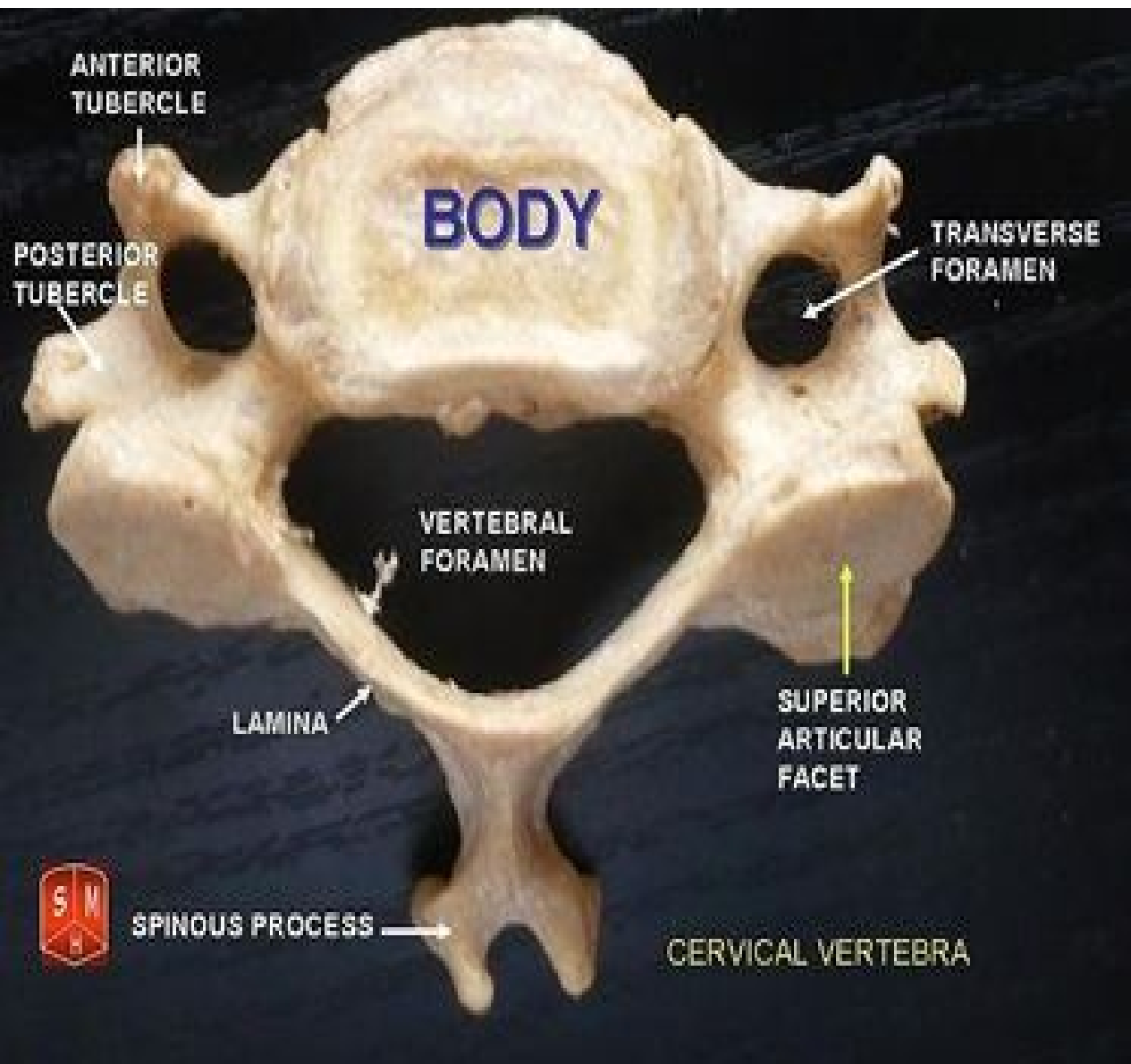
- i. **body**
- ii. **vertebral arch**, which consists of:
 - a. two **pedicles**
 - b. two **laminae**
- iii. **7 processes:**
 - a. two **transverse processes**
 - b. one **spinous process (spine)**
 - c. two **superior articular processes** with **facets**
 - d. two **inferior articular processes** with **facets**

General Structure of Vertebrae

- **Body or centrum** – disc-shaped, weight-bearing region
- **Spinous processes** project posteriorly, and transverse processes project laterally
- **Vertebral arch** – composed of pedicles and laminae that, along with the centrum, enclose the vertebral foramen
- **Superior and inferior articular processes** – protrude superiorly and inferiorly from the pedicle-lamina junctions
- **Vertebral foramina** – make up the vertebral canal through which the spinal cord passes
- **Intervertebral foramina** – lateral openings formed from notched areas on the superior and inferior borders of adjacent pedicles

General Structure of Vertebrae







Vertebral artery

Spinous process C2

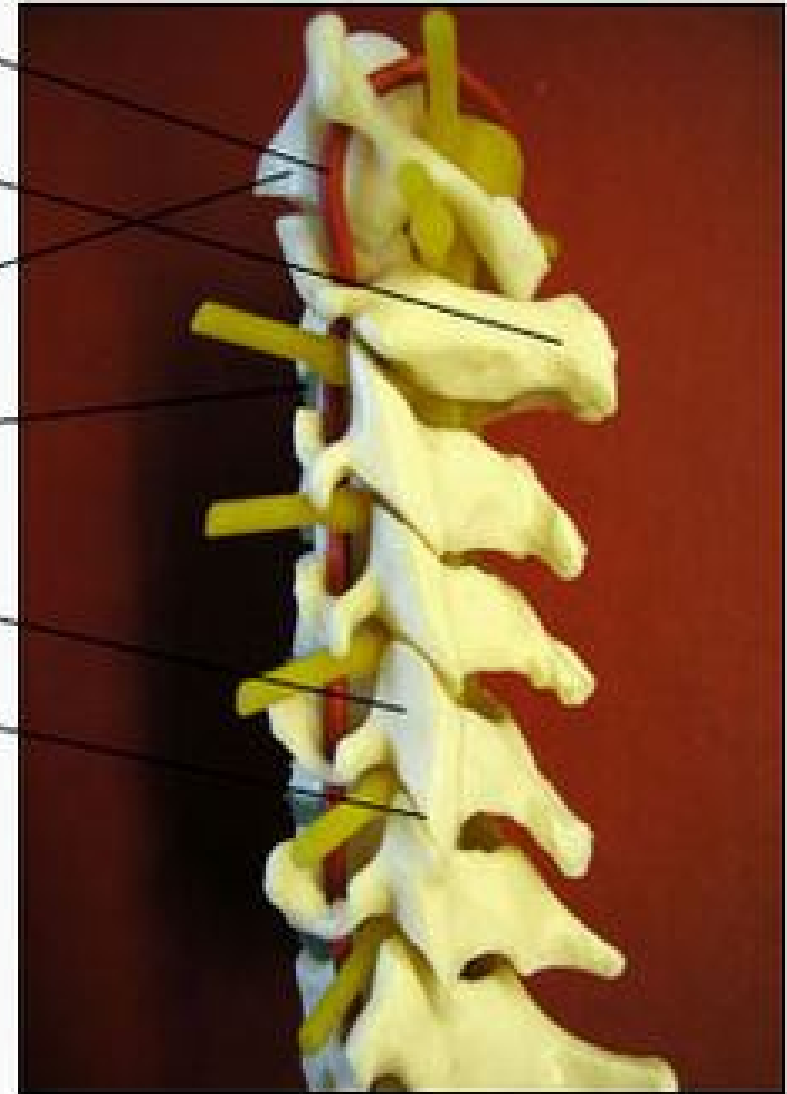
Vertebral body

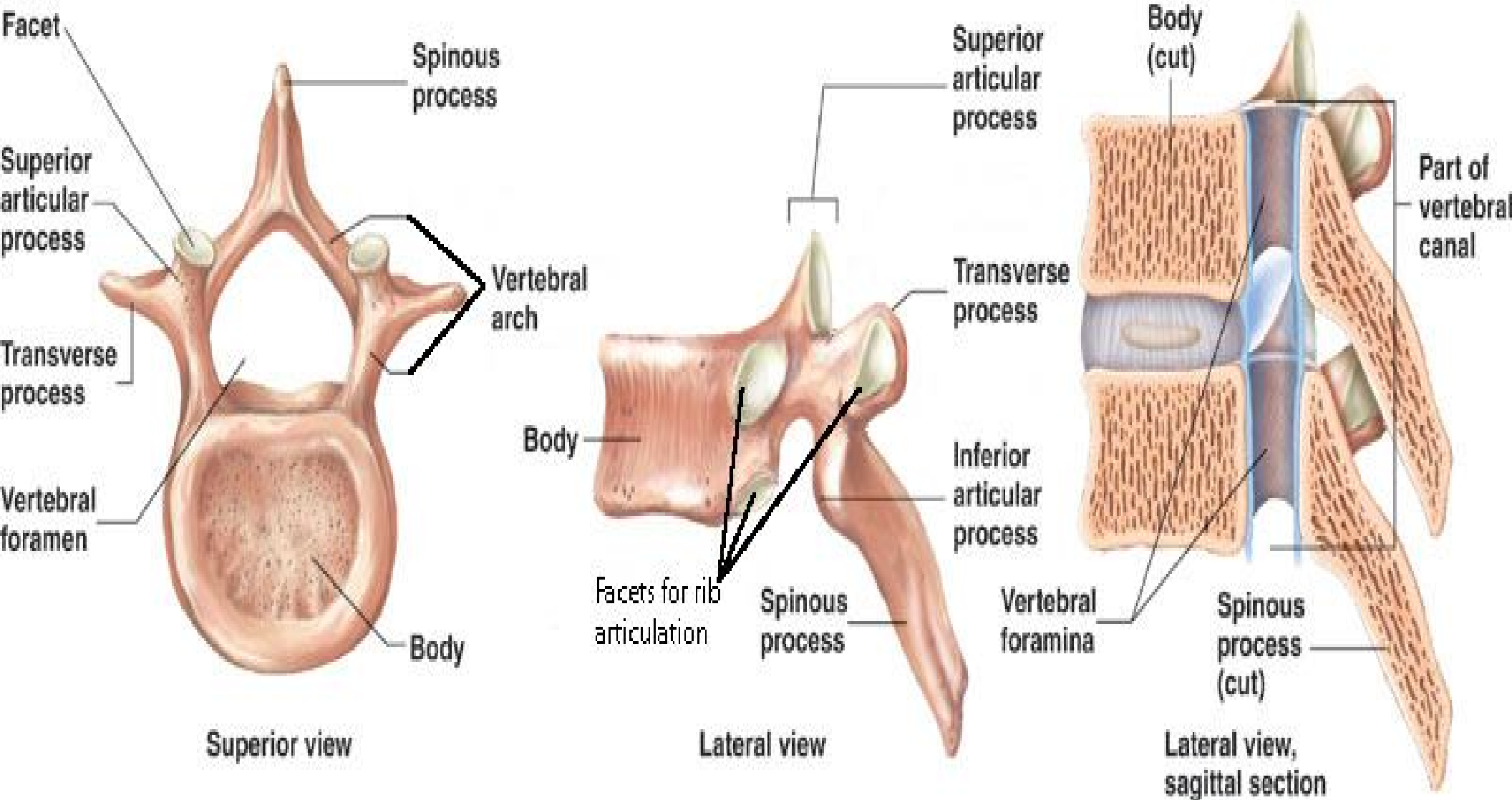
Intervertebral disc

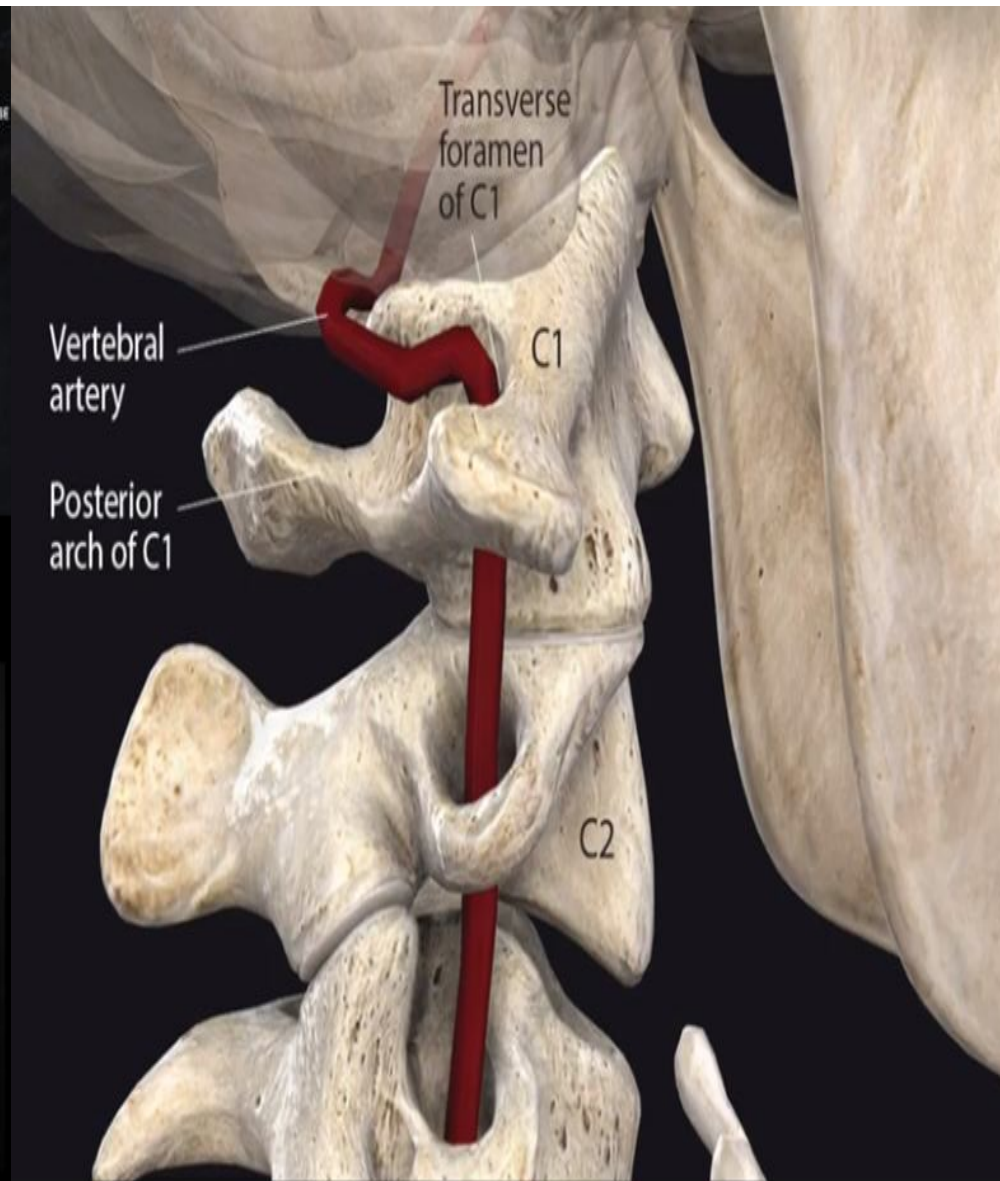
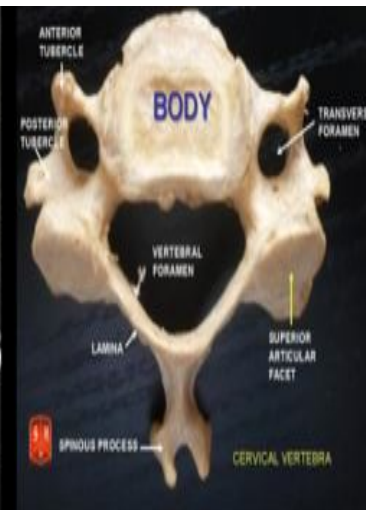
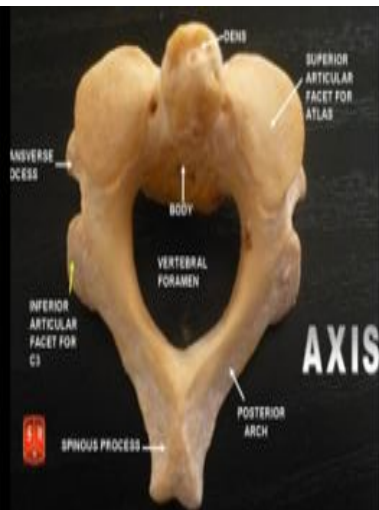
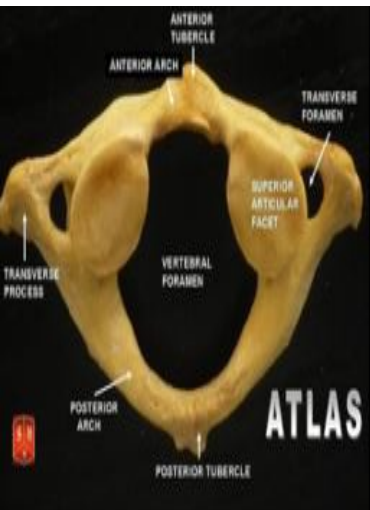
Lateral mass

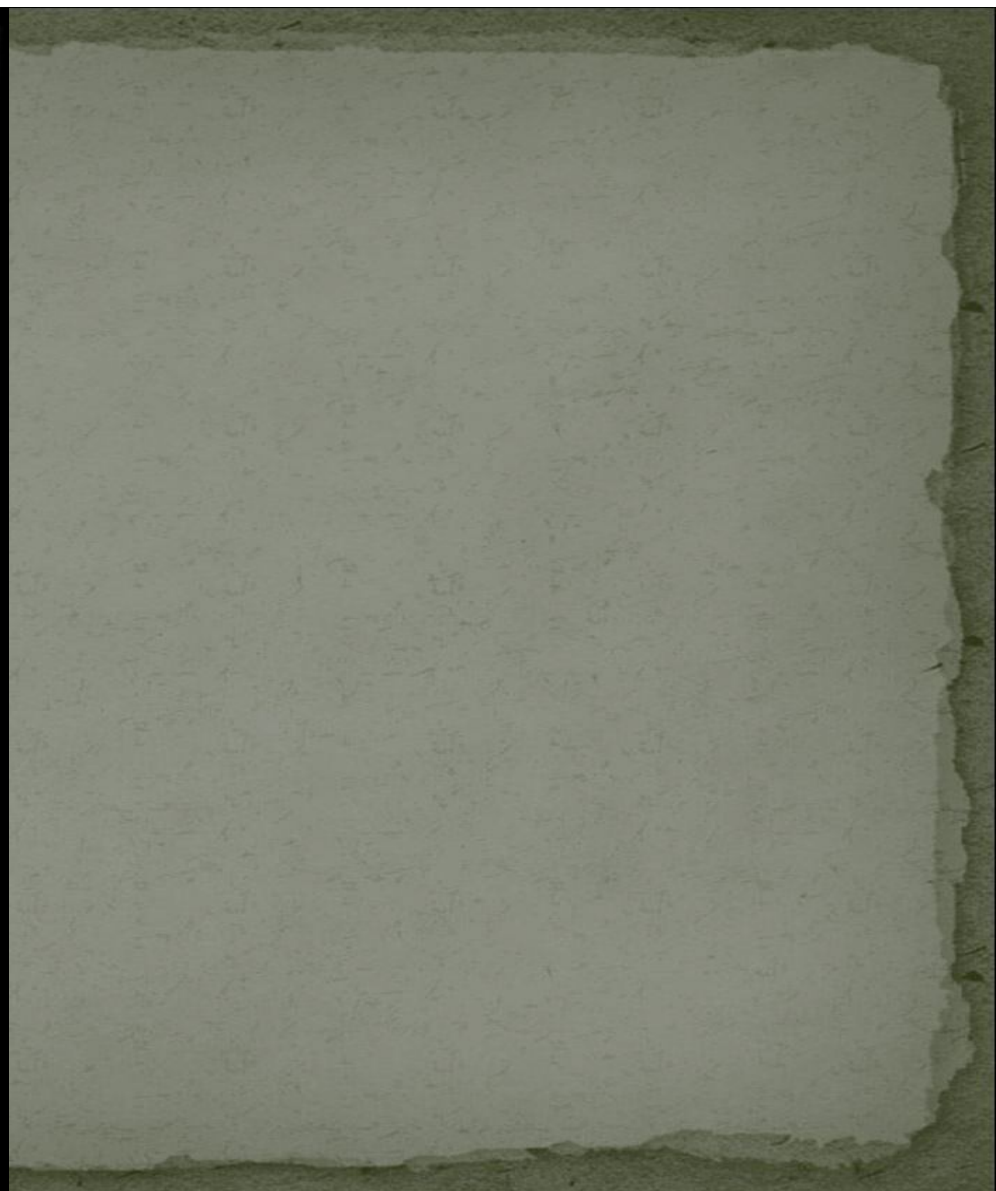
Facets

Calcifications
(degenerative)



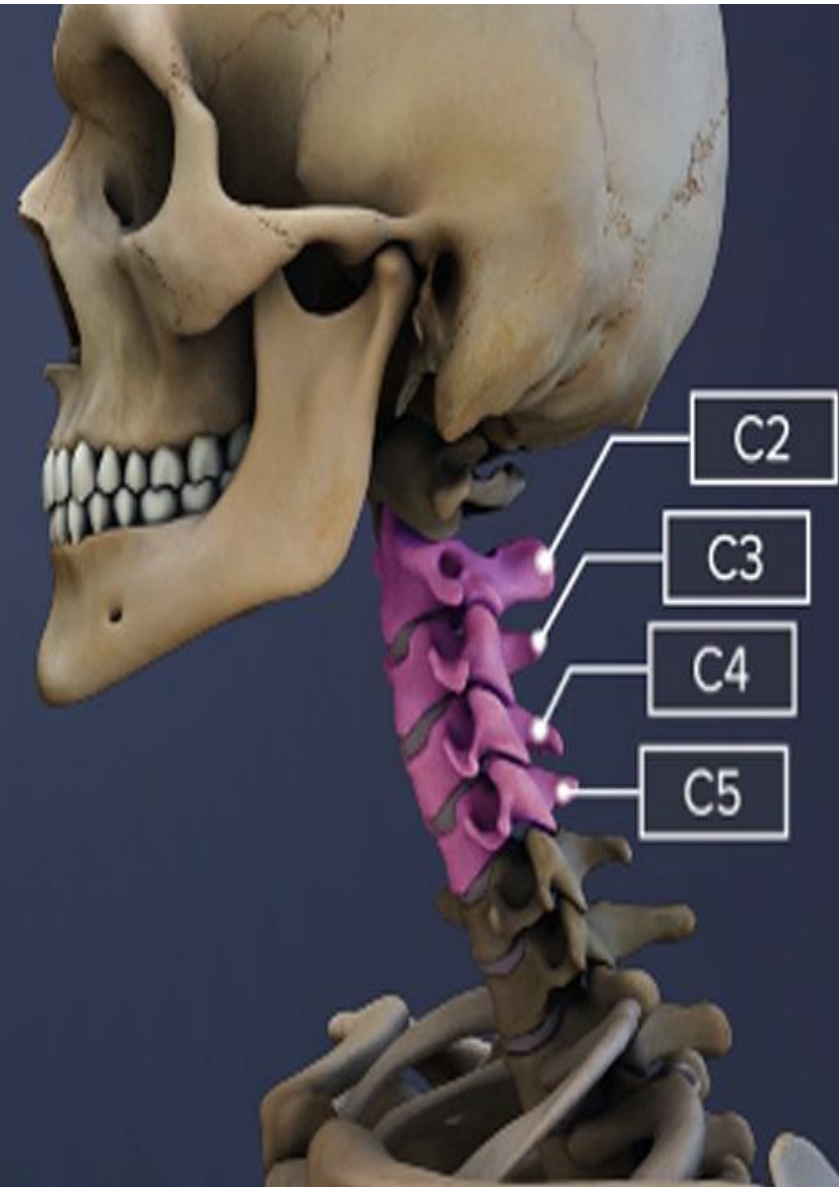
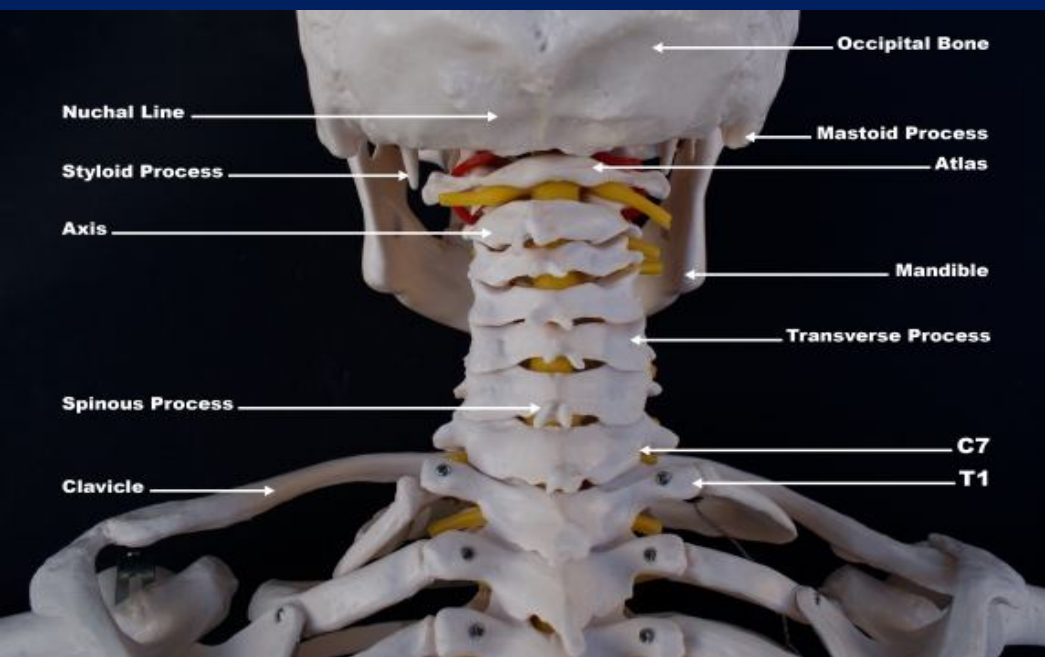






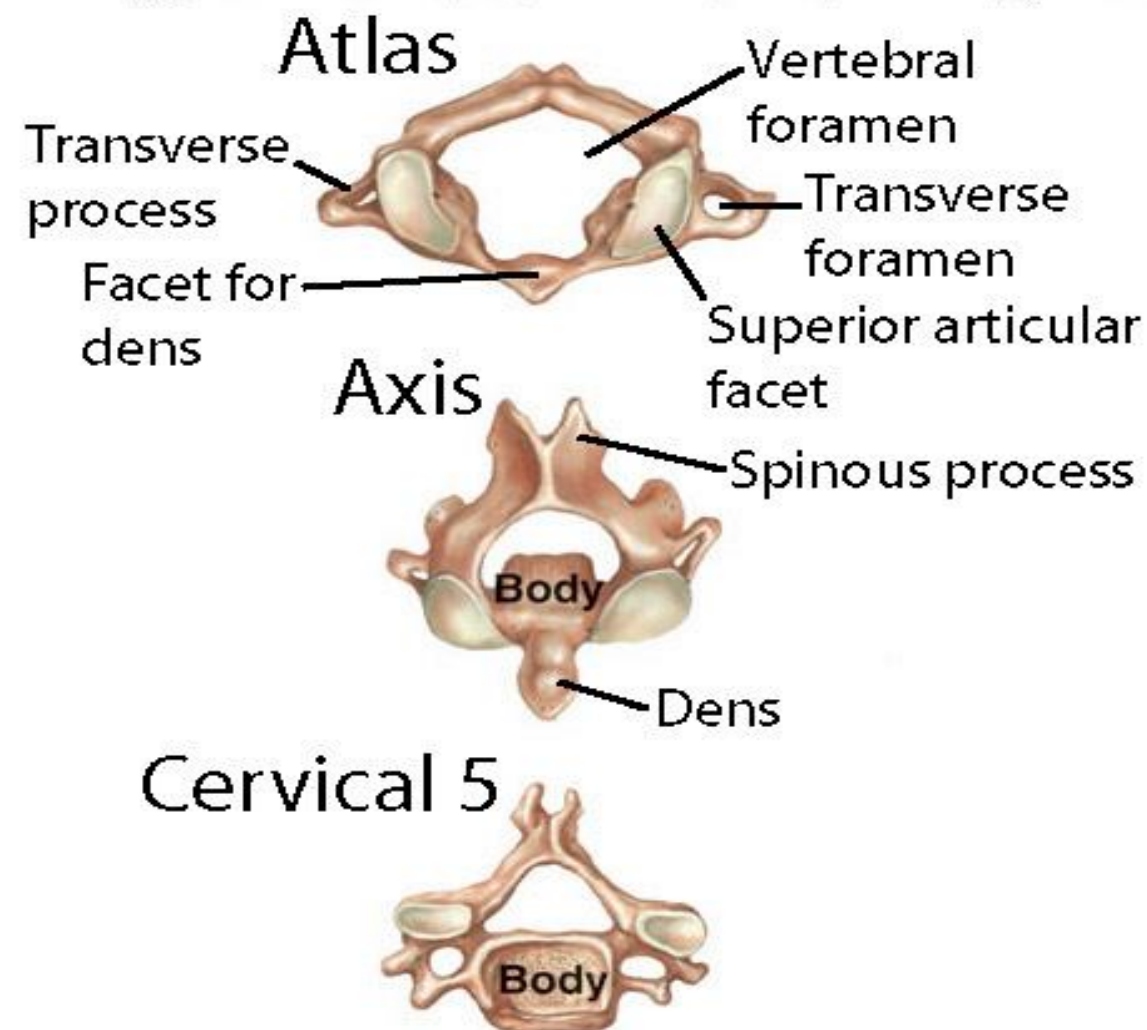
Cervical Vertebrae

- Seven vertebrae (C₁-C₇) are the smallest, lightest vertebrae
- C₃-C₇ are distinguished with an oval body, short spinous processes, and large, triangular vertebral foramina
- Each transverse process contains a transverse foramen



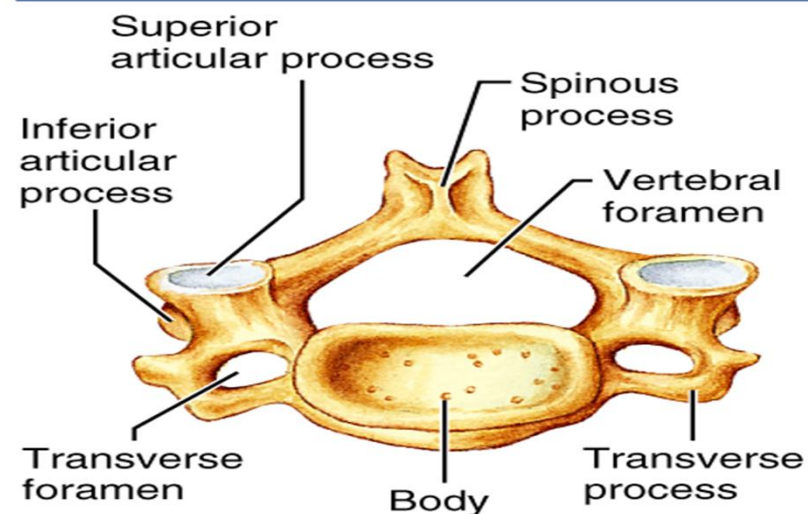
Cervical Vertebrae

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CERVICAL (3-7)

SUPERIOR VIEW



RIGHT LATERAL VIEW

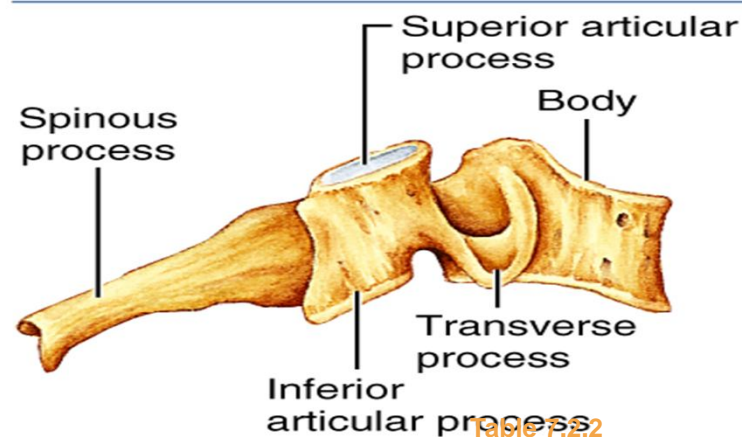
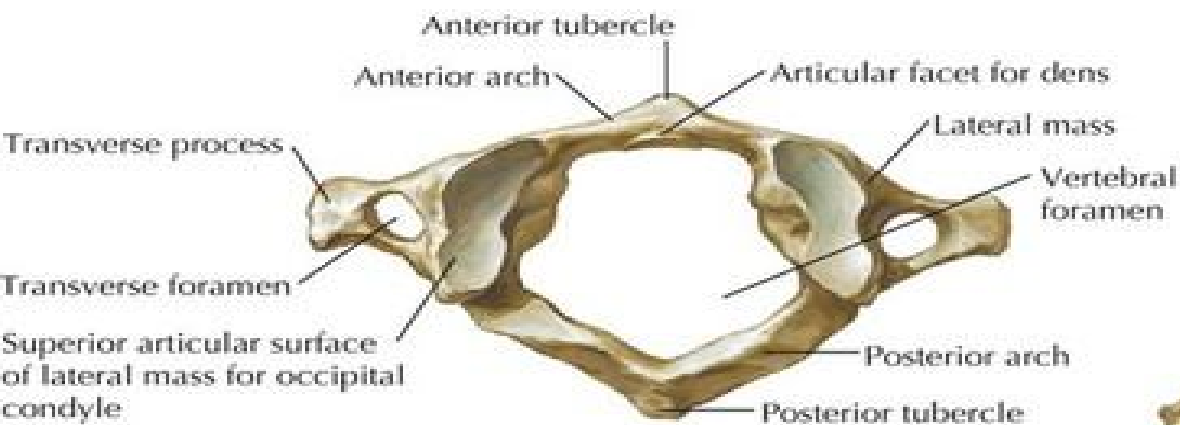
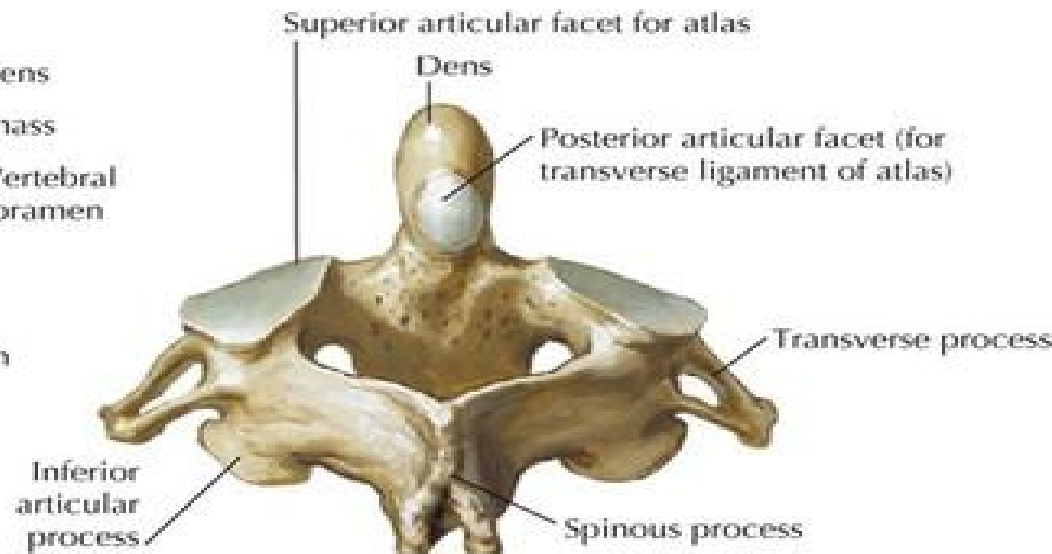


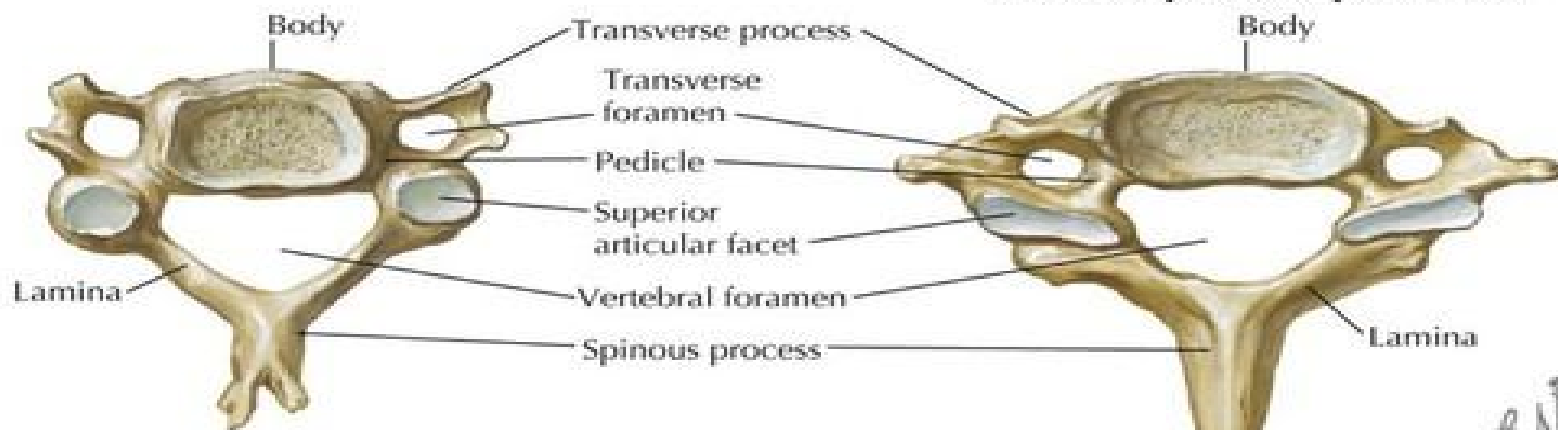
Table F.2.2



Atlas (C1): superior view



Axis (C2): posterosuperior view



4th cervical vertebra: superior view

7th cervical vertebra: superior view

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Cervical Vertebrae: The Atlas (C₁)

- The atlas has no body and **no spinous process**
- It consists of **anterior and posterior arches, and two lateral masses**
- The superior surfaces of lateral masses articulate with the occipital condyles

Cervical Vertebrae: The Atlas (C₁)

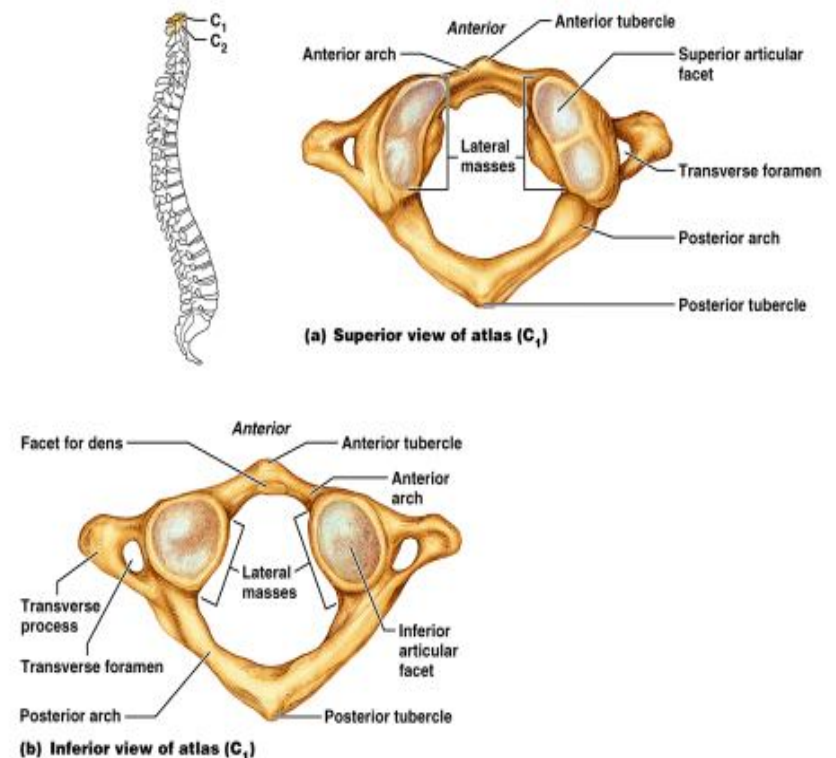
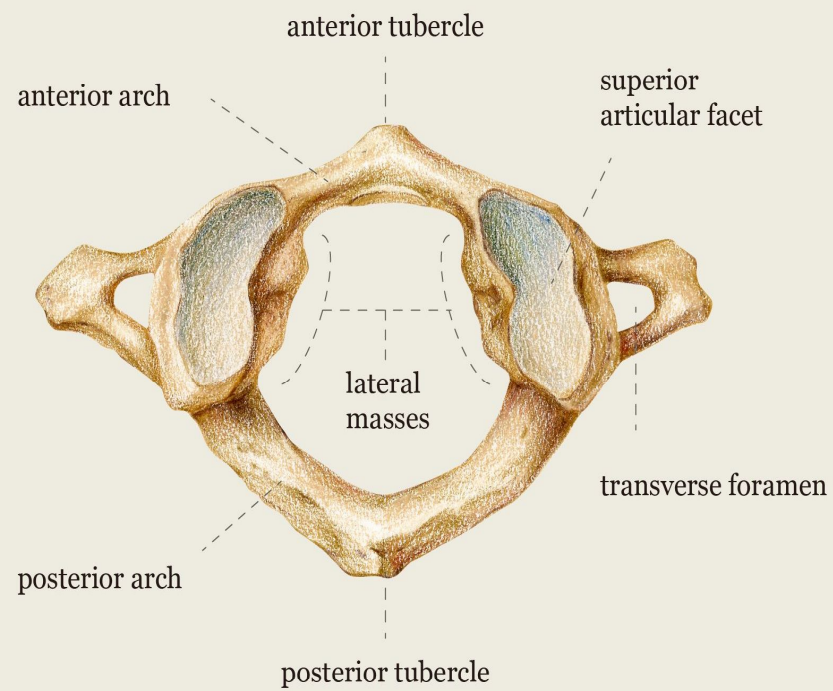
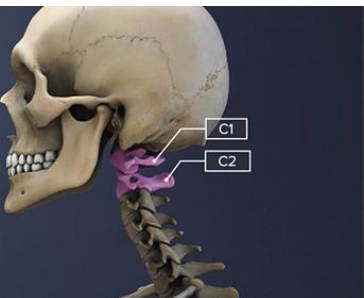
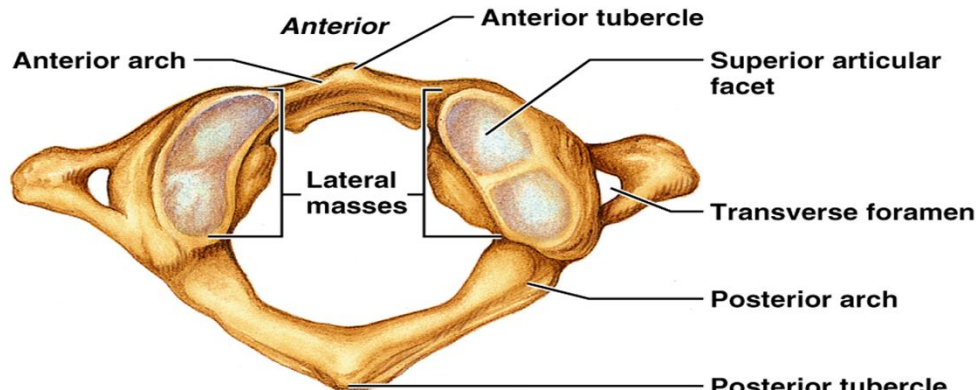


Figure 7.16a, b

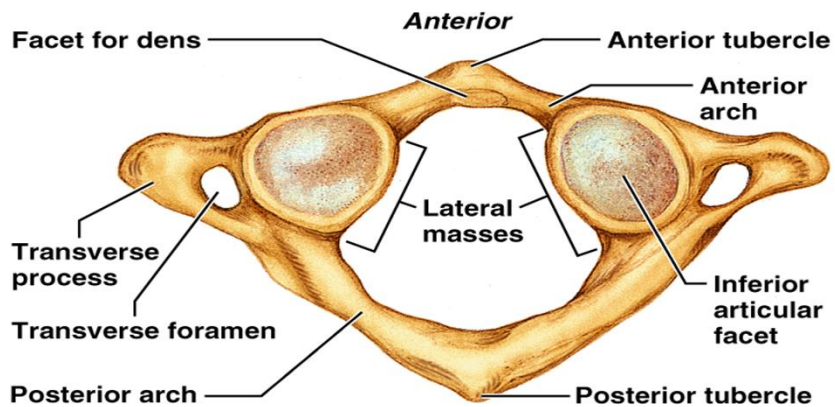
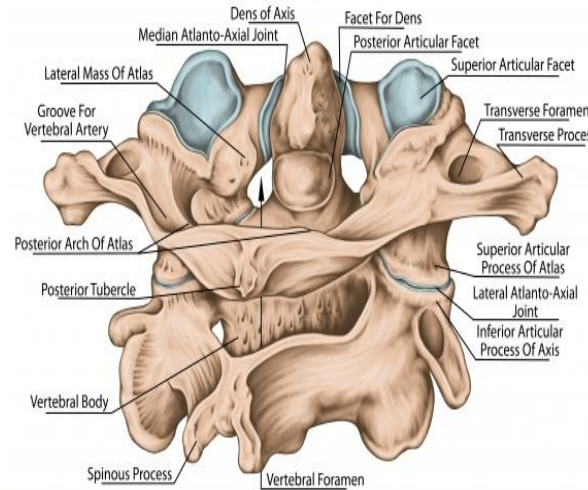


the 1st cervical vertebra

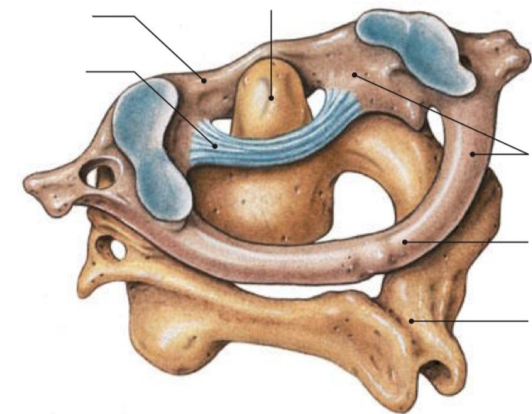
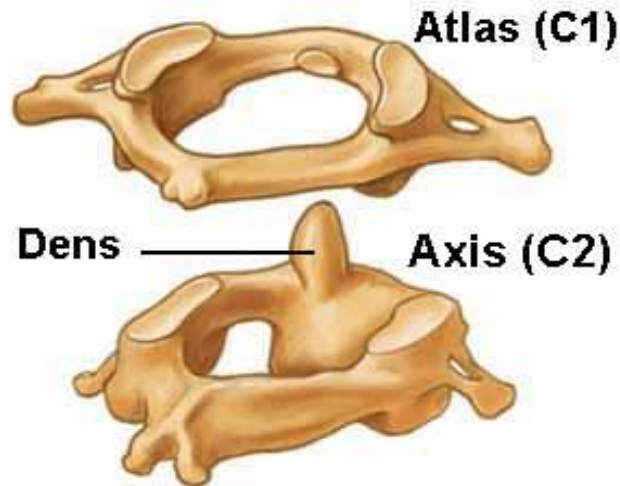
Cervical Vertebrae: The Atlas (C₁)



(a) Superior view of atlas (C₁)



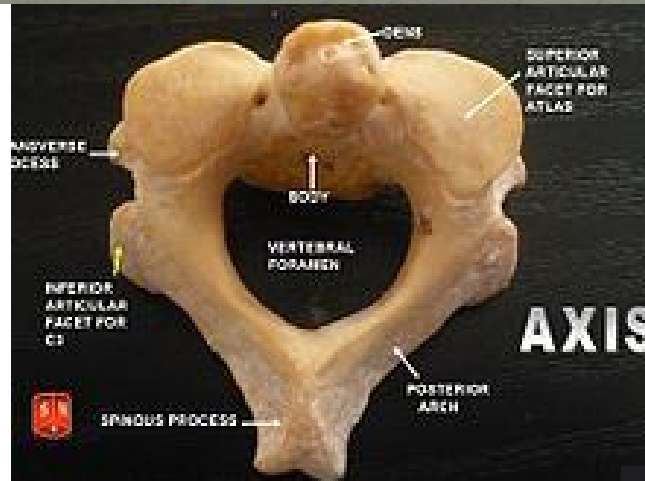
(b) Inferior view of atlas (C₁)



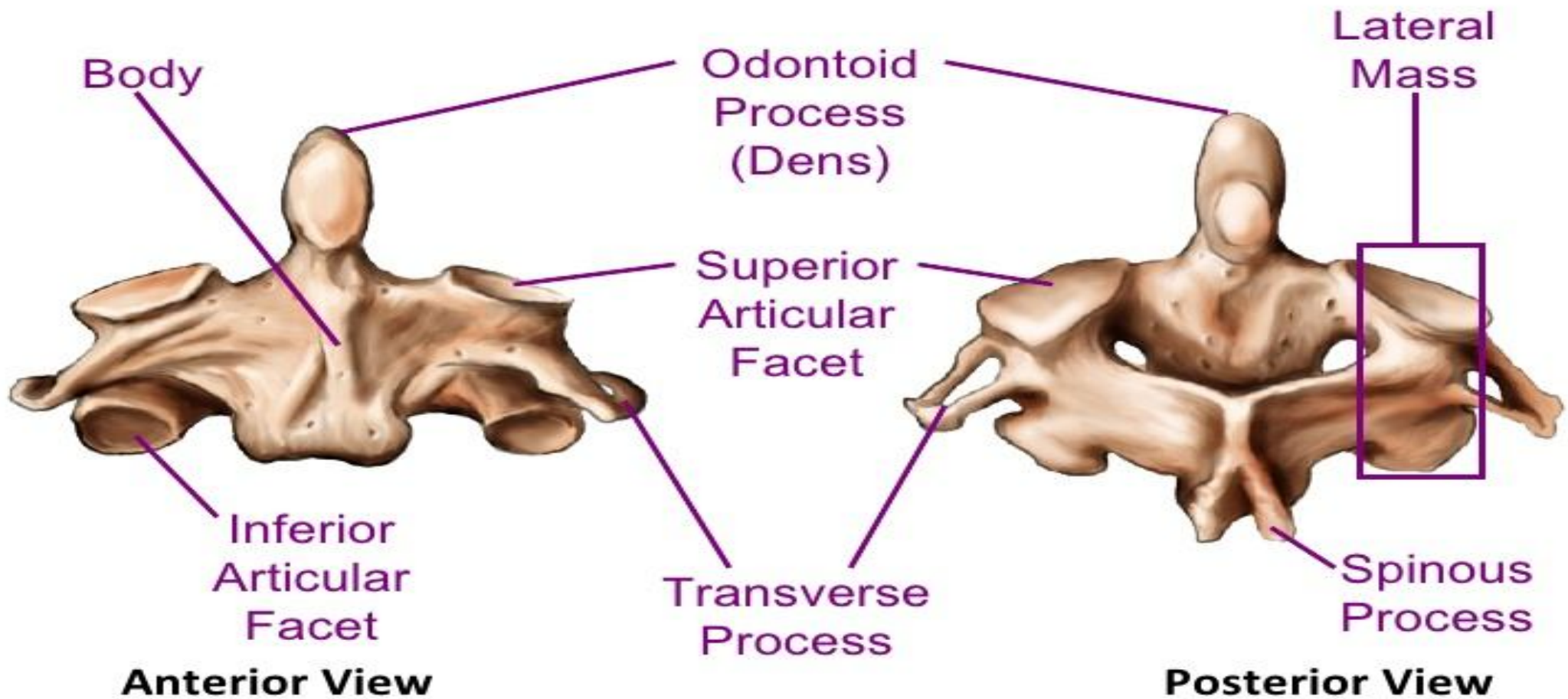
d The atlas (C₁) and axis (C₂).

Cervical Vertebrae: The Axis (C_2)

- The axis has a body, spine, and vertebral arches as do other cervical vertebrae
- Unique to the axis is the dens, or odontoid process, which projects superiorly from the body and is cradled in the anterior arch of the atlas
- The dens is a pivot for the rotation of the atlas

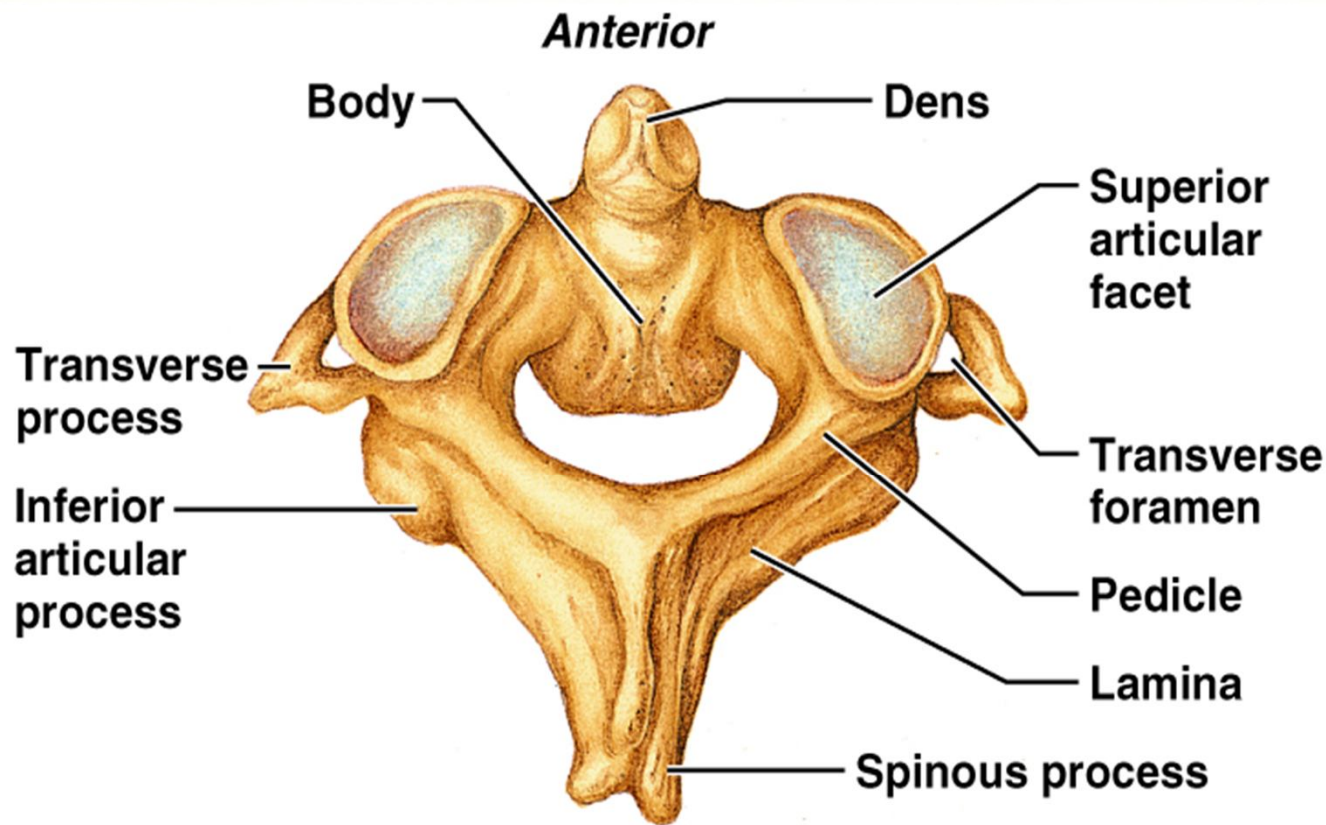


The Axis (C2)





Cervical Vertebrae: The Axis (C₂)



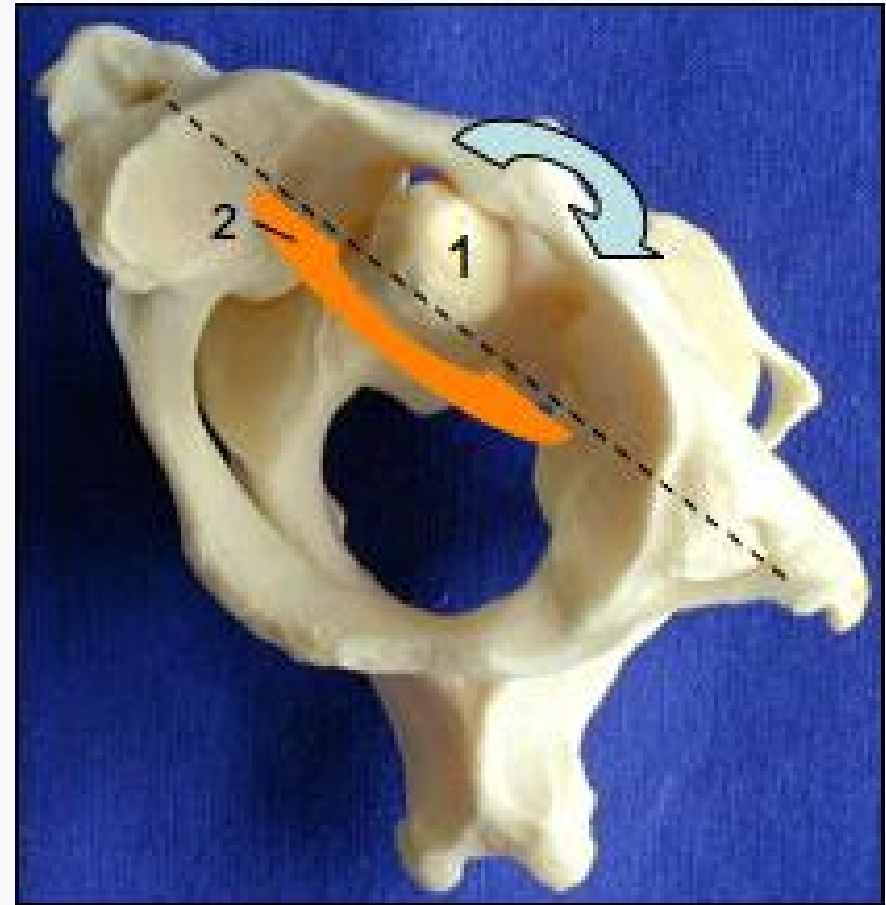
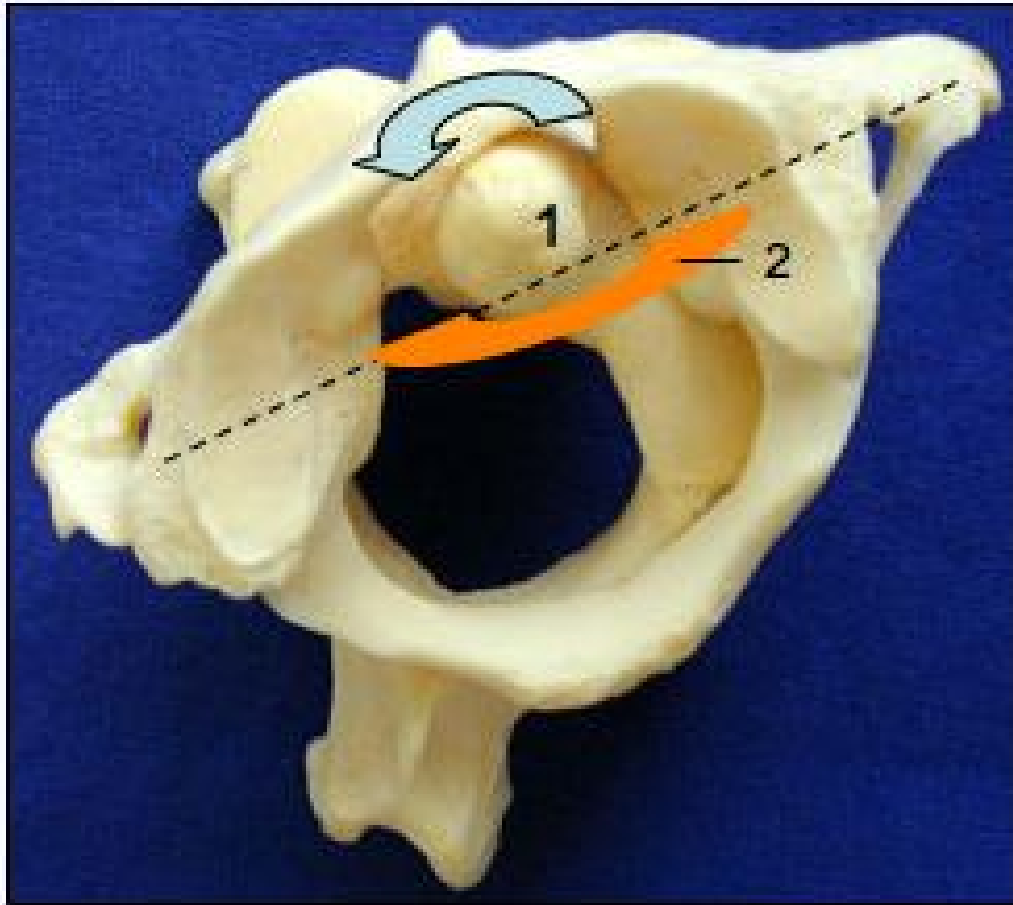
(c) Superior view of axis (C₂)

Like the atlas, the axis is distinct in appearance and function from the rest of your vertebrae.

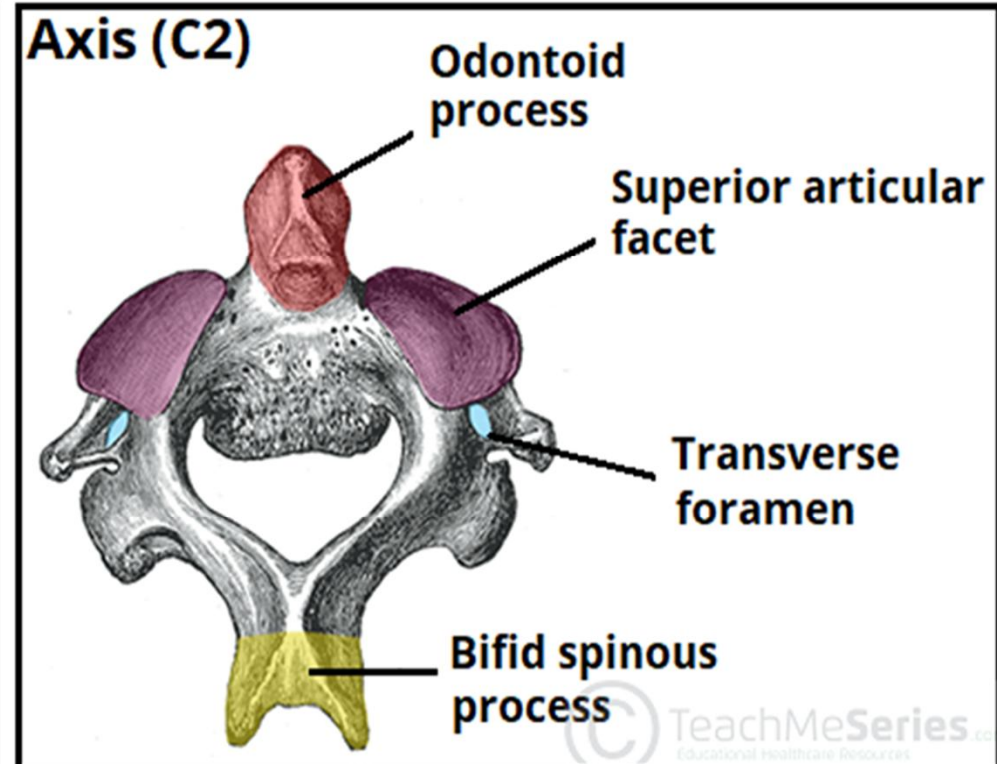
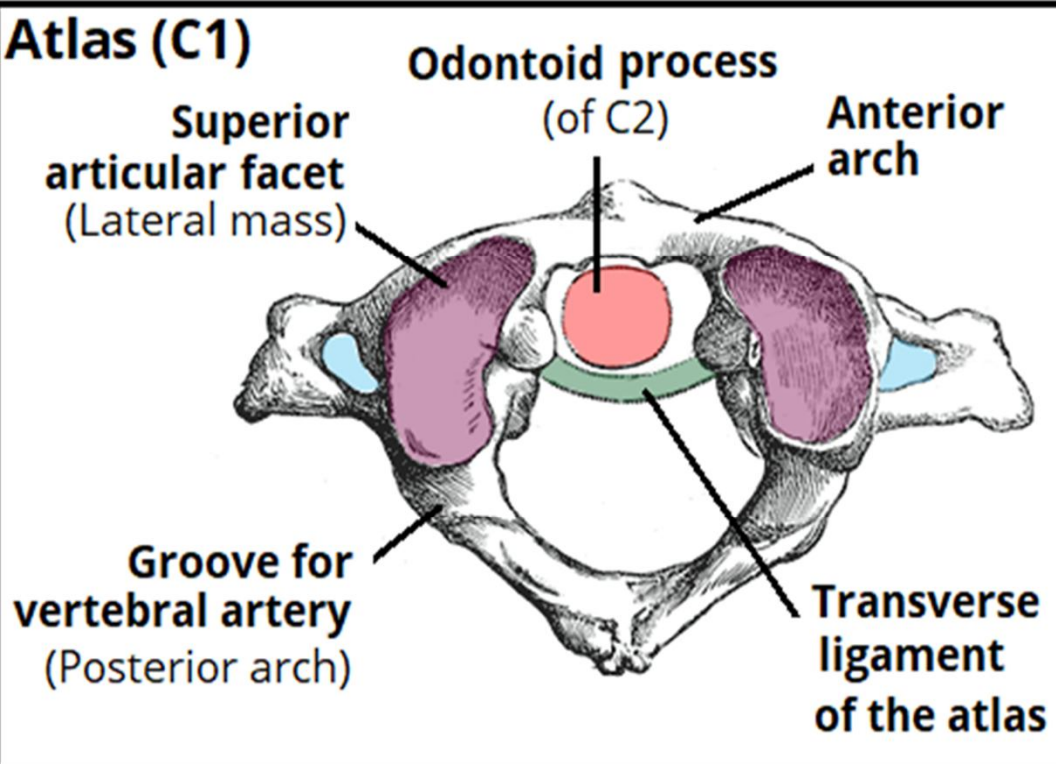
Between C1 and C2, there are two synovial joints called the atlanto-axial joint. These joints facilitate rotation at this level.

The axis has a superior extension (upward), which is a peg-like bone called the dens. The dens fits within the ring of the atlas and with the axis, allows your head to rotate. So, when you shake your head "no," that's the axis at work.

Figure 7.16c



The main rotation of the head is performed in the atlantoaxial (C1/2) segment between the first and the second vertebrae. The odontoid peg (1) acts as an axis of rotation. The transverse ligament (2) is an important stabilizer.

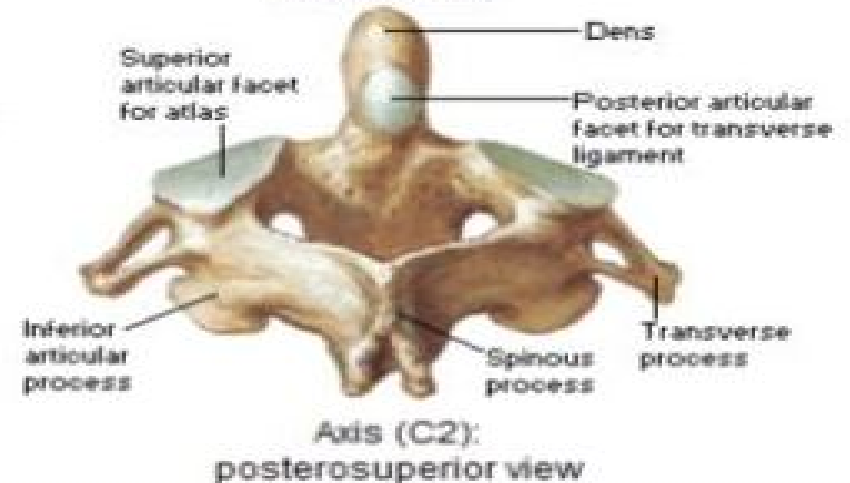
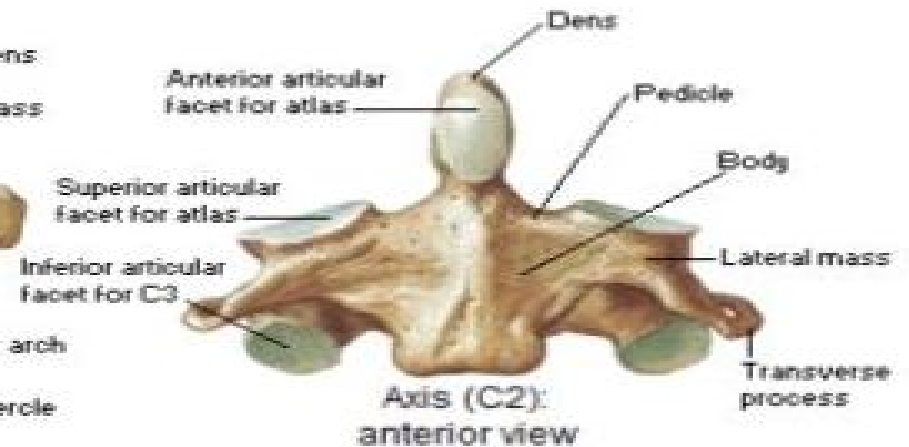
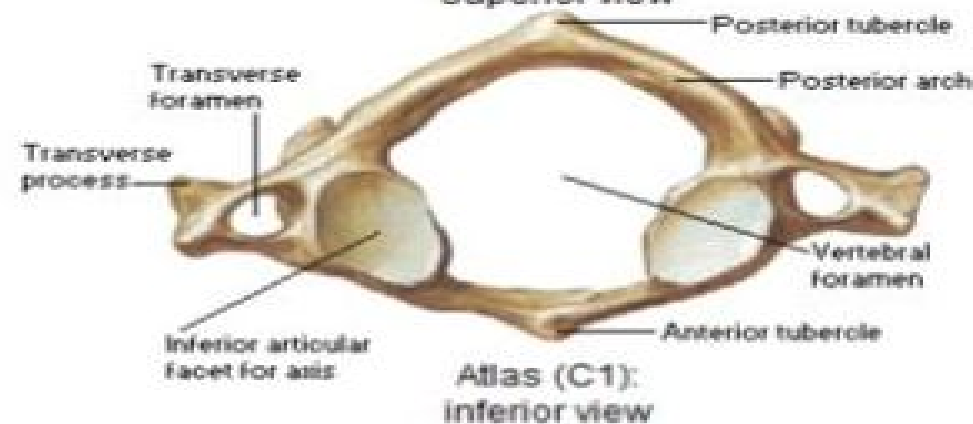
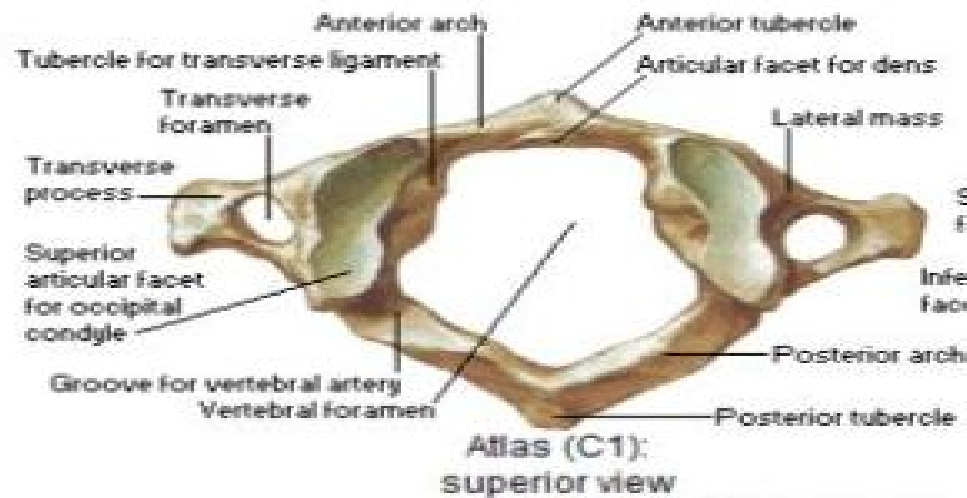


The atlas' shape allows the head to nod "yes" and the axis' shape allows the head to shake "no".

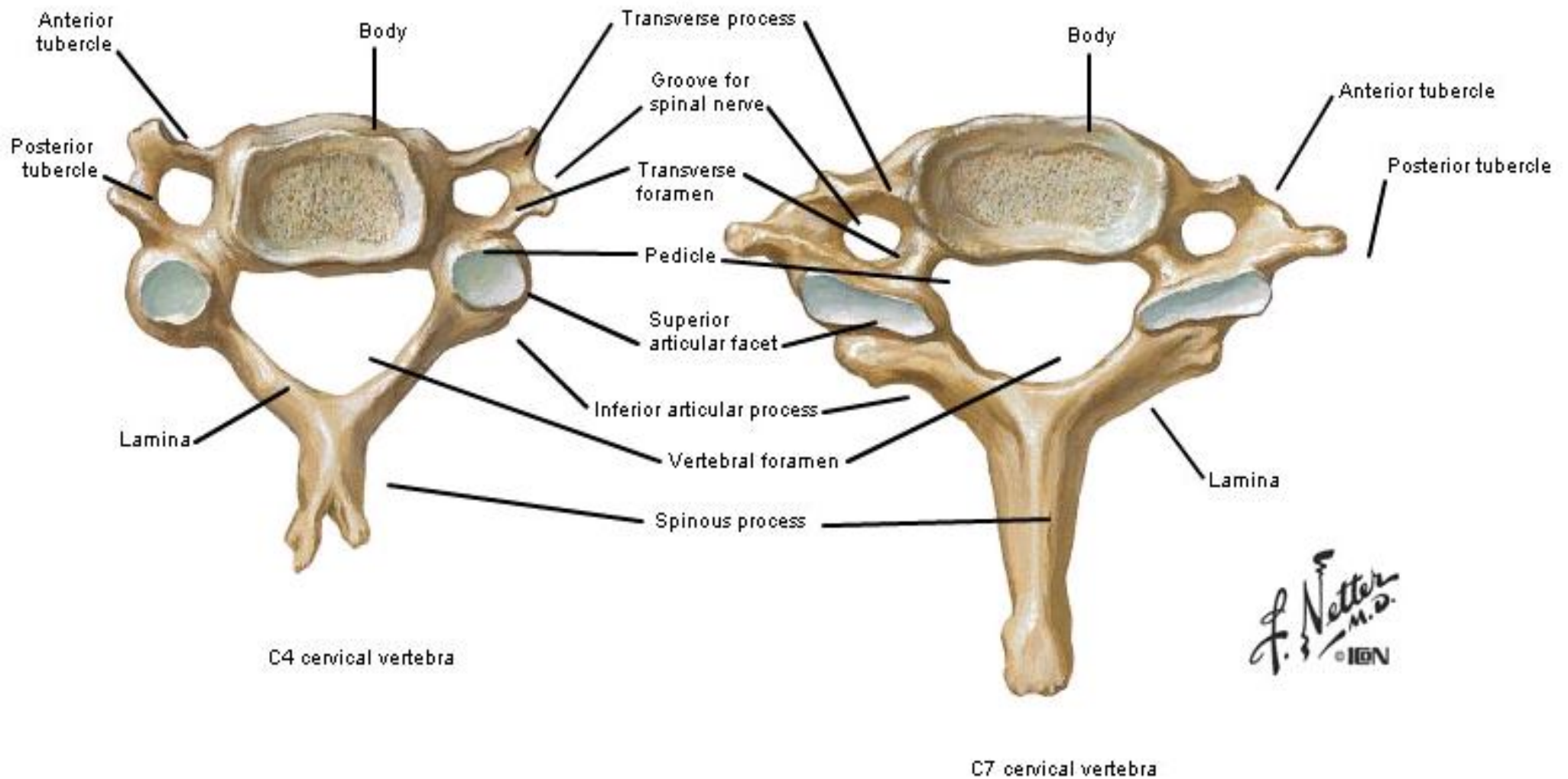


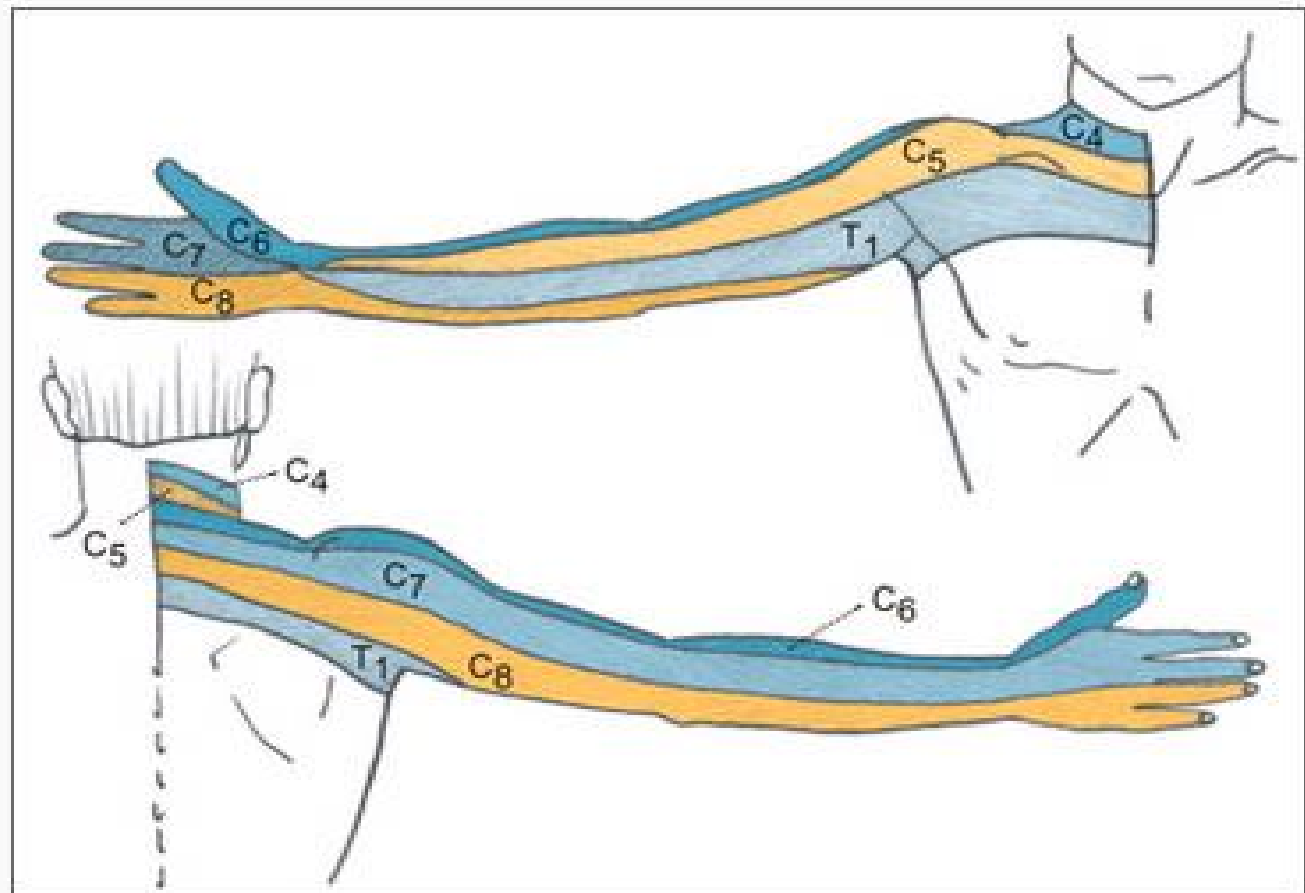
Cervical Vertebrae

Atlas and Axis



Cervical Vertebrae (C4 and C7) Superior Views





Nerve roots leave the spine between two corresponding vertebrae. The anatomical distribution of sensory disturbance/pain indicate the nerve root involved.

Differences	Cervical	Thoracic	Lumbar
1- Size and shape of the body	Small, oval	Medium, heart-shaped	Large, kidney-shaped
2- Transverse foramen for vertebral arteries	Present	Absent	Absent
3- Spinous process	Short, bifid	Long, slender and overlapping	Quadrangular, horizontal
4- Vertebral foramen	Large, triangular (cervical bulging of the spinal cord due to the origin of the brachial plexus)	Small, circular	Large, oval or triangular (lumbar bulging of the spinal cord due to the origin of the lumbosacral plexus)
5- Costal fovea	Absent	Present	Absent
6- Articular processes	Flat, rather horizontal	Flat, in a frontal plane	Concave, in a sagittal plane

Regional Characteristics of Vertebrae

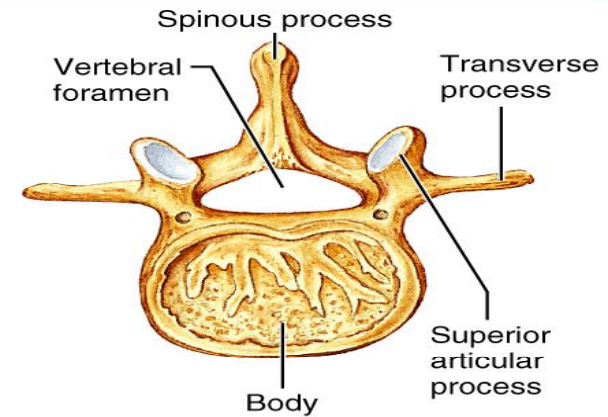
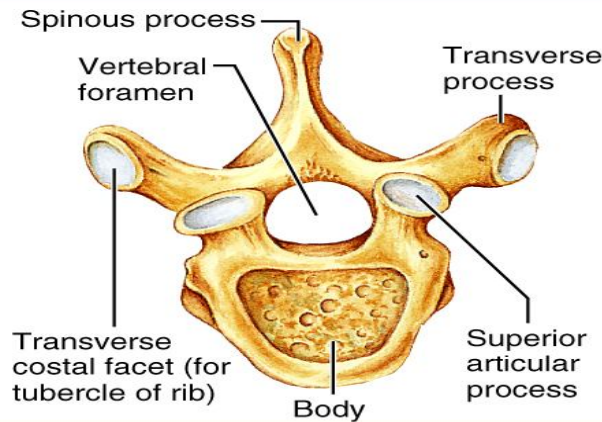
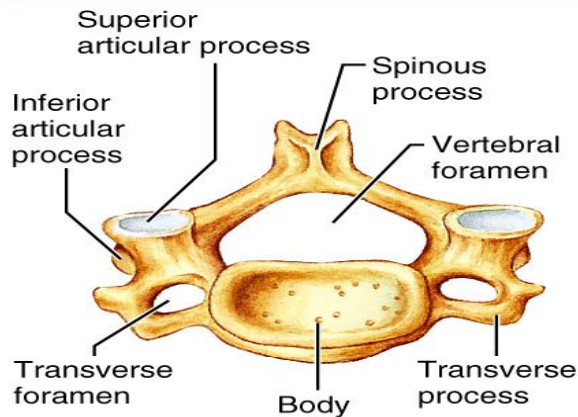
TABLE 7.2 Regional Characteristics of Cervical, Thoracic, and Lumbar Vertebrae

CERVICAL (3–7)

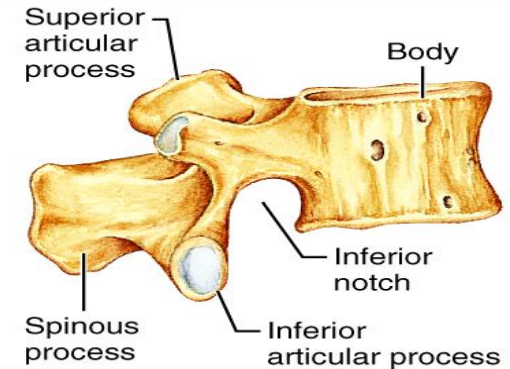
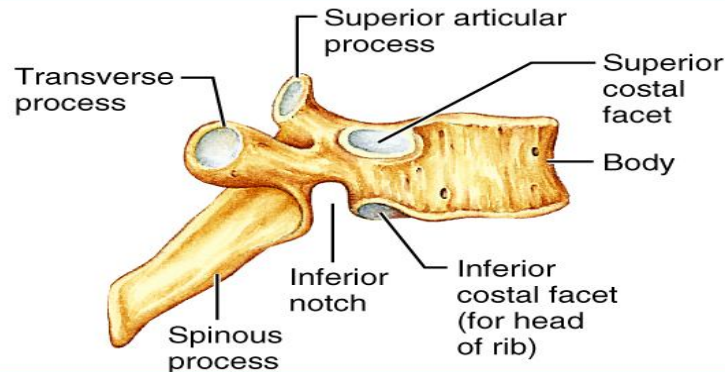
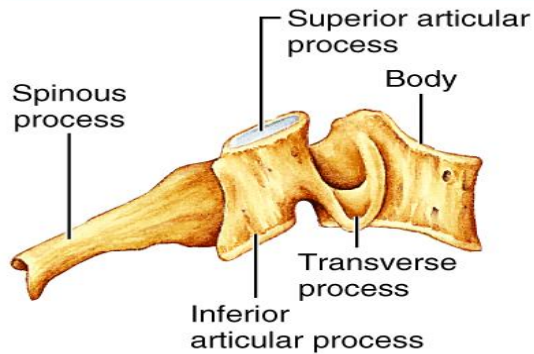
THORACIC

LUMBAR

SUPERIOR VIEW



RIGHT LATERAL VIEW



Thoracic Vertebrae

- There are twelve vertebrae (T_1 - T_{12}) all of which articulate with ribs
- Major markings include two facets and two demifacets on the heart-shaped body, the circular vertebral foramen, transverse processes, and a long spinous process
- The location of the articulate facets prevents flexion and extension, but allows rotation of this area of the spine

Thoracic Vertebrae

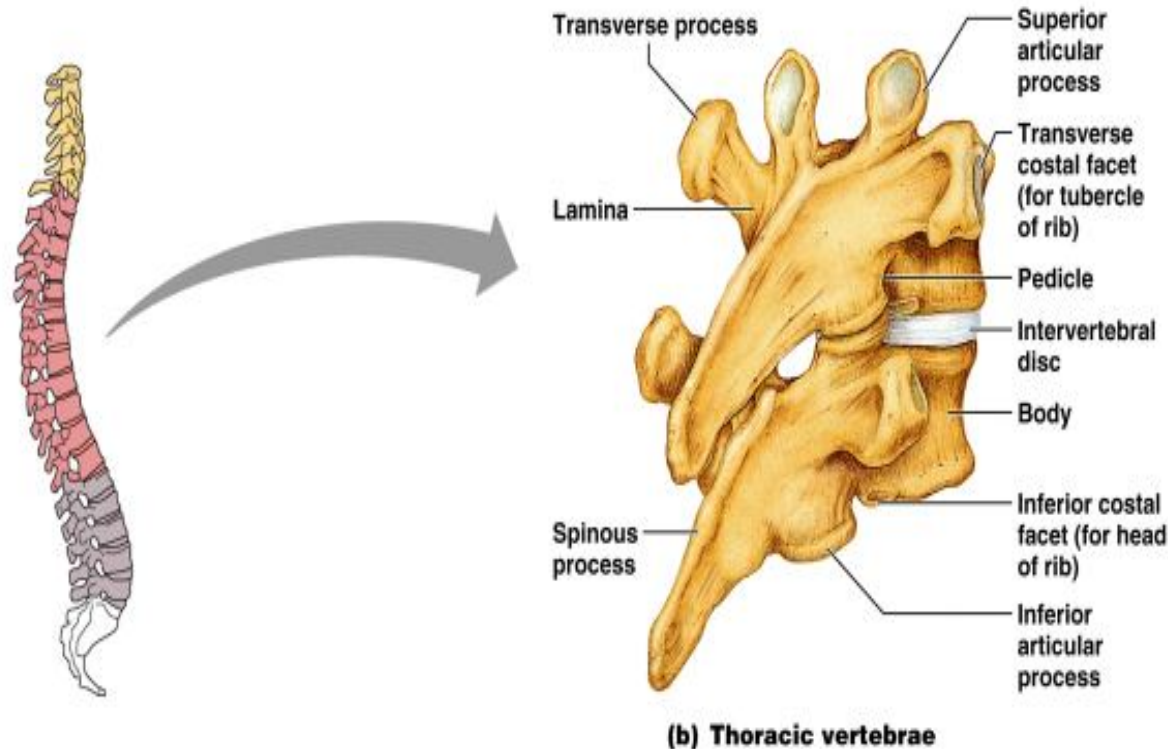
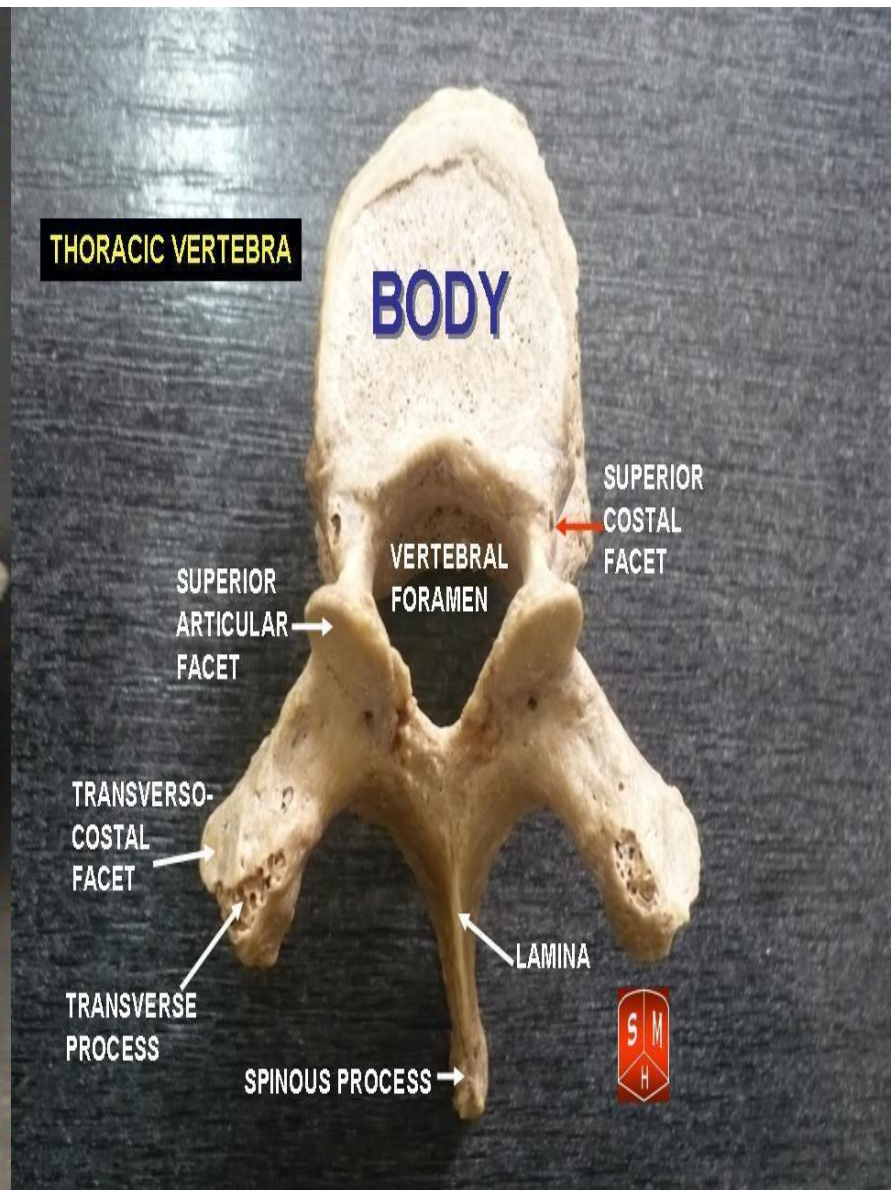
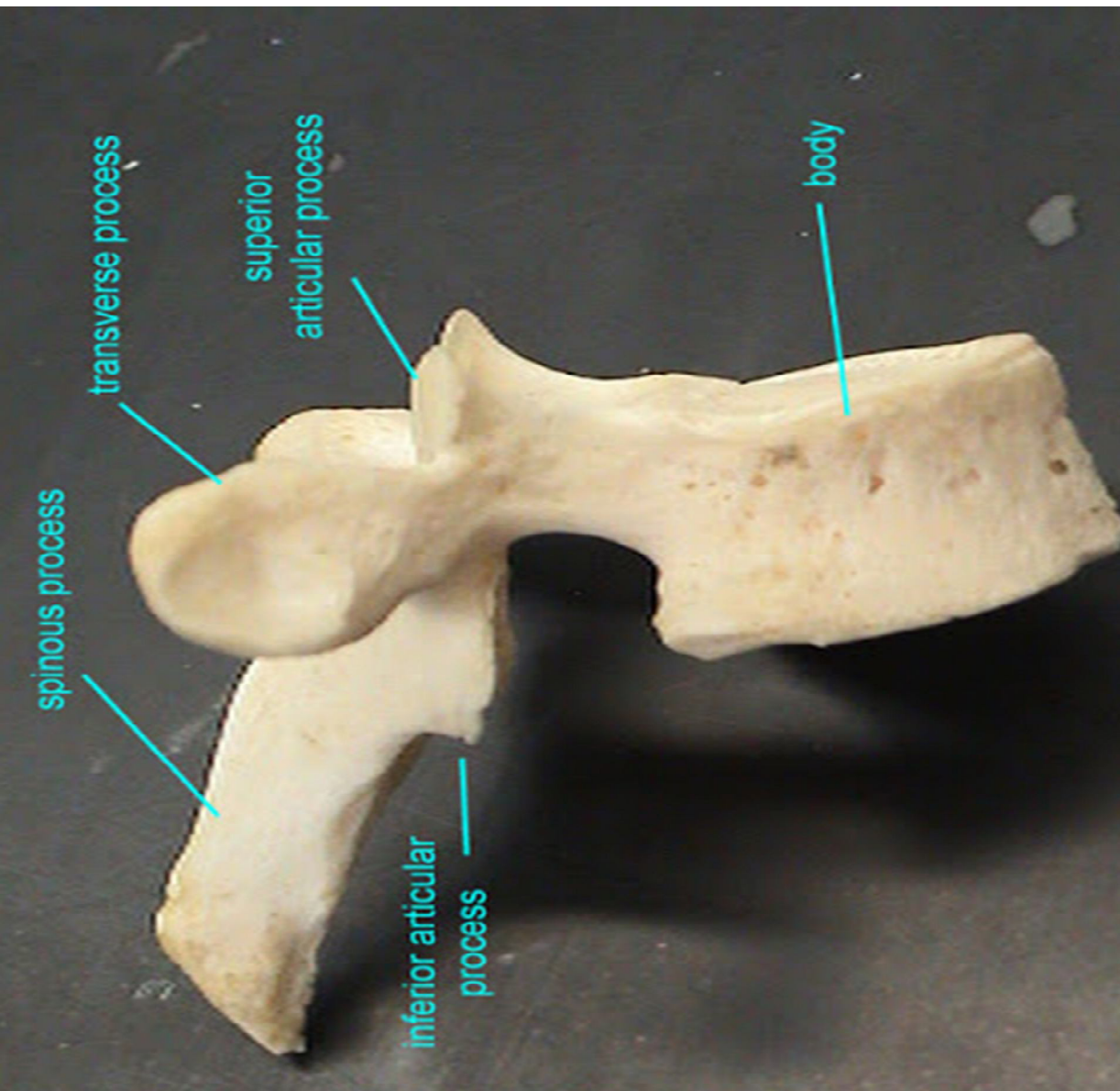


Figure 7.17b

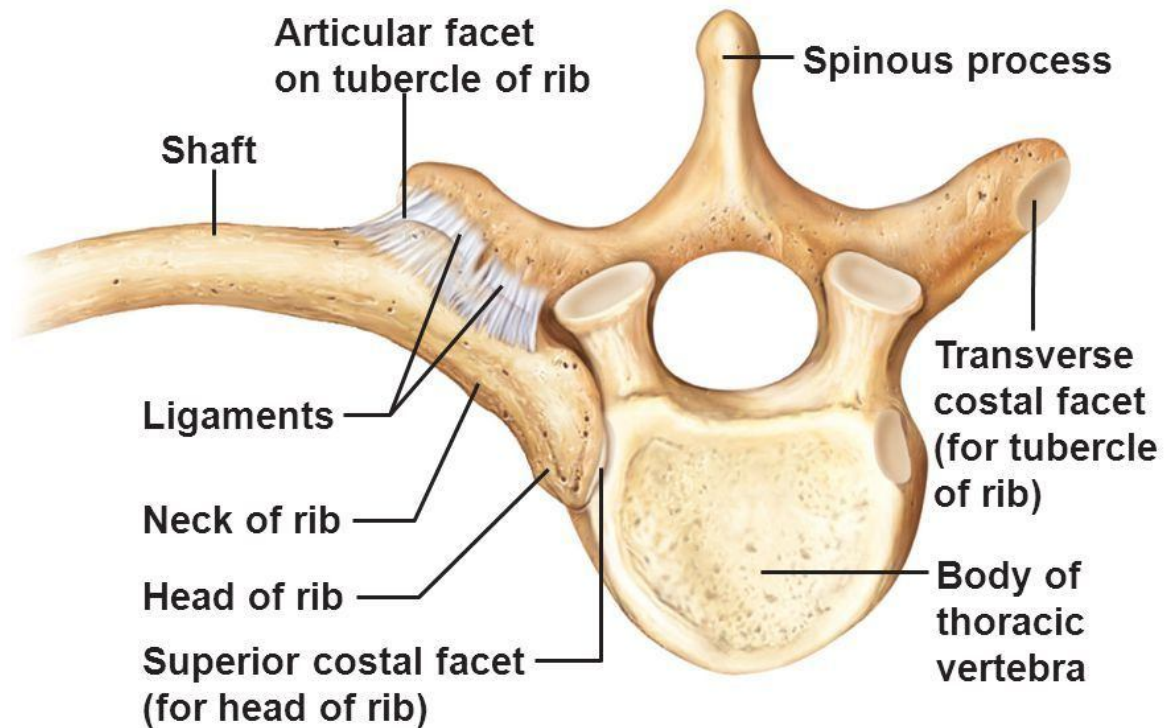
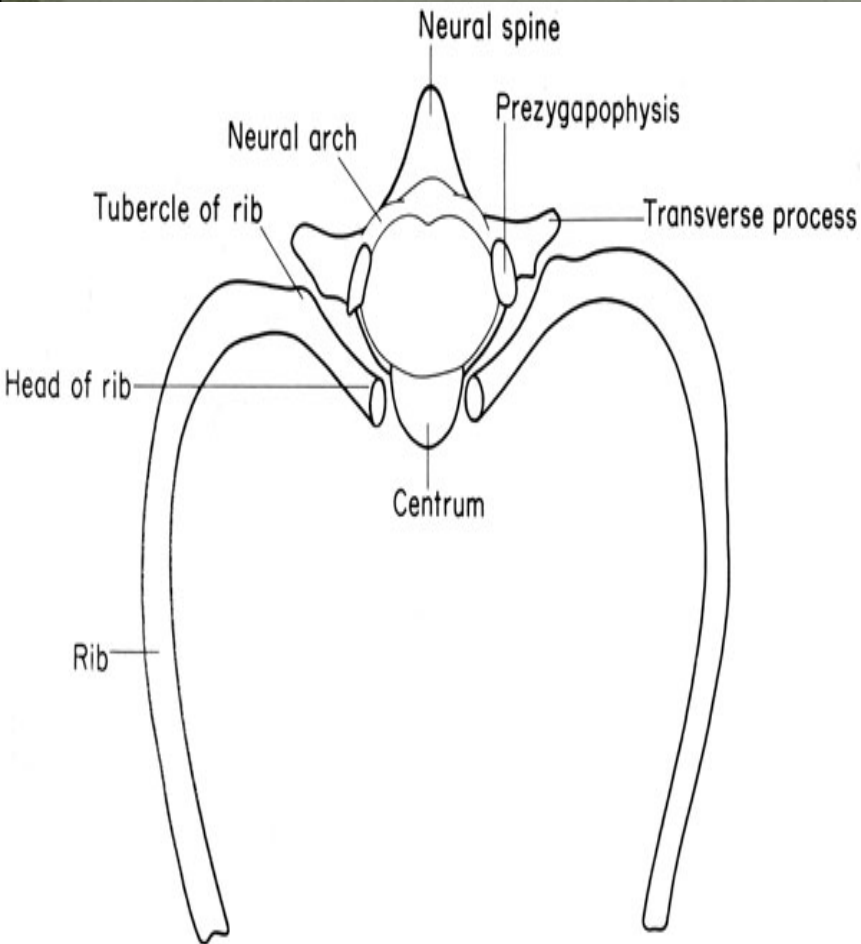




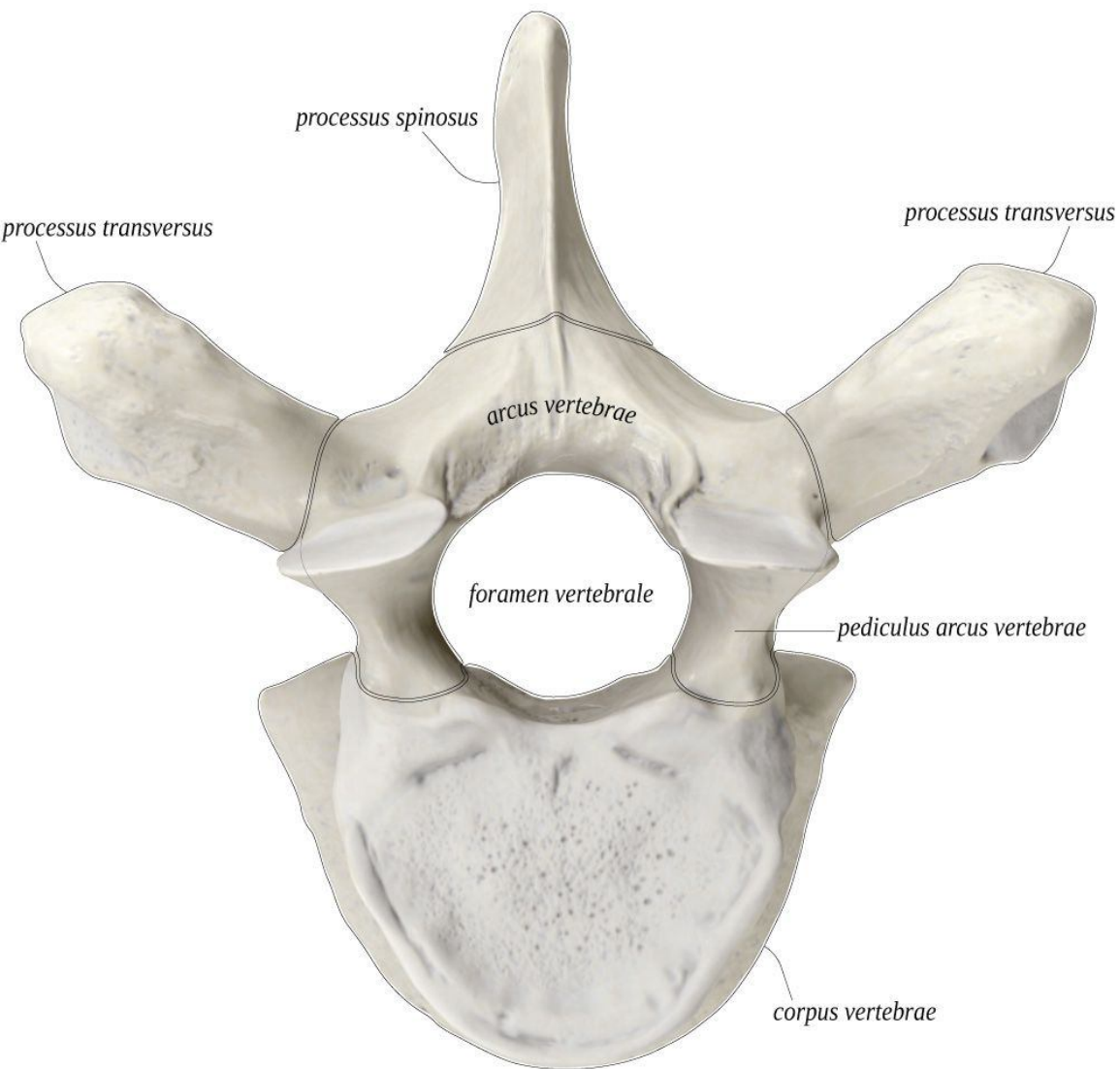
spinous process
transverse process
articular process
body



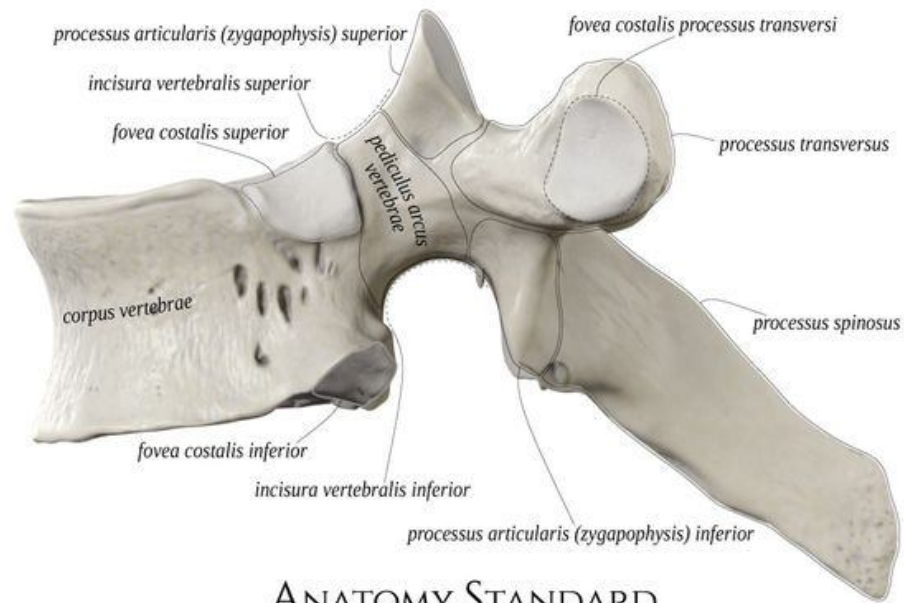
5th thoracic vertebra with rib. Anterior aspect.



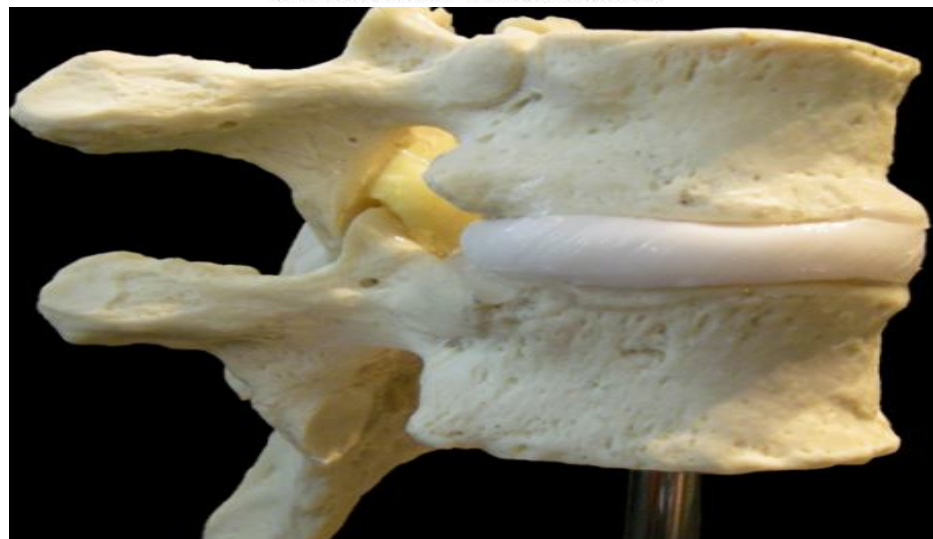
(b) Superior view of the articulation between a rib and a thoracic vertebra



ANATOMY STANDARD



ANATOMY STANDARD

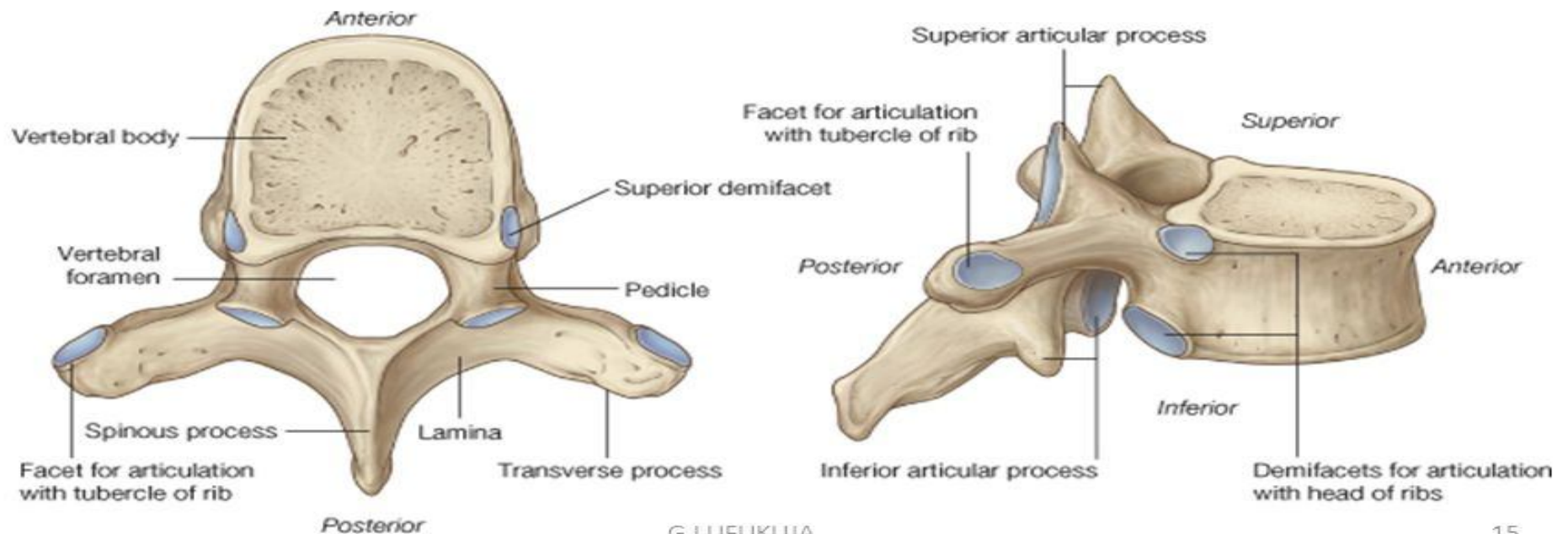


Features of typical thoracic vertebra:

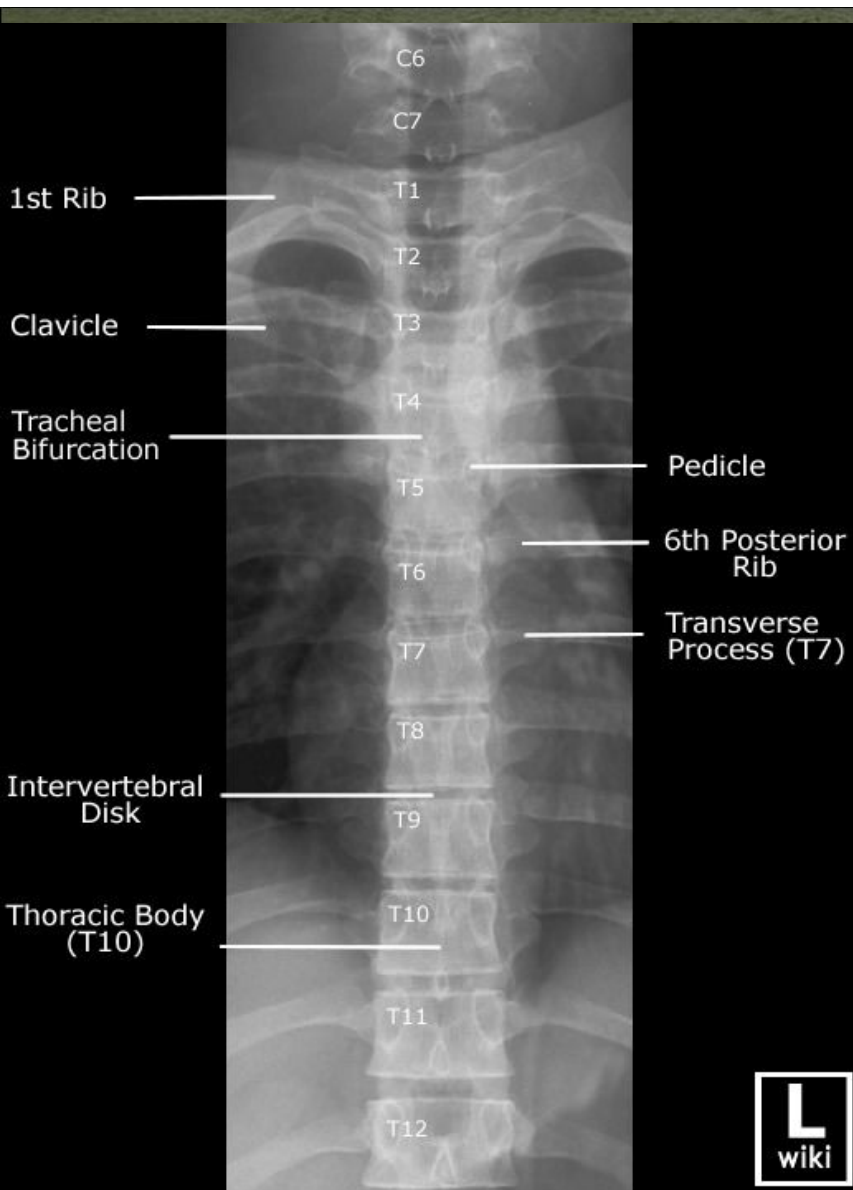
Body: It is heart shaped; Presence of **two costal demifacets**

The transverse process: Tips bear oval **costal facets**

Spinous process: Long and slopes downward

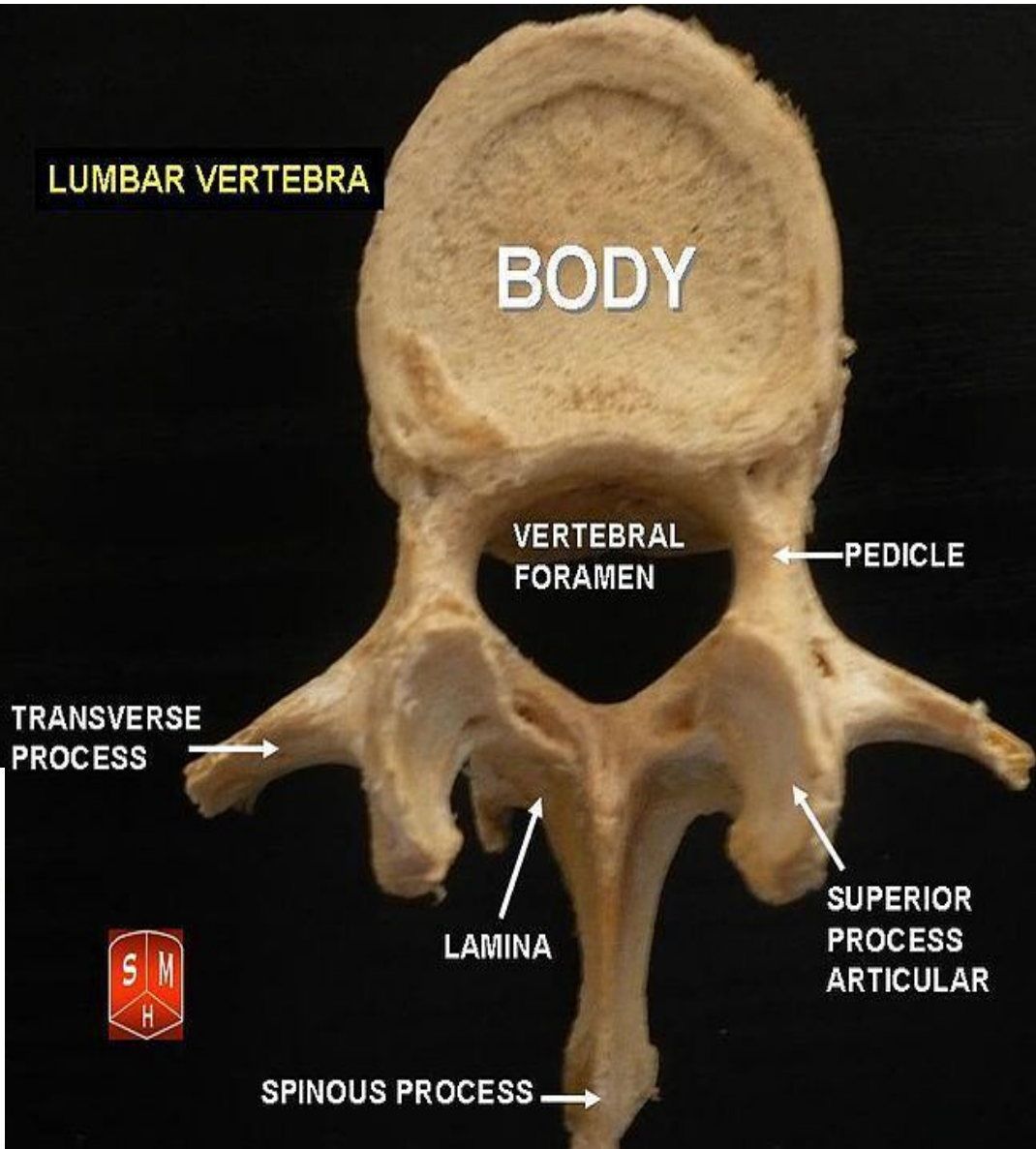
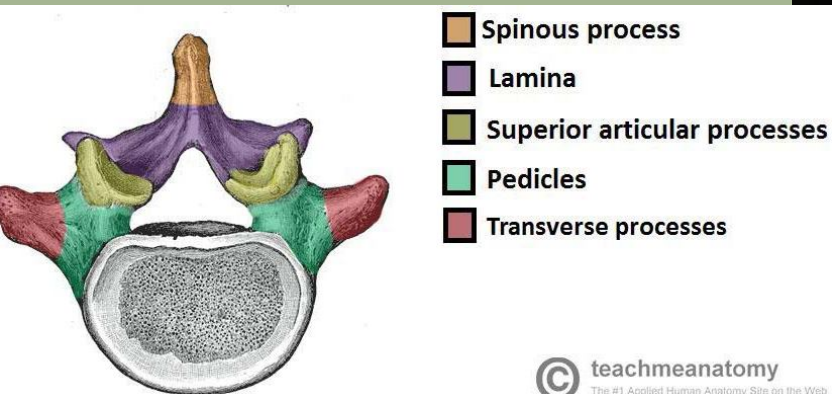


G.LUFUKUJA



Lumbar Vertebrae

- The five lumbar vertebrae (L₁-L₅) are located in the small of the back and have an enhanced weight-bearing function
- They have short, thick pedicles and laminae, flat hatchet-shaped spinous processes, and a triangular-shaped vertebral foramen
- Orientation of articular facets locks the lumbar vertebrae together to provide stability





heavy centra,

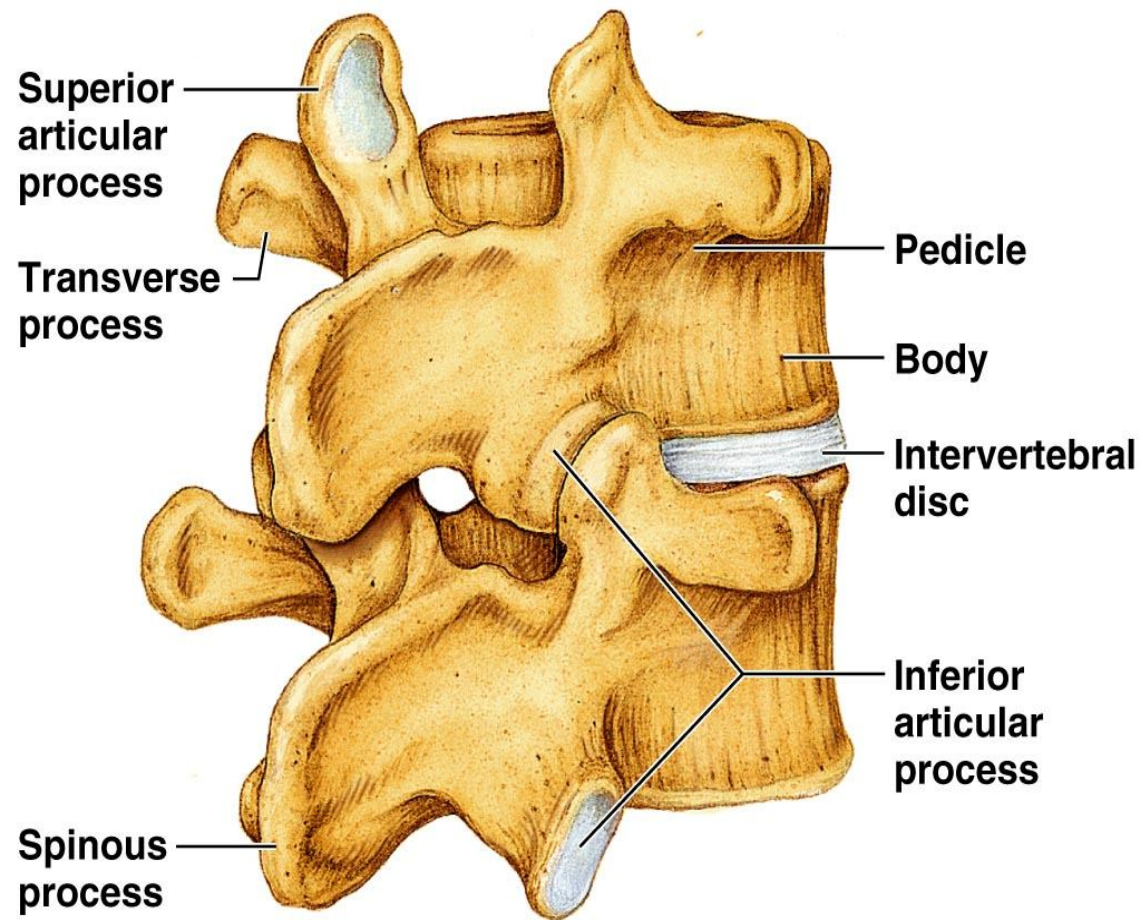
broad heavy spinous process,

transverse process lacks facets

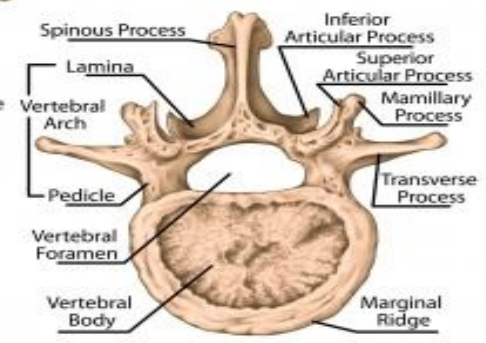
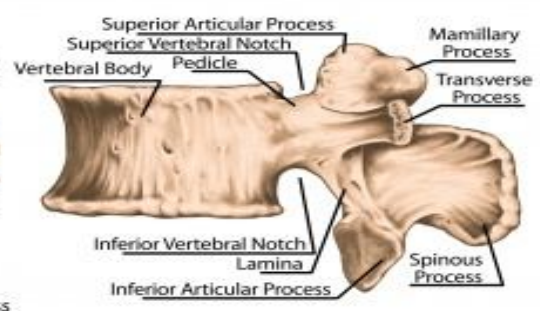
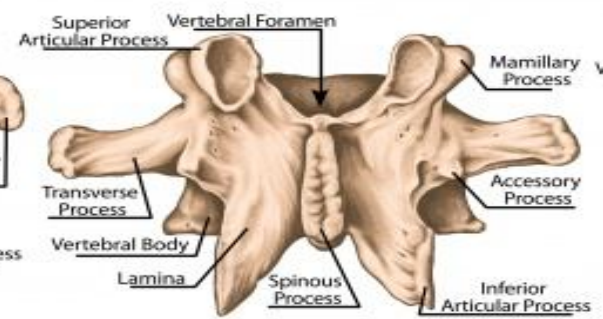
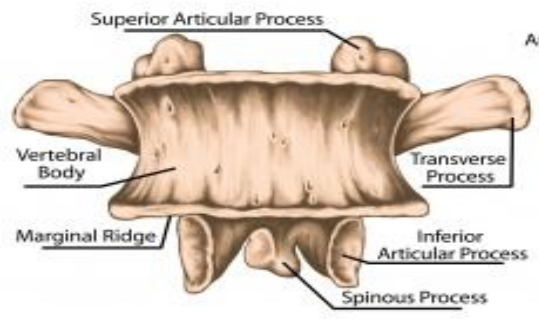
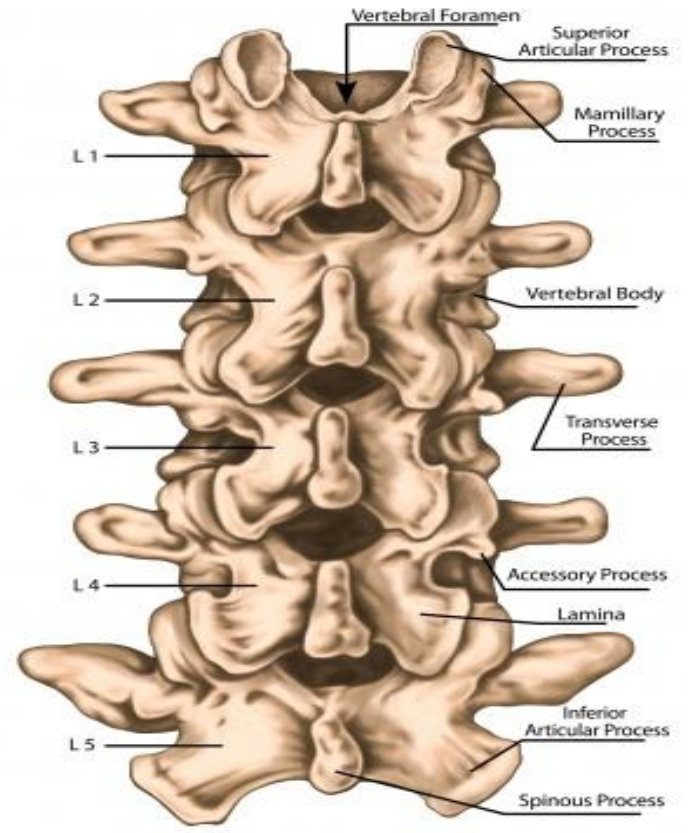
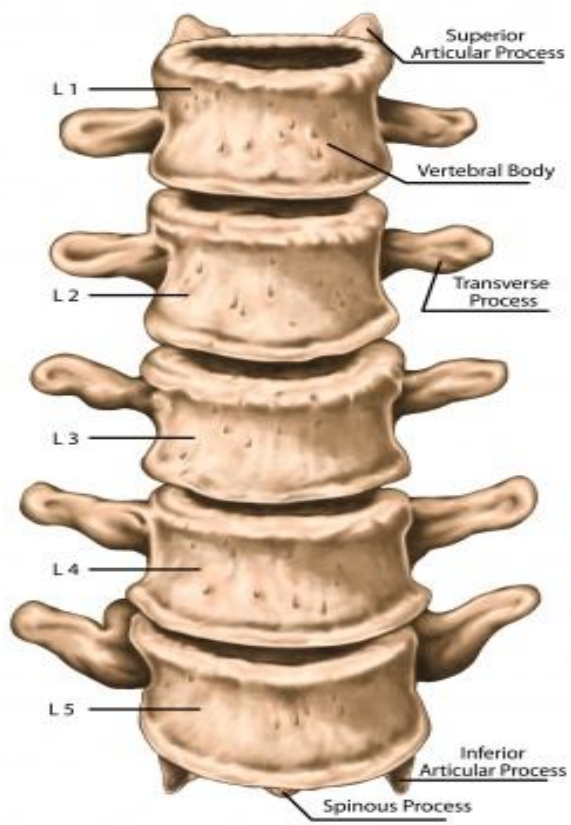
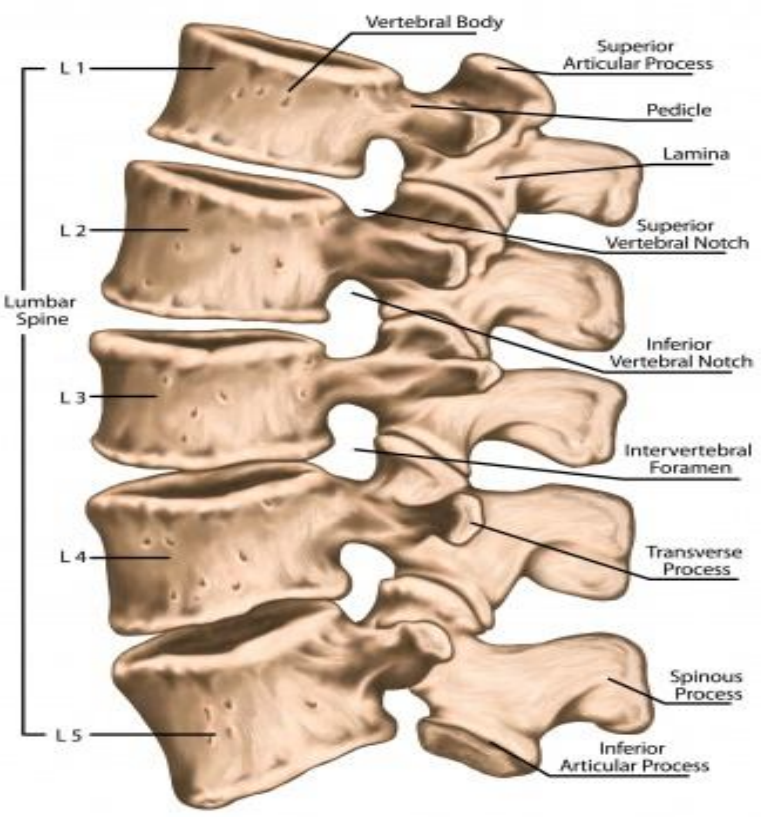
Lumbar Vertebrae

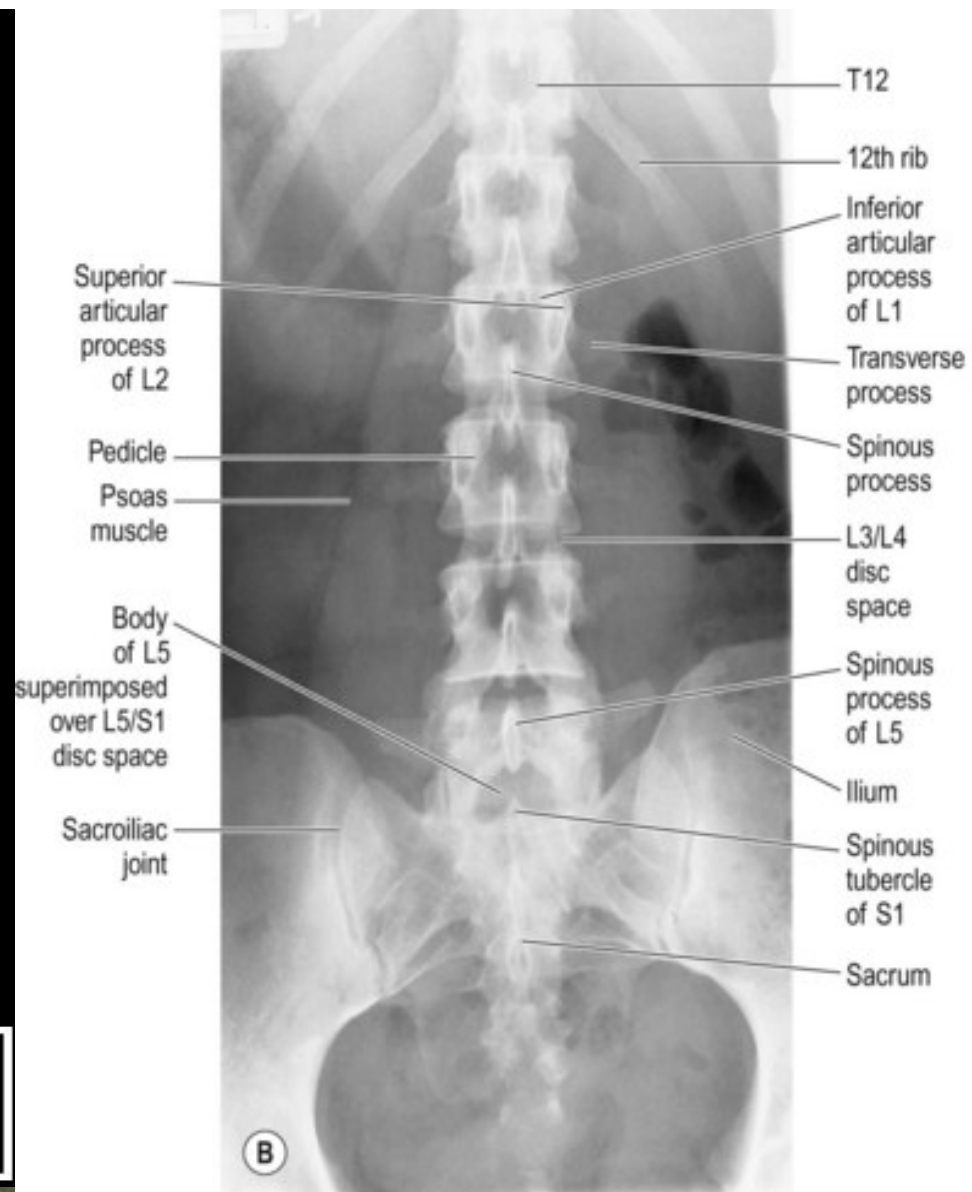
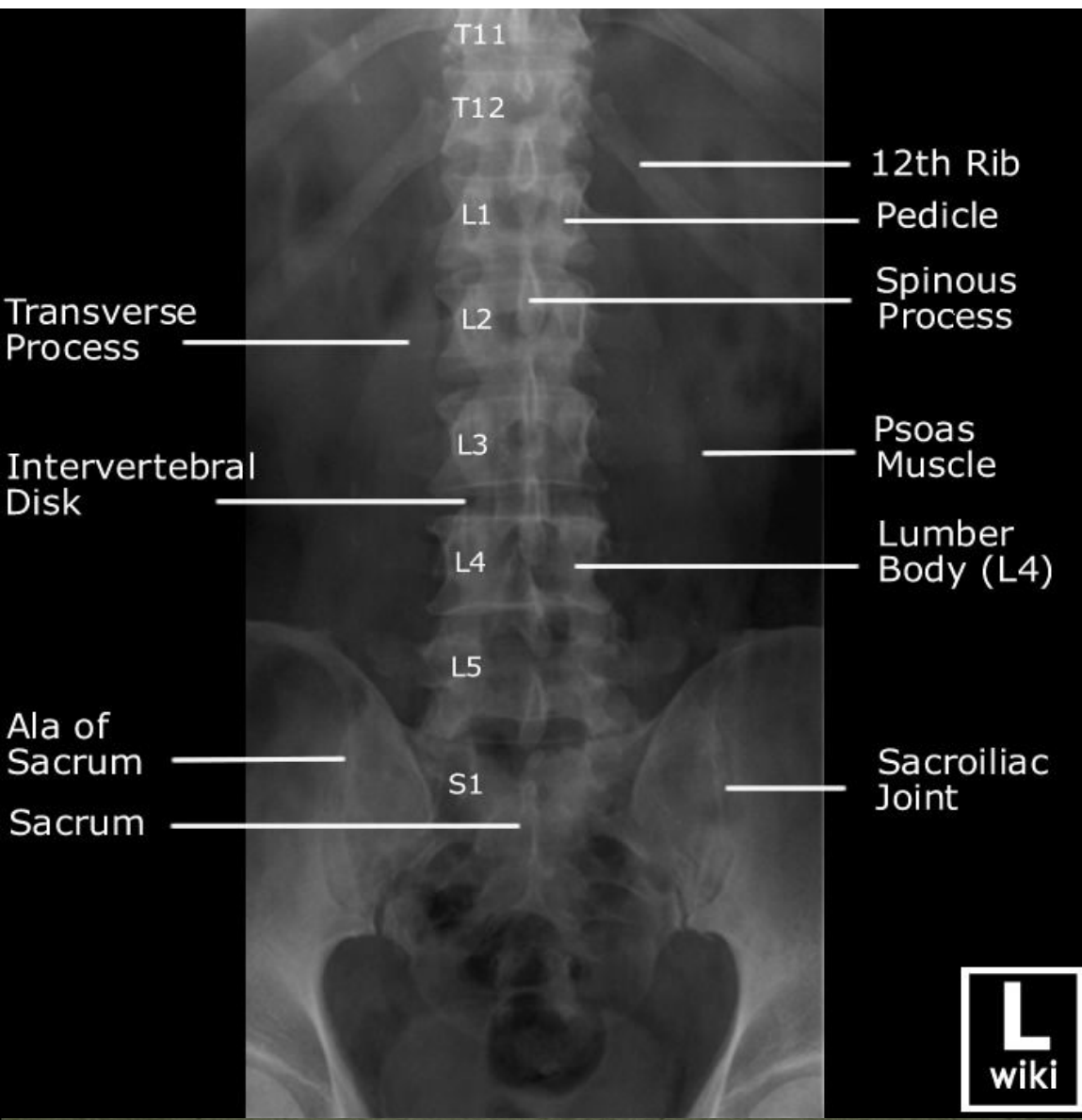


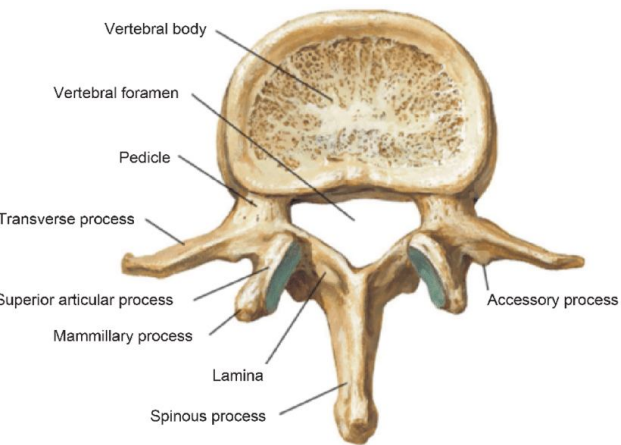
The lumbar spine is the lower back that begins below the last thoracic vertebra (T12) and ends at the top of the sacral spine, or sacrum (S1). Most people have 5 lumbar levels (L1-L5), although it is not unusual to have 6. Each lumbar spinal level is numbered from top to bottom—L1 through L5, or L6.



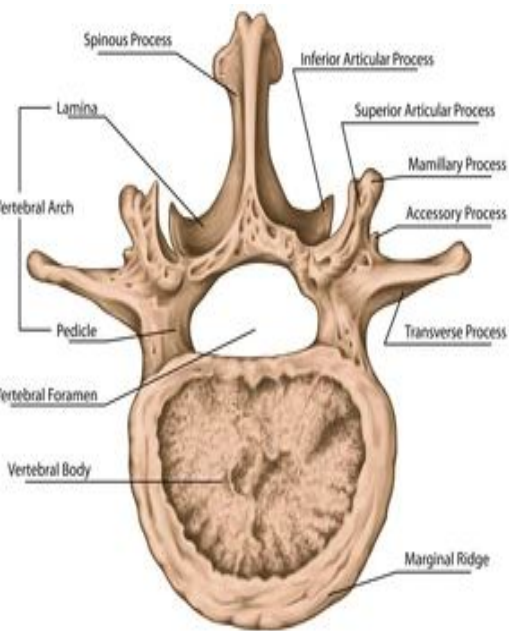
(c) Lumbar vertebrae







L2 vertebra:
superior view

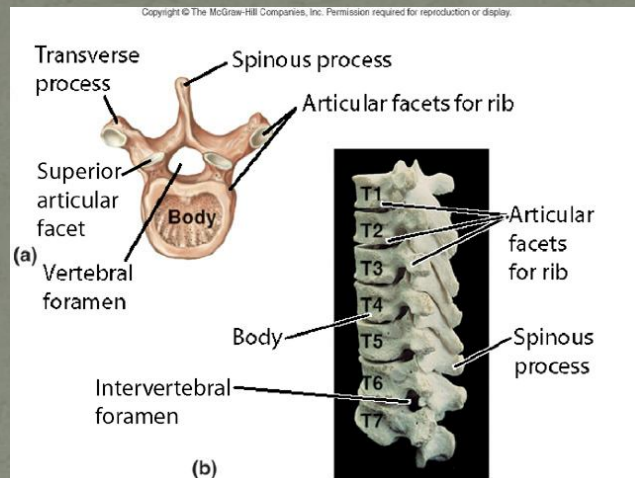


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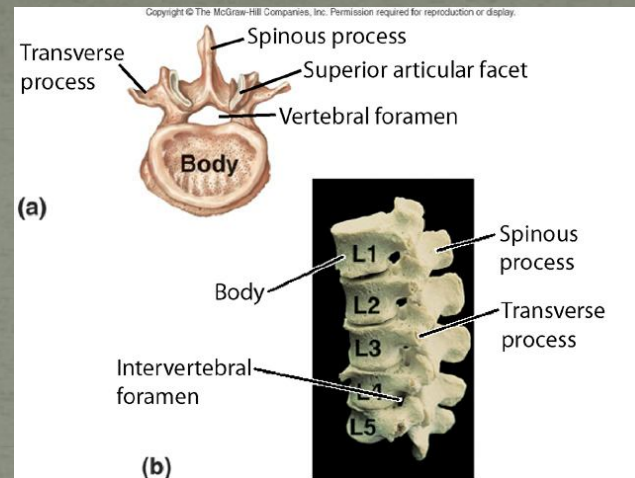


FIG. 61-2 Lateral osteophytes (*arrow*) of spondylosis deformans are visible on a ventrodorsal view of a dog's lumbar spine. Lateral osteophytes can be mistaken for a calcified or herniated disk on a lateral radiographic view of the spine.

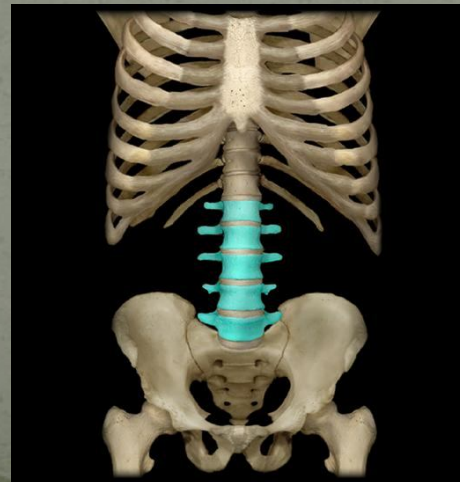
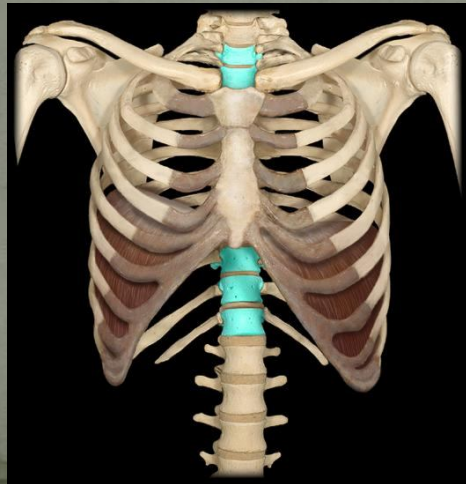
Thoracic and Lumbar Vertebrae



Modified from Fig. 7.18

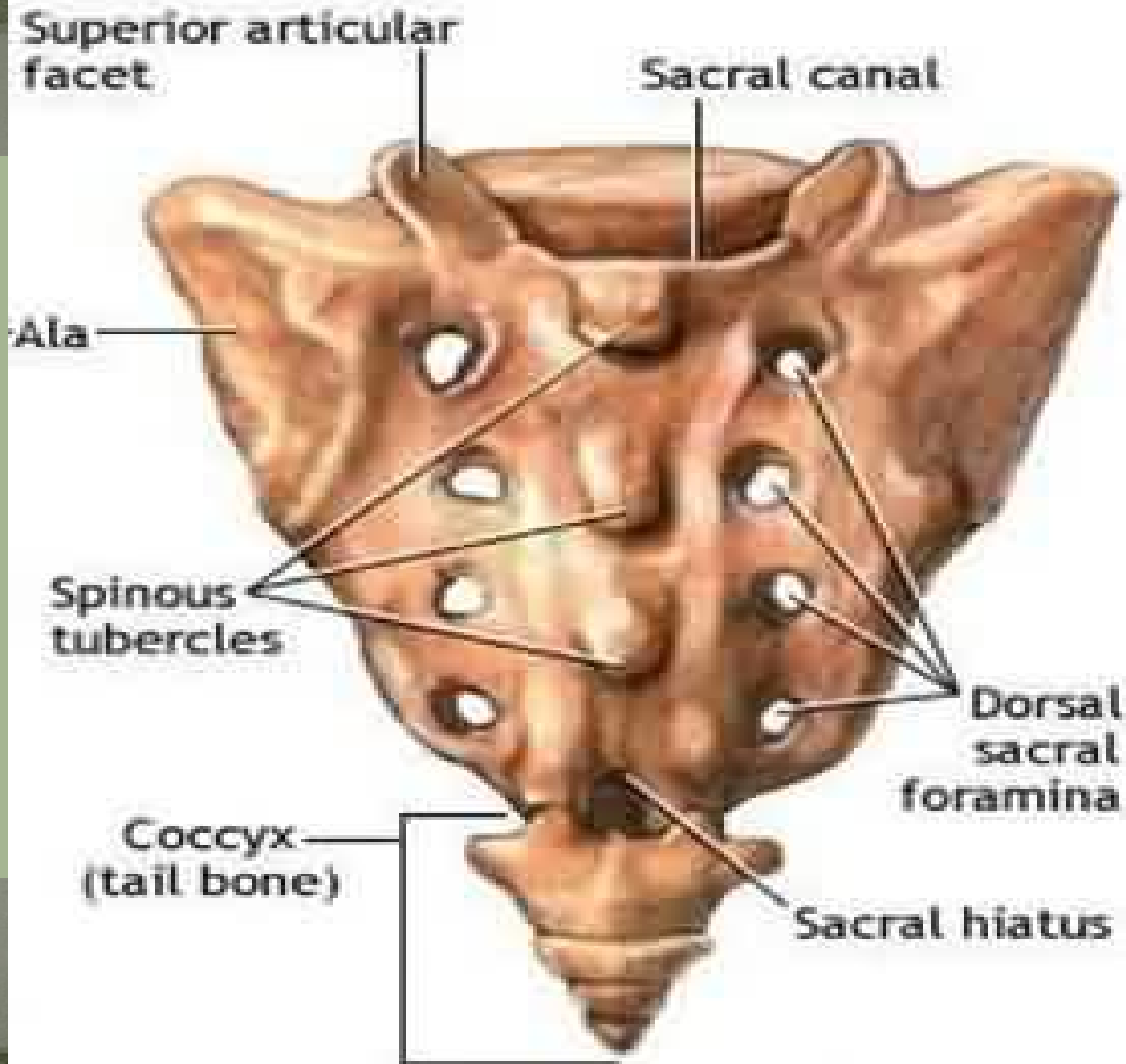


Modified from Fig. 7.19

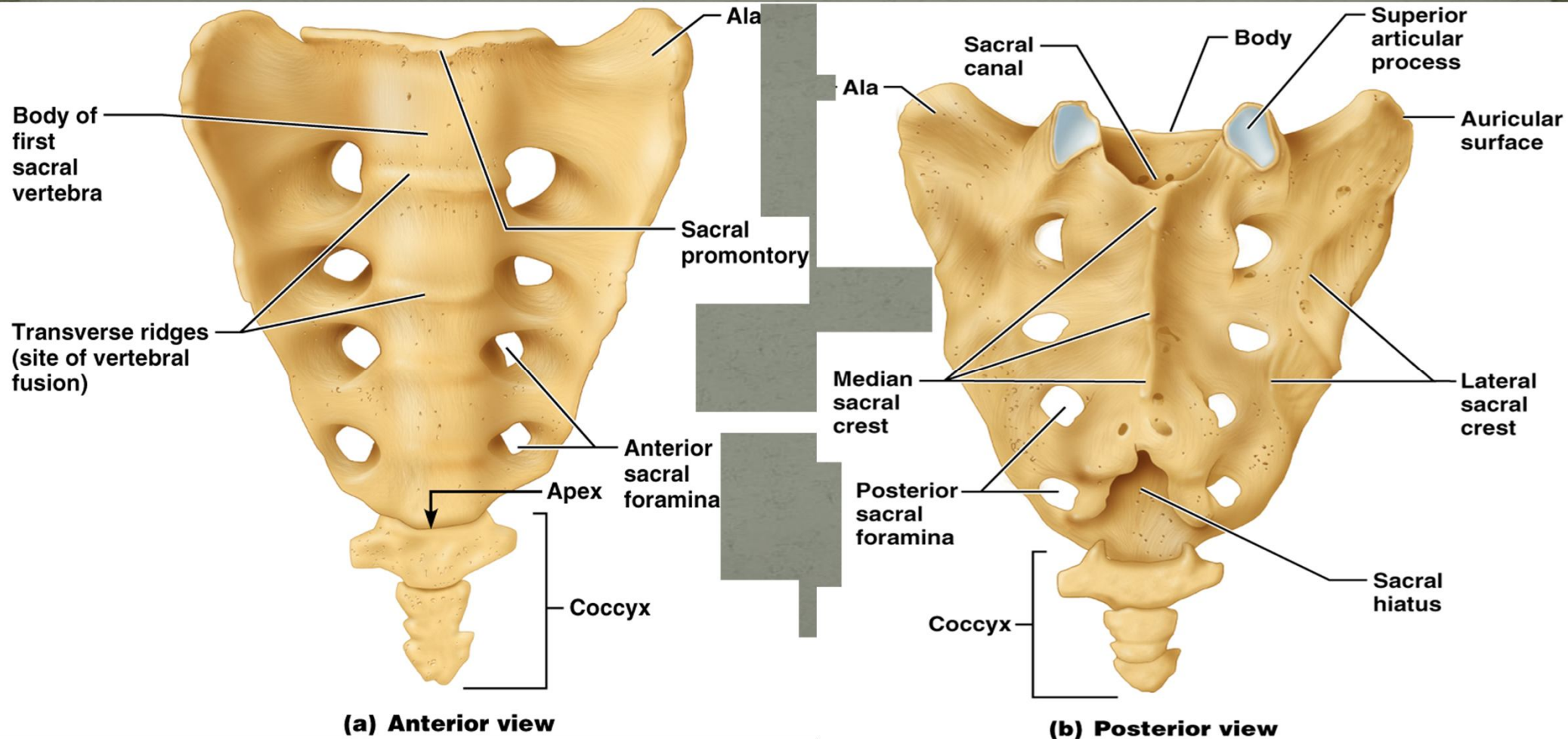


Sacrum

- Sacrum
 - Consists of five fused vertebrae (S_1 - S_5), which shape the posterior wall of the pelvis
 - It articulates with L_5 superiorly, and with the auricular surfaces of the hip bones
 - Major markings include the sacral promontory, transverse lines, alae, dorsal sacral foramina, sacral canal, and sacral hiatus

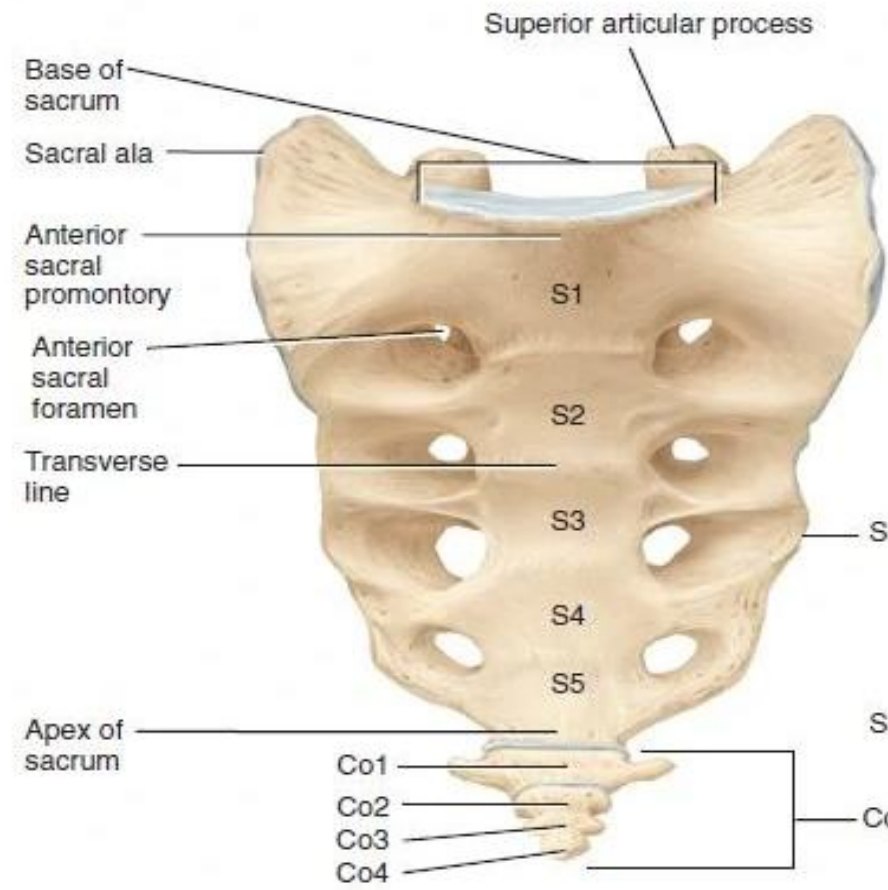


Sacrum and Coccyx:

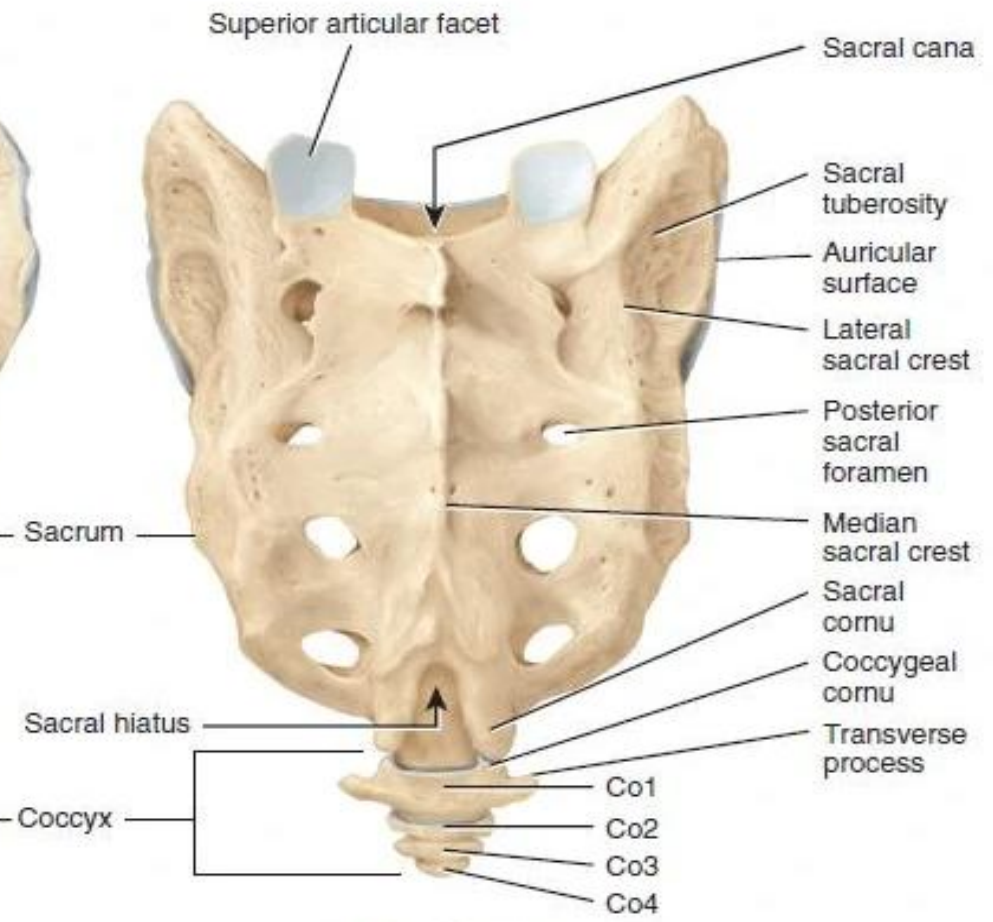




ANTERIOR

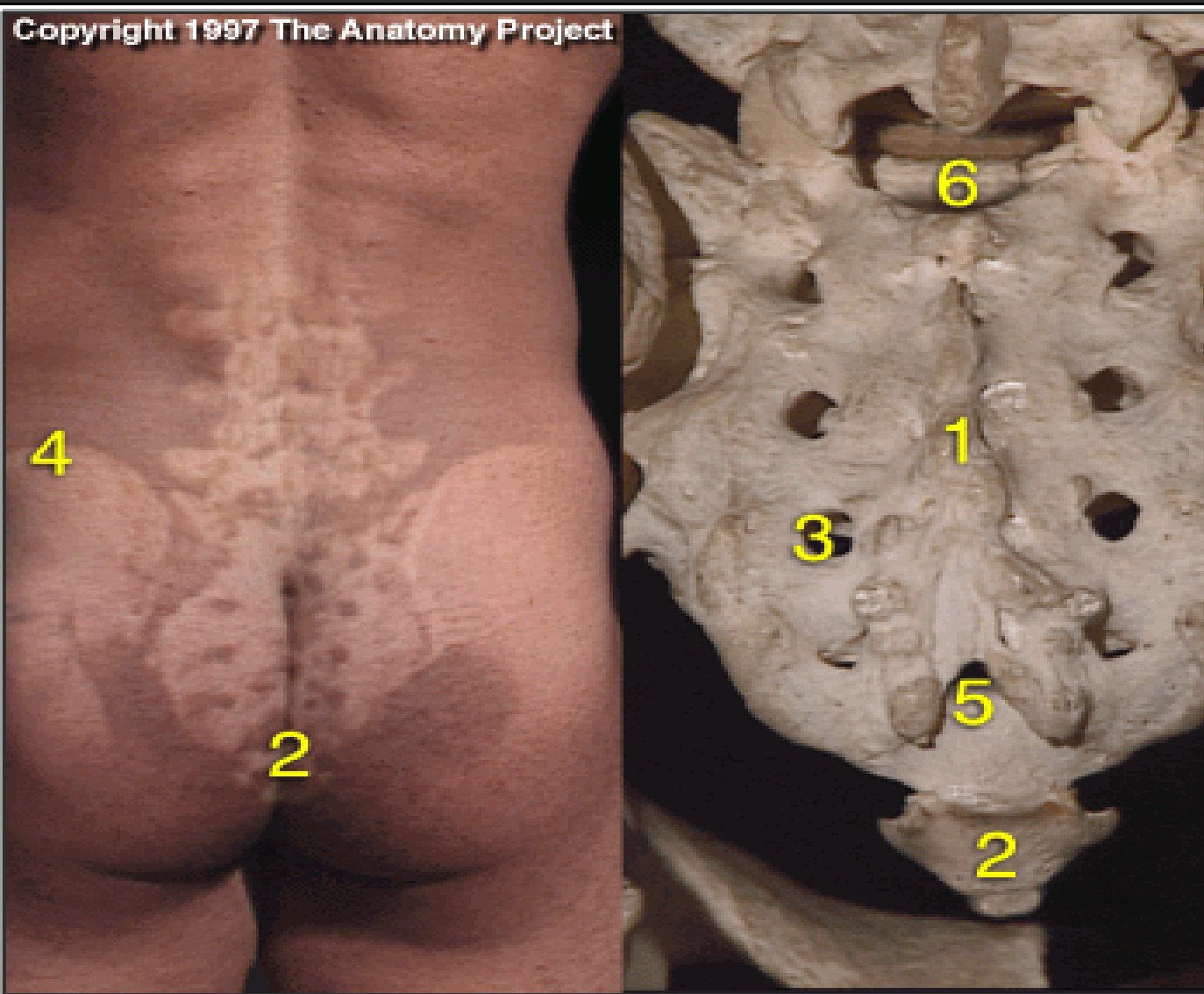


(a) Anterior view



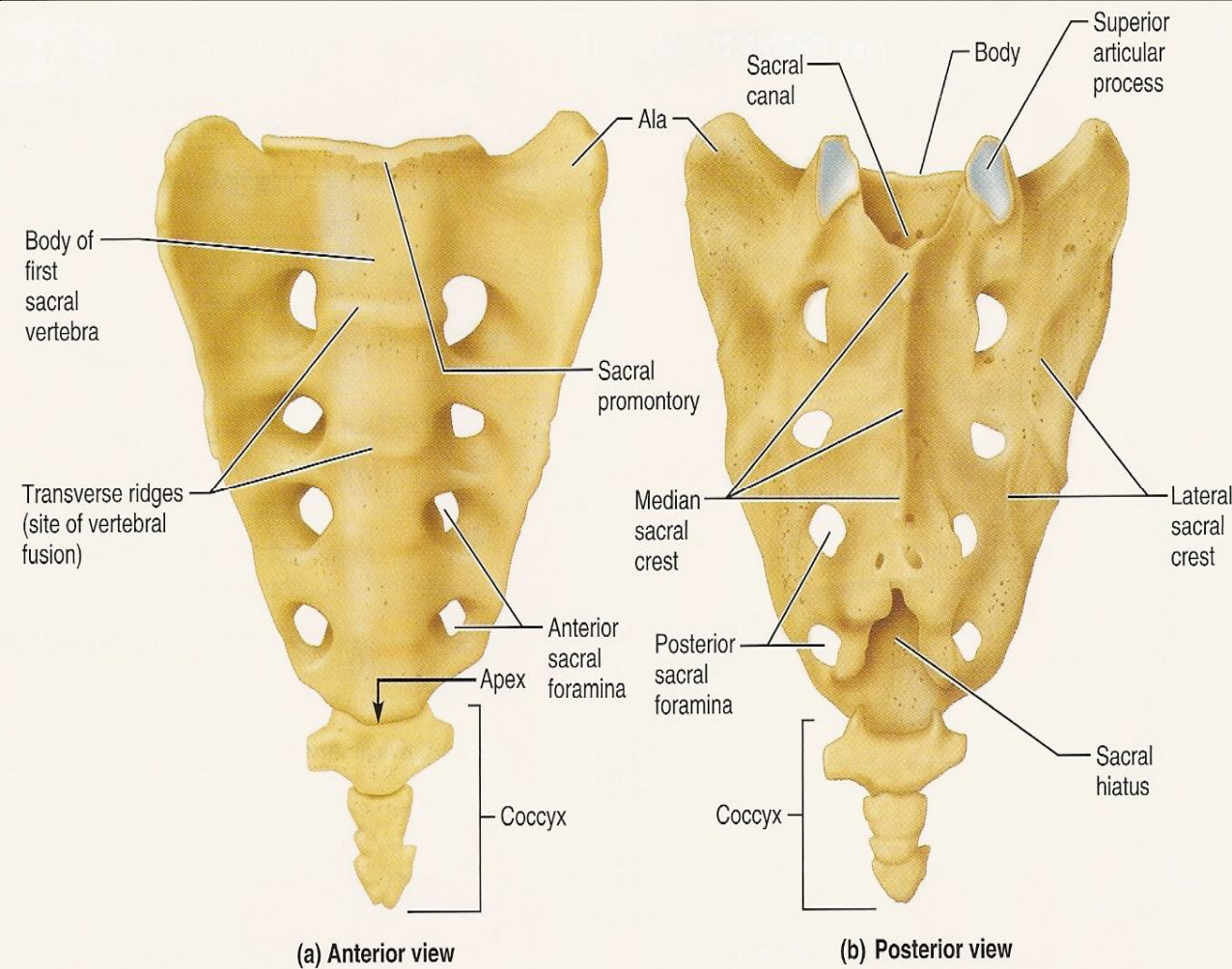
(b) Posterior view

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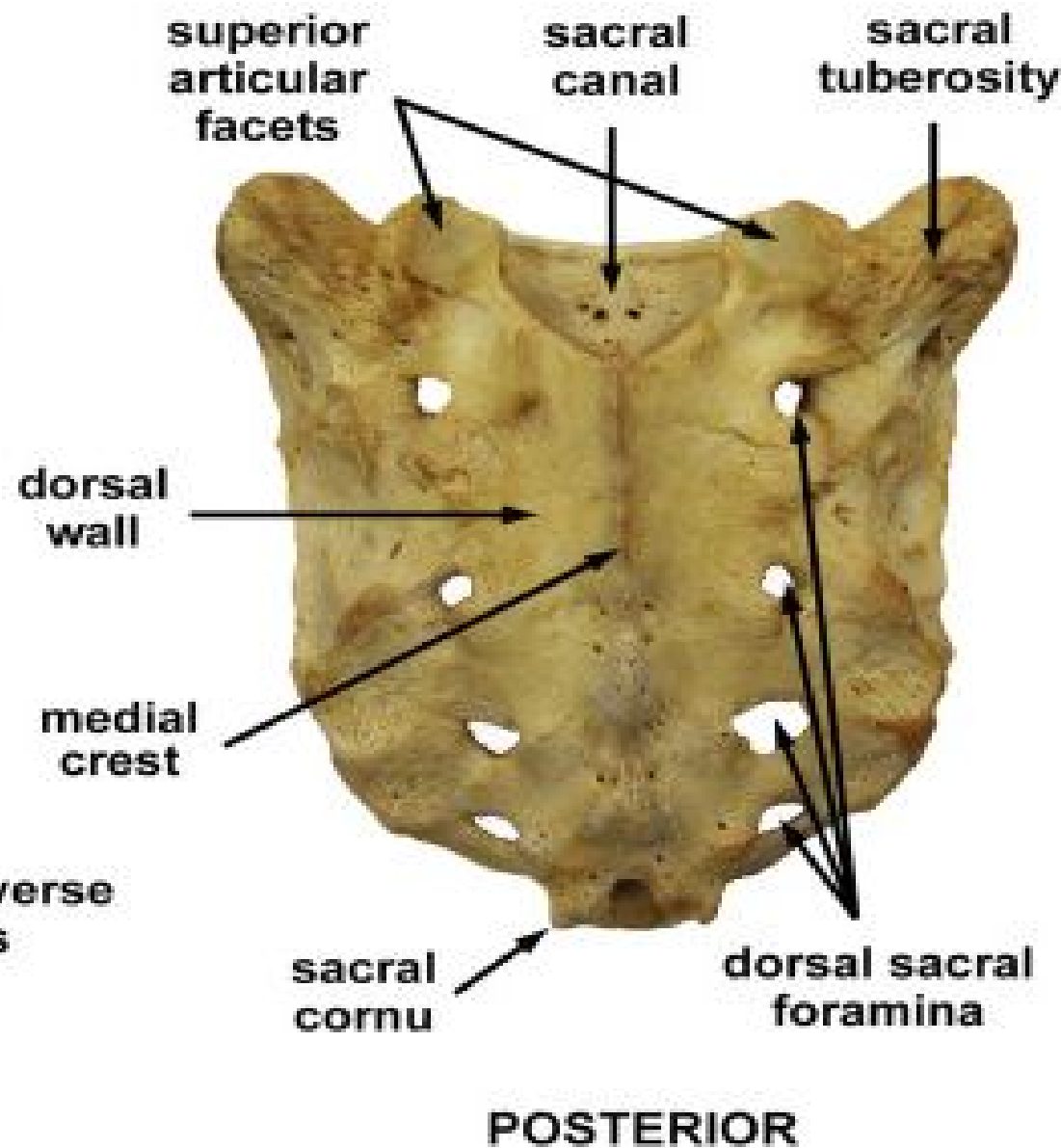
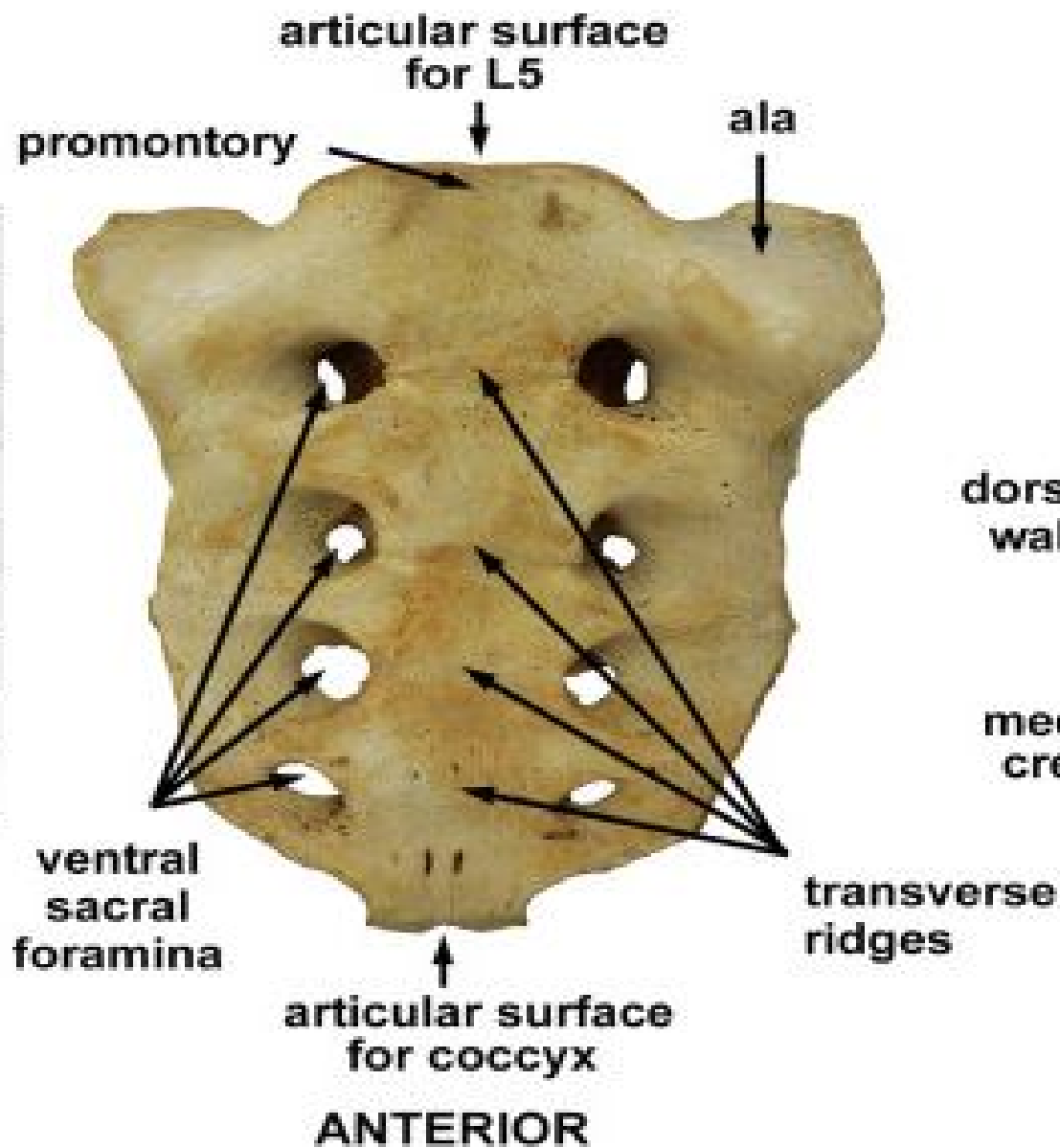


1. Sacral crest
2. Coccyx
3. Posterior sacral foramen
4. Iliac crest
5. Sacral hiatus
6. Vertebral foramen

Sacrum



- 5 vertebrae fuse together to form a single bone
- Articulates with:
 - L5 (through SAP)
 - Coccyx
- Functions in weight transfer
- Anterior surface
 - Sacral promontory
 - Transverse ridges
 - Anterior sacral foramina
- Posterior surface
 - Median and lateral sacral crest
 - Posterior sacral foramen

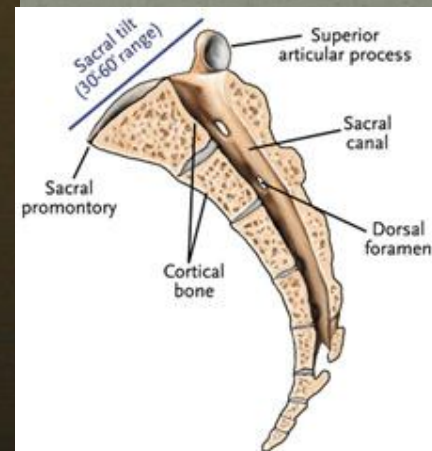




SACRUM

(posterior view):

- dorsal sacral foramina, superior articular facet,
- auricular surface (on sides, for os coxa),
- (ala),
- median sacral crest,
- sacral canal,
- sacral hiatus.

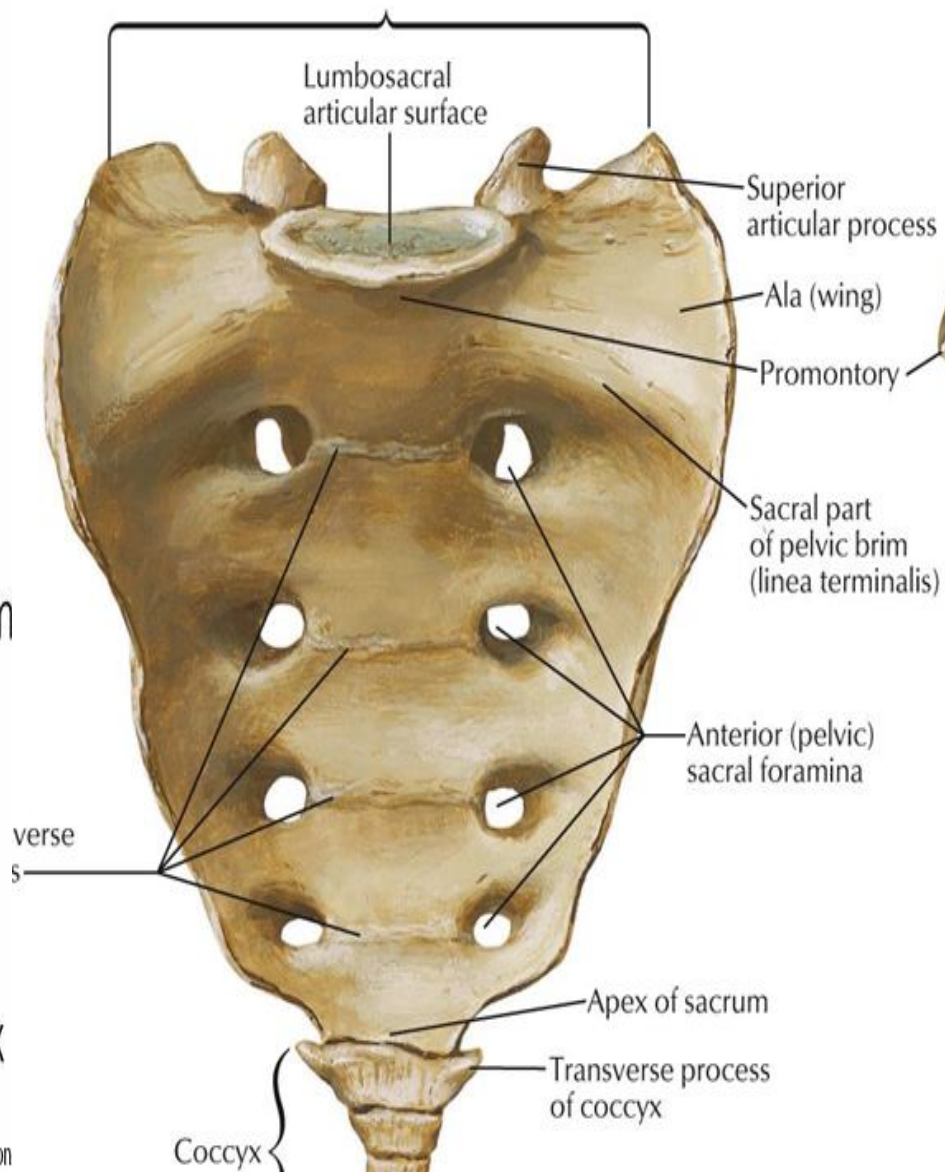




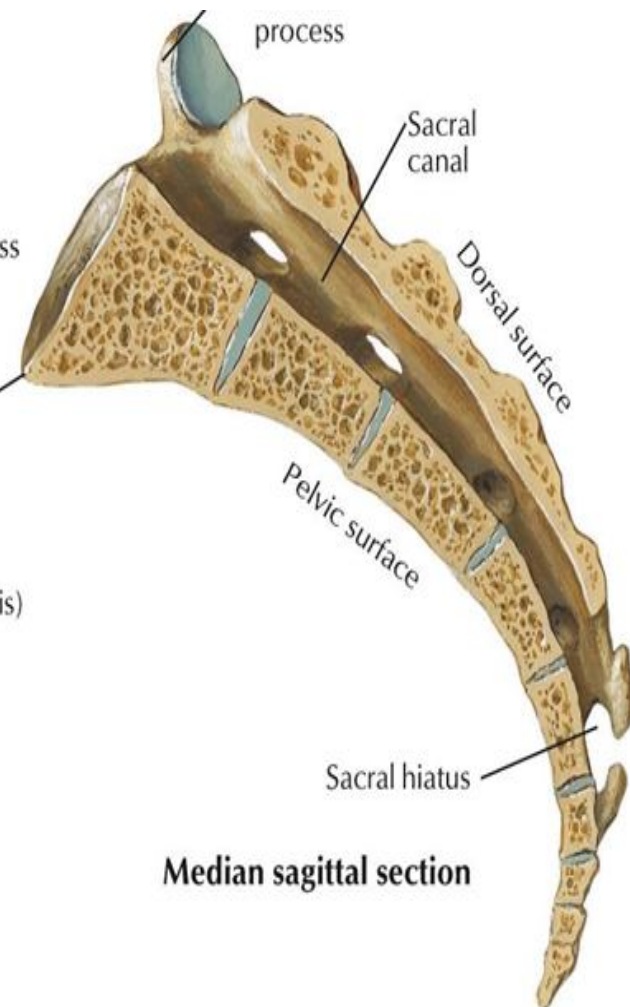
sacrum

coccyx

Carlyn Iverson

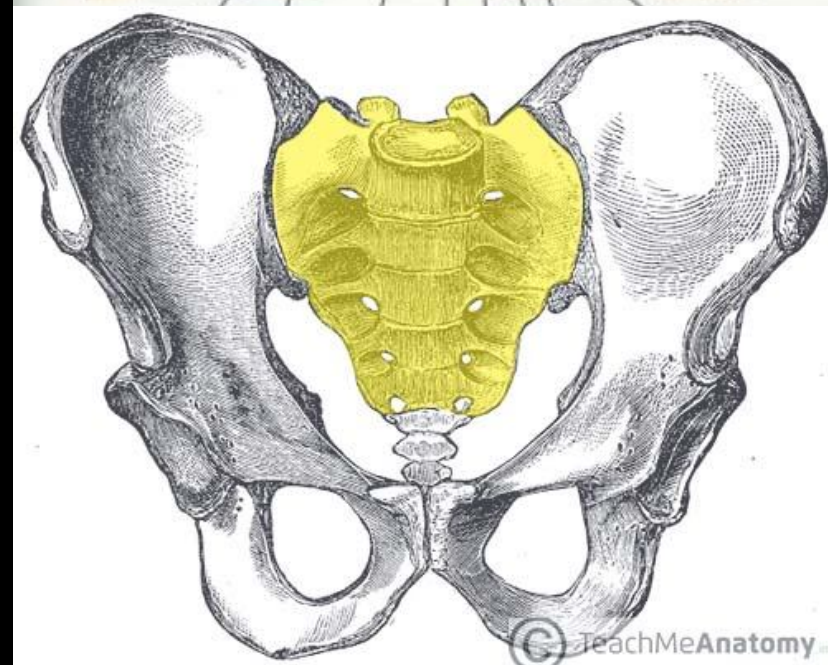
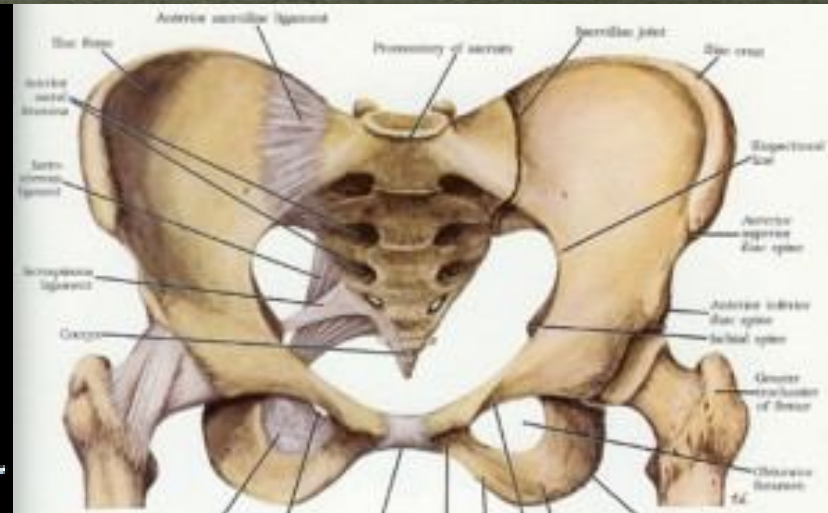
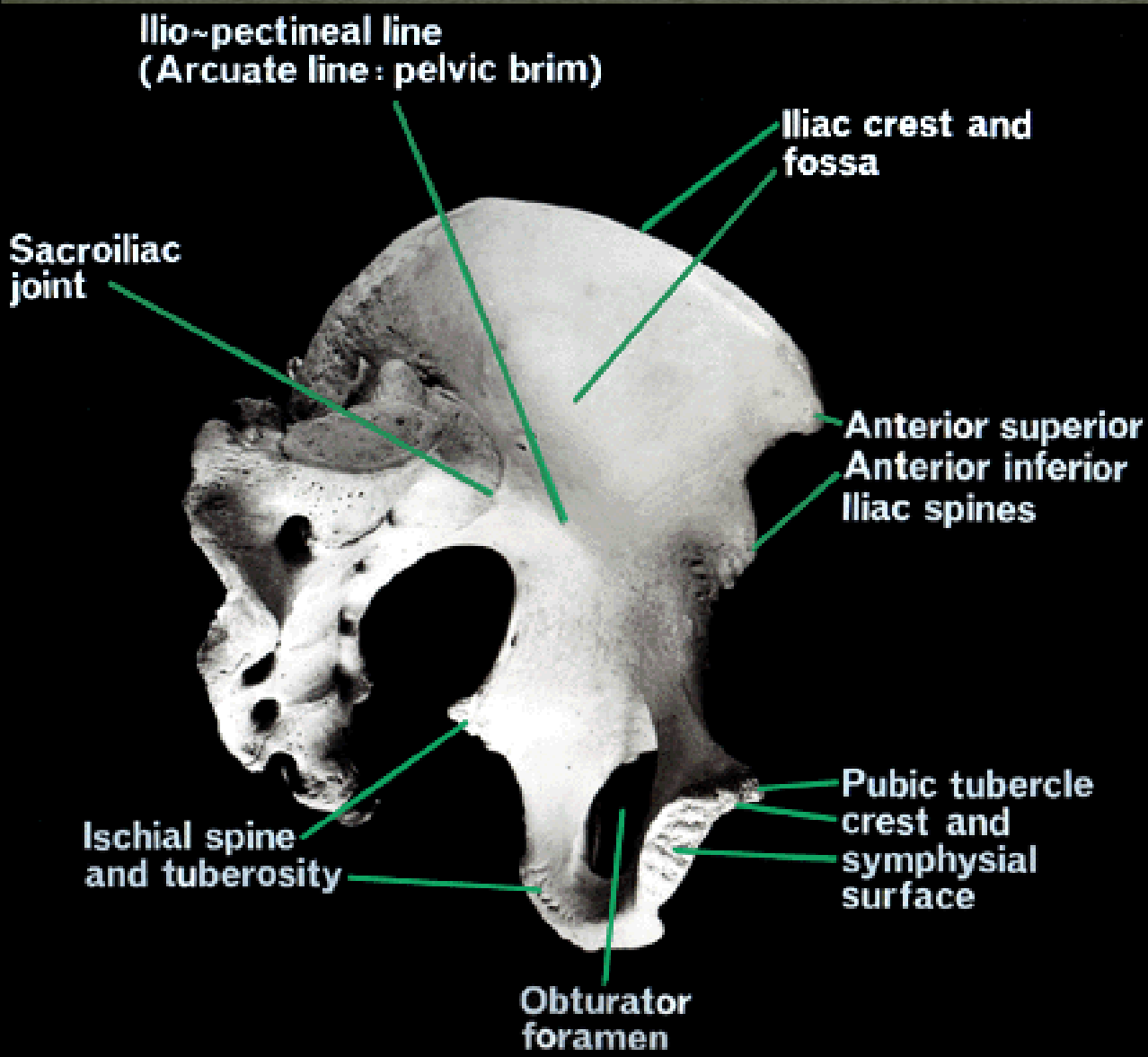


Coccyx

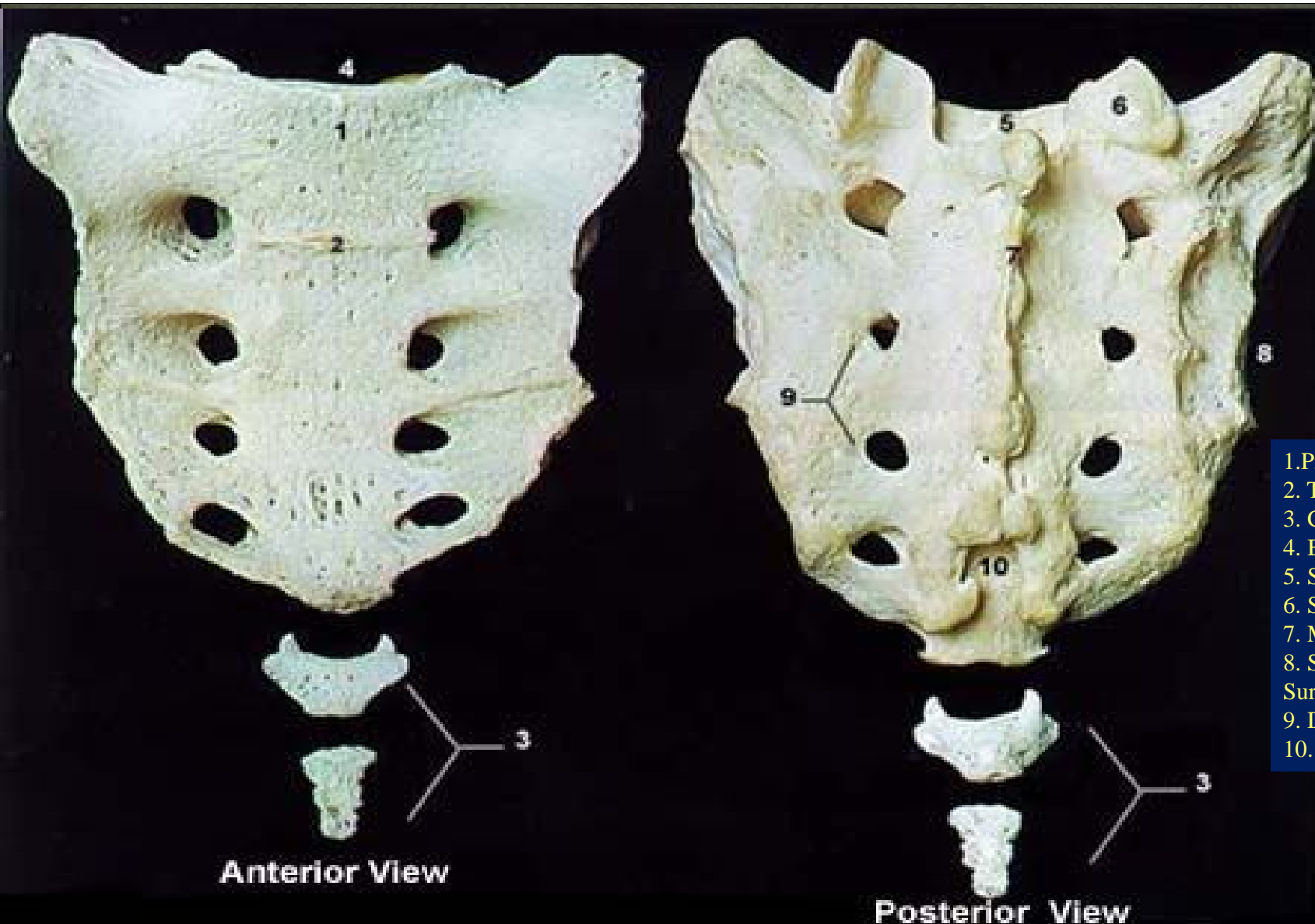


Median sagittal section

Facets of

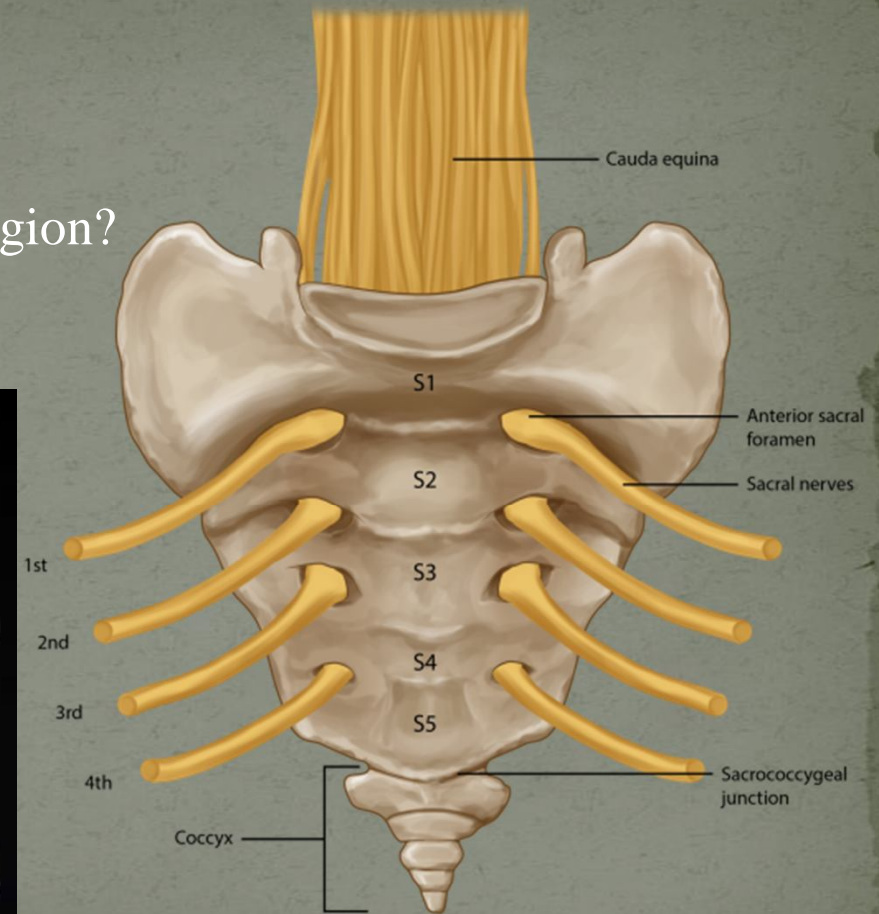
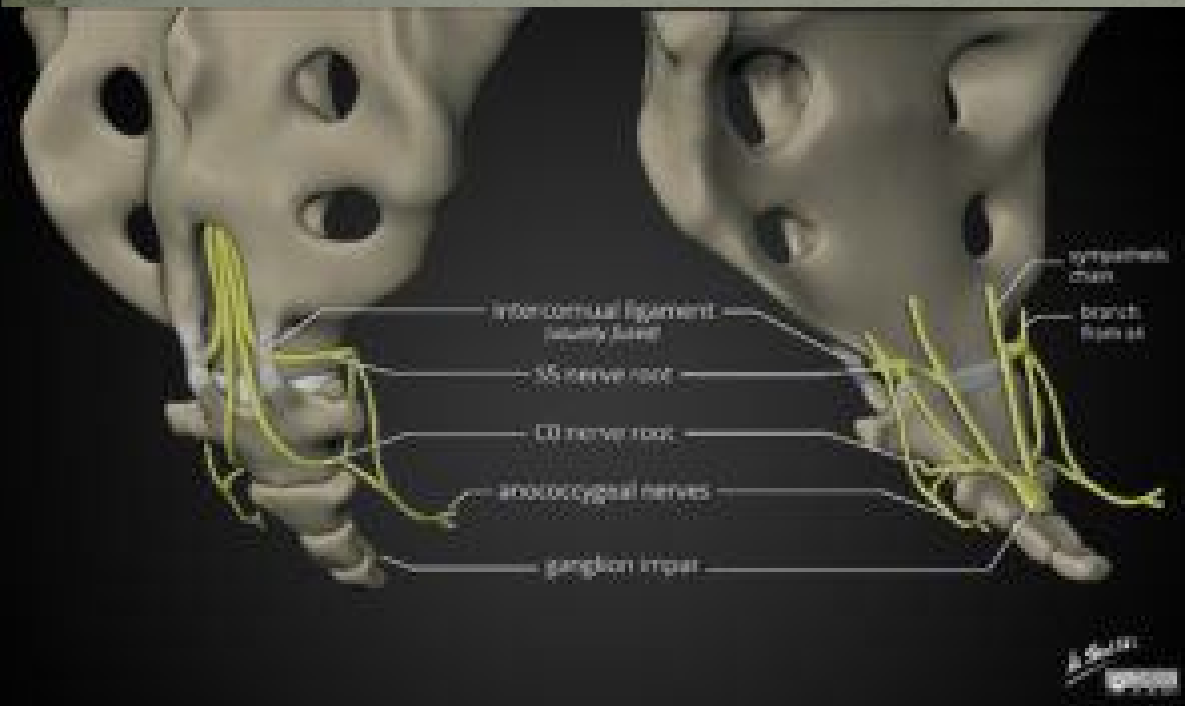


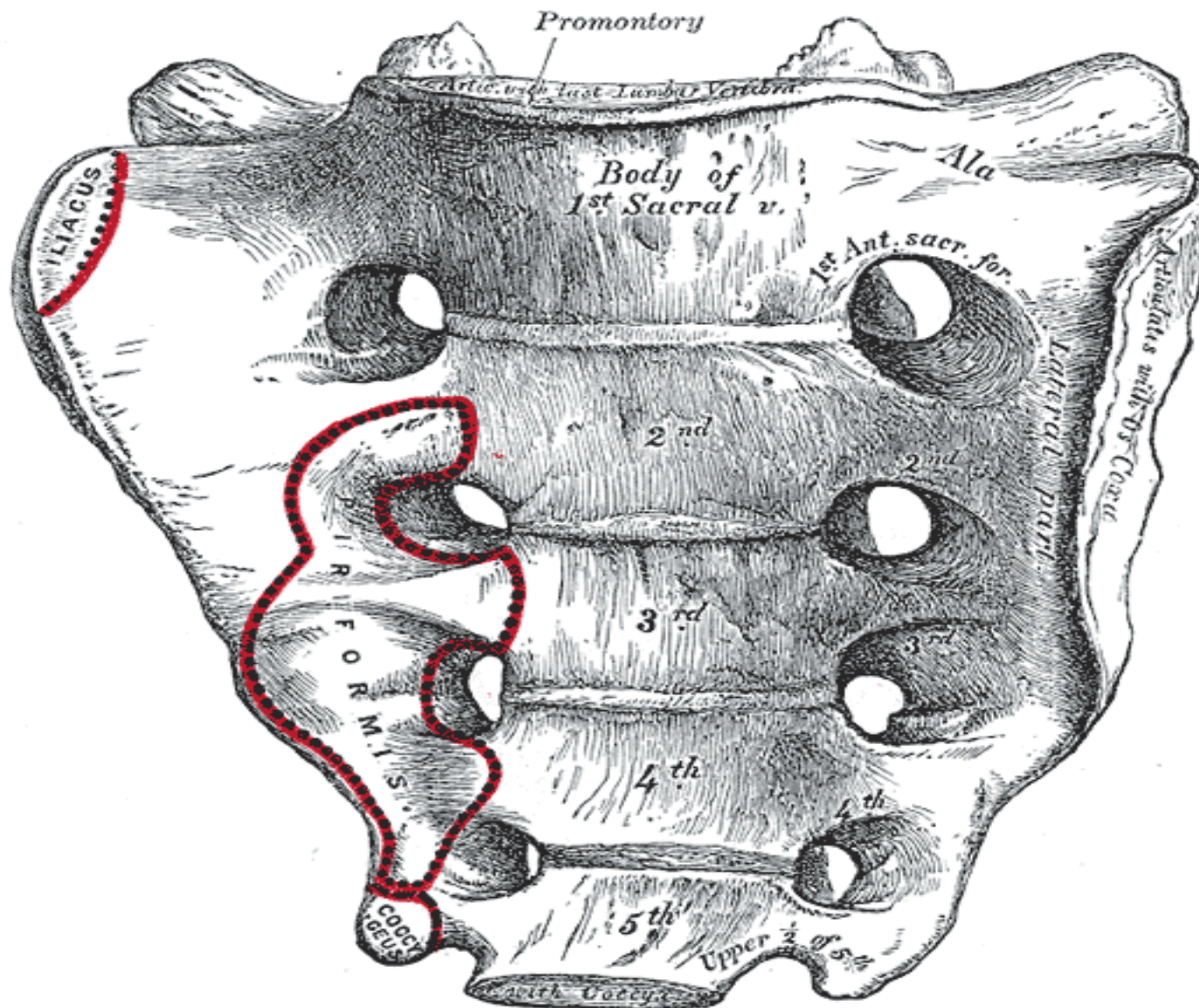




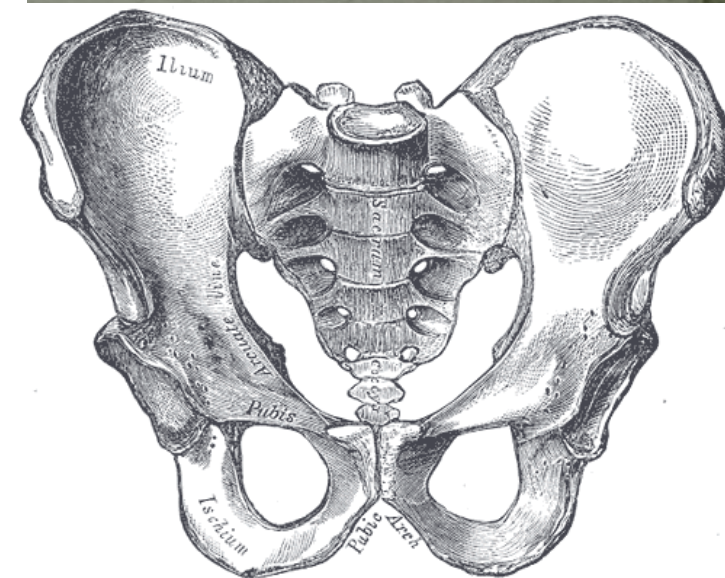
1. Promontory
2. Transverse Ridges
3. Coccyx
4. Body of Sacrum
5. Sacral Canal
6. Superior Articular Surface
7. Median Sacral Crest
8. Sacrum to Ilium Articular Surface
9. Dorsal Sacral Foramina
10. Sacral Hiatus

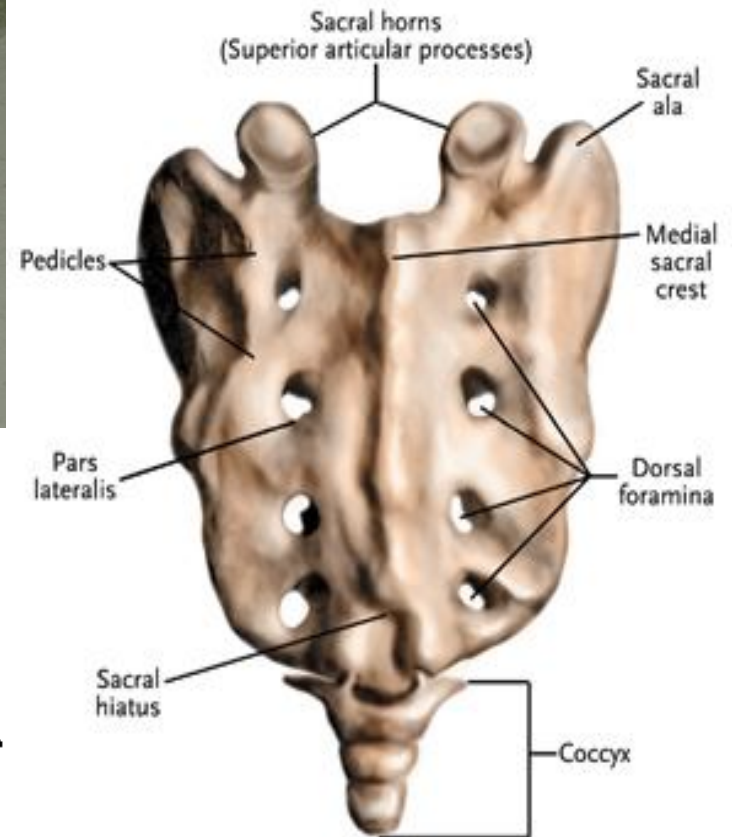
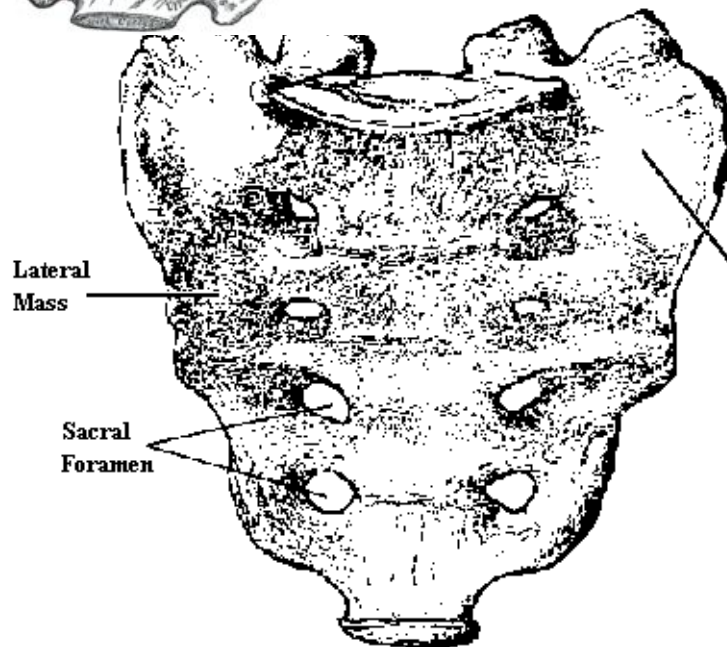
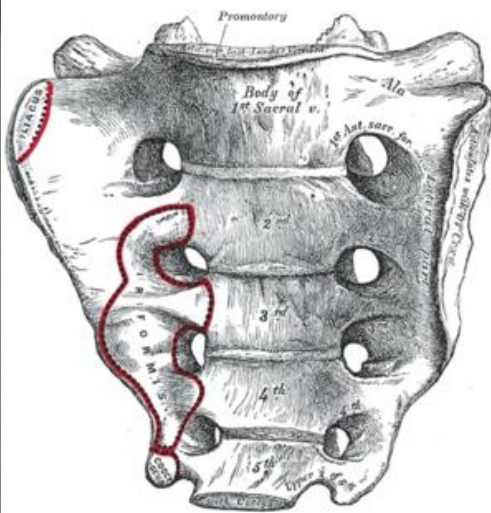
Home work ? What are the sciatica?
What are the sacral joints?
What are ligaments around the vertebra?
What are the causes of hyperkyphosis?
What are the dermatomes for breast and umbilical region?





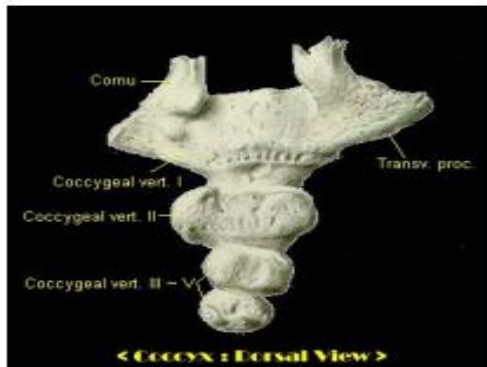
The sacrum articulates with four bones: the last lumbar vertebra above, the coccyx below, and the hip bone on either side. Although in most people the sacro-iliac joints are tightly bound and immobile, some are able to rotate the sacrum forward a few degrees vis-à-vis the ilia. This motion is sometimes called "nutation", and the reverse motion "counter-nutation".





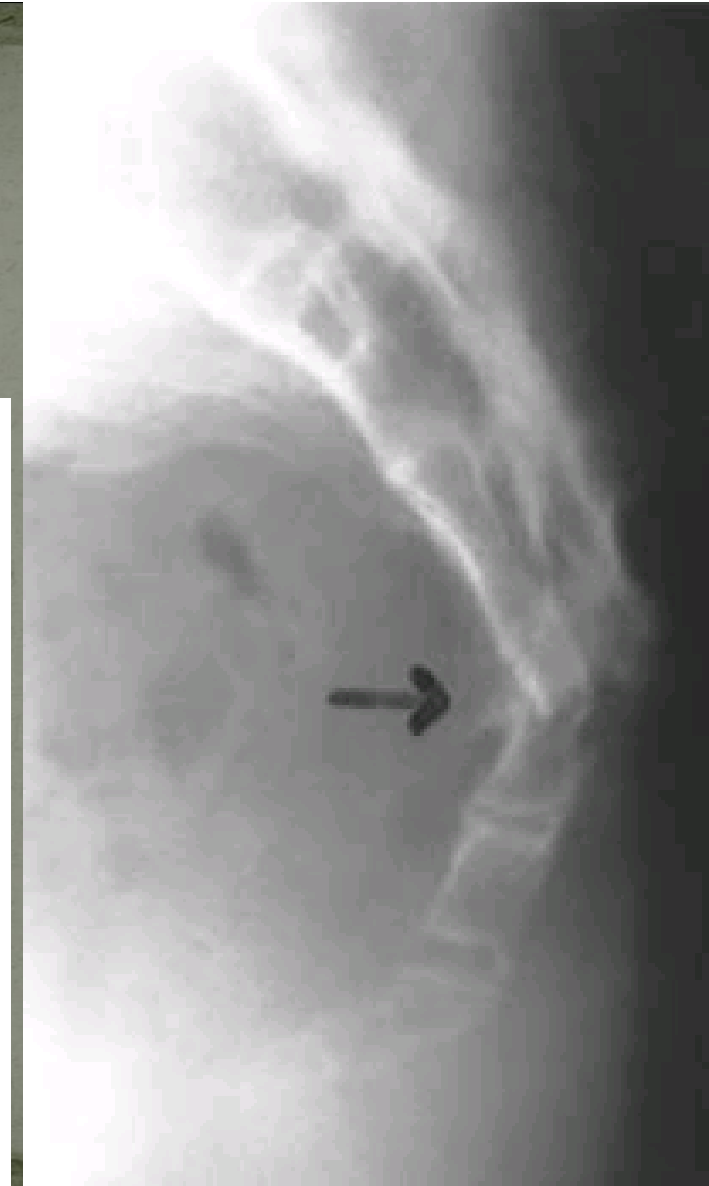
Coccyx

- Coccyx (Tailbone)
 - The coccyx is made up of four (in some cases three to five) fused vertebrae that articulate superiorly with the sacrum



Coccyx (3-5 fused)

- “**Tailbone”**
- Useless bone.....
 - But painful!
- Slight support to pelvic organs and ligament attachment
- Articulates superiorly with sacrum
- Anterior concave
- Posterior convex

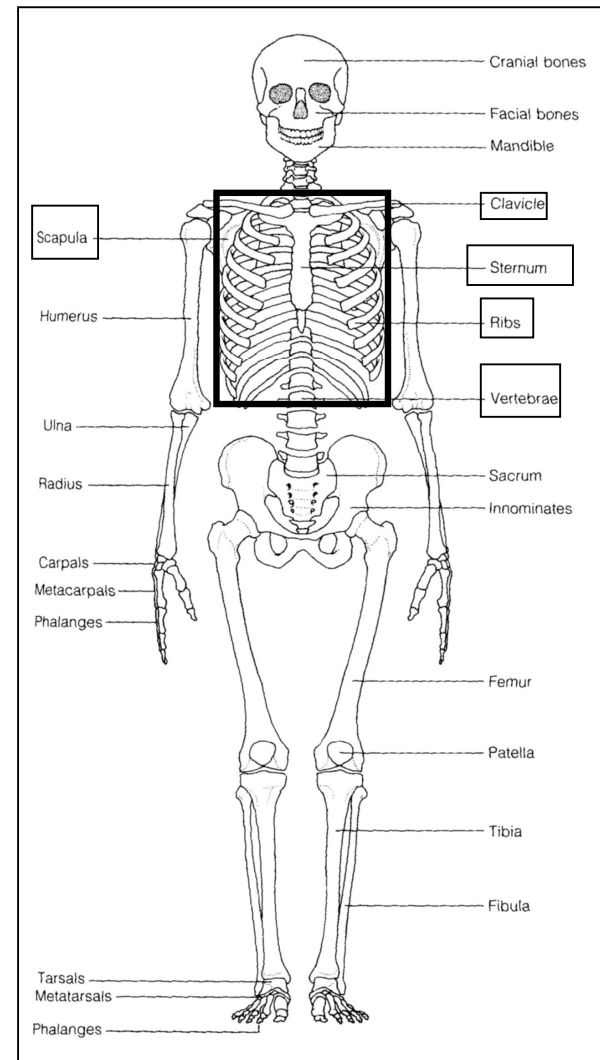


- Anterior angulation of the coccyx?



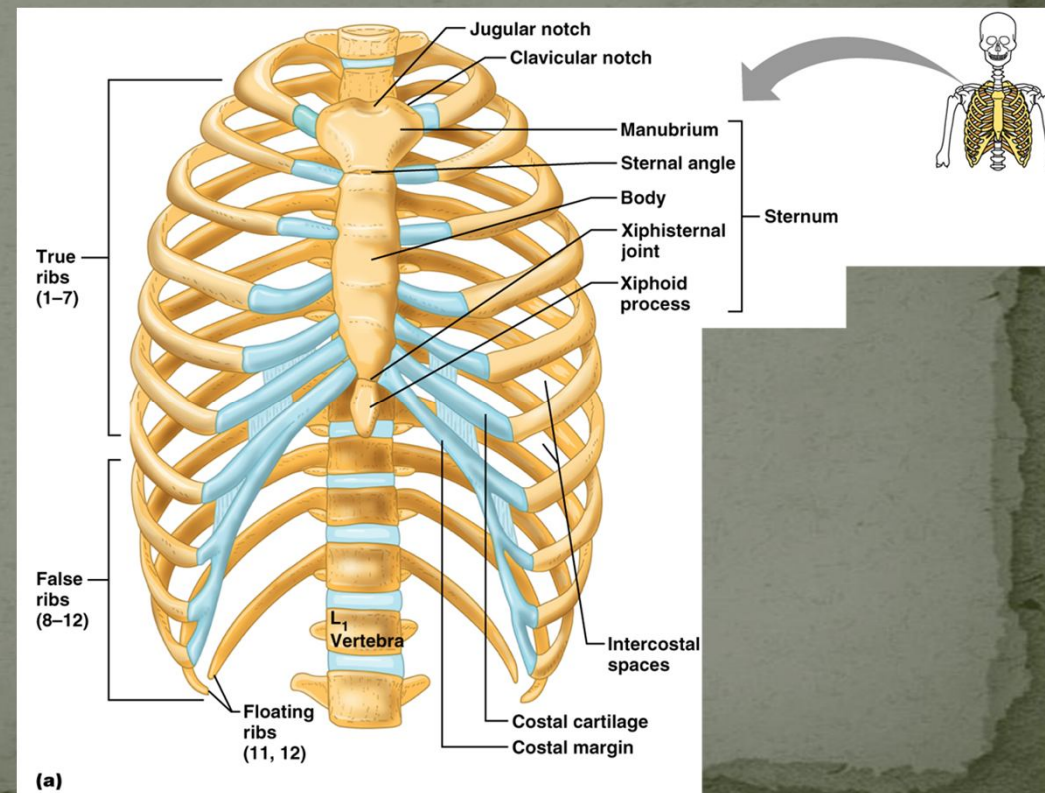
The Bony Thorax

- Sternum (3 parts)
- Ribs
- Clavicle
- Scapula
- Vertebrae (5 parts)

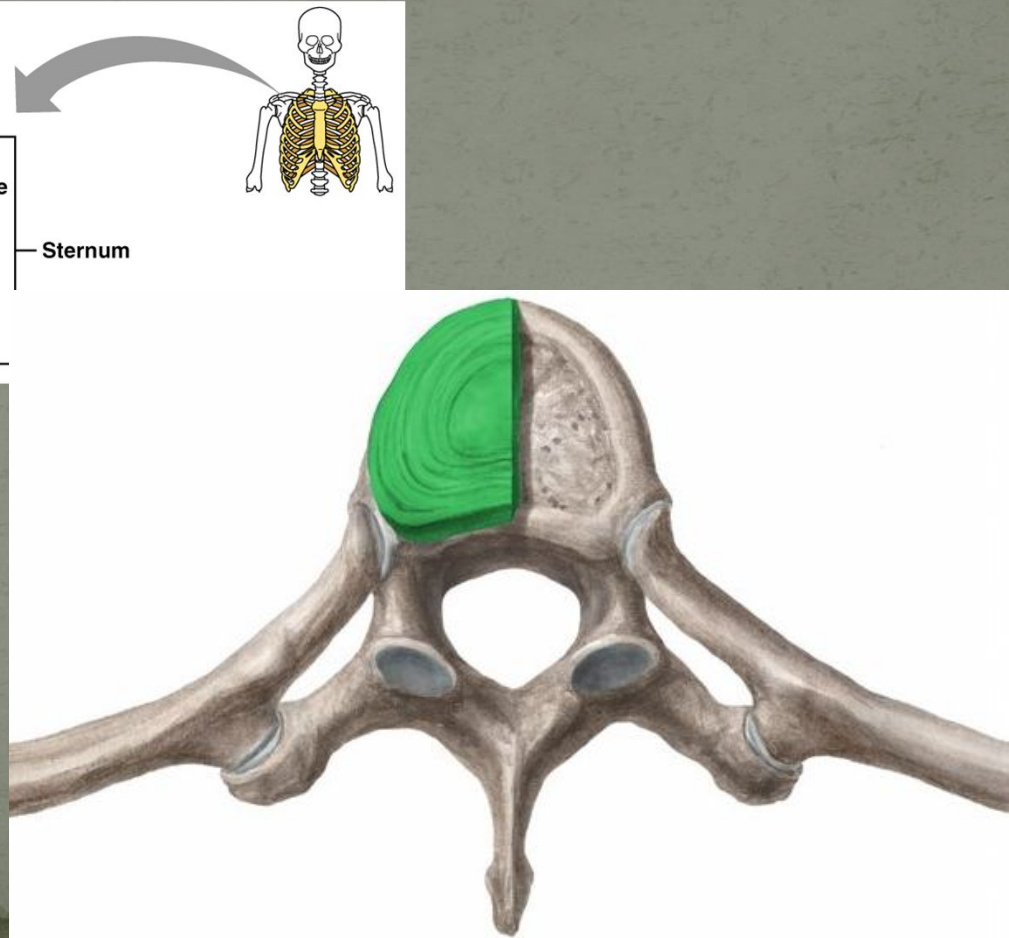
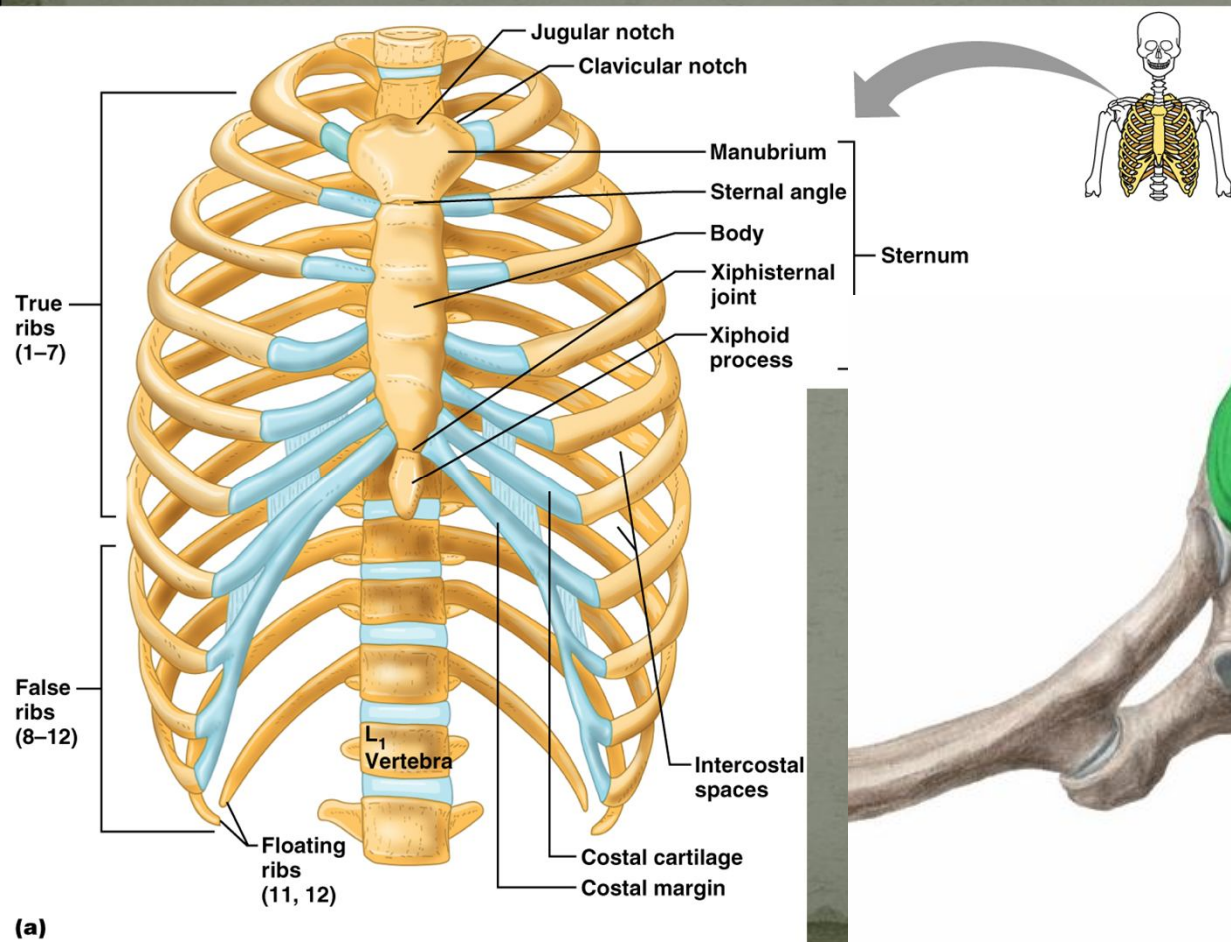


Bony Thorax (Thoracic Cage)

- The thoracic cage is composed of the thoracic vertebrae dorsally, the ribs laterally, and the sternum and costal cartilages anteriorly
- Functions
 - Forms a protective cage around the heart, lungs, and great blood vessels
 - Supports the shoulder girdles and upper limbs
 - Provides attachment for many neck, back, chest, and shoulder muscles
 - Uses intercostal muscles to lift and depress the thorax during breathing



Bony Thorax (Thoracic Cage)



Bony Thorax (Thoracic Cage)

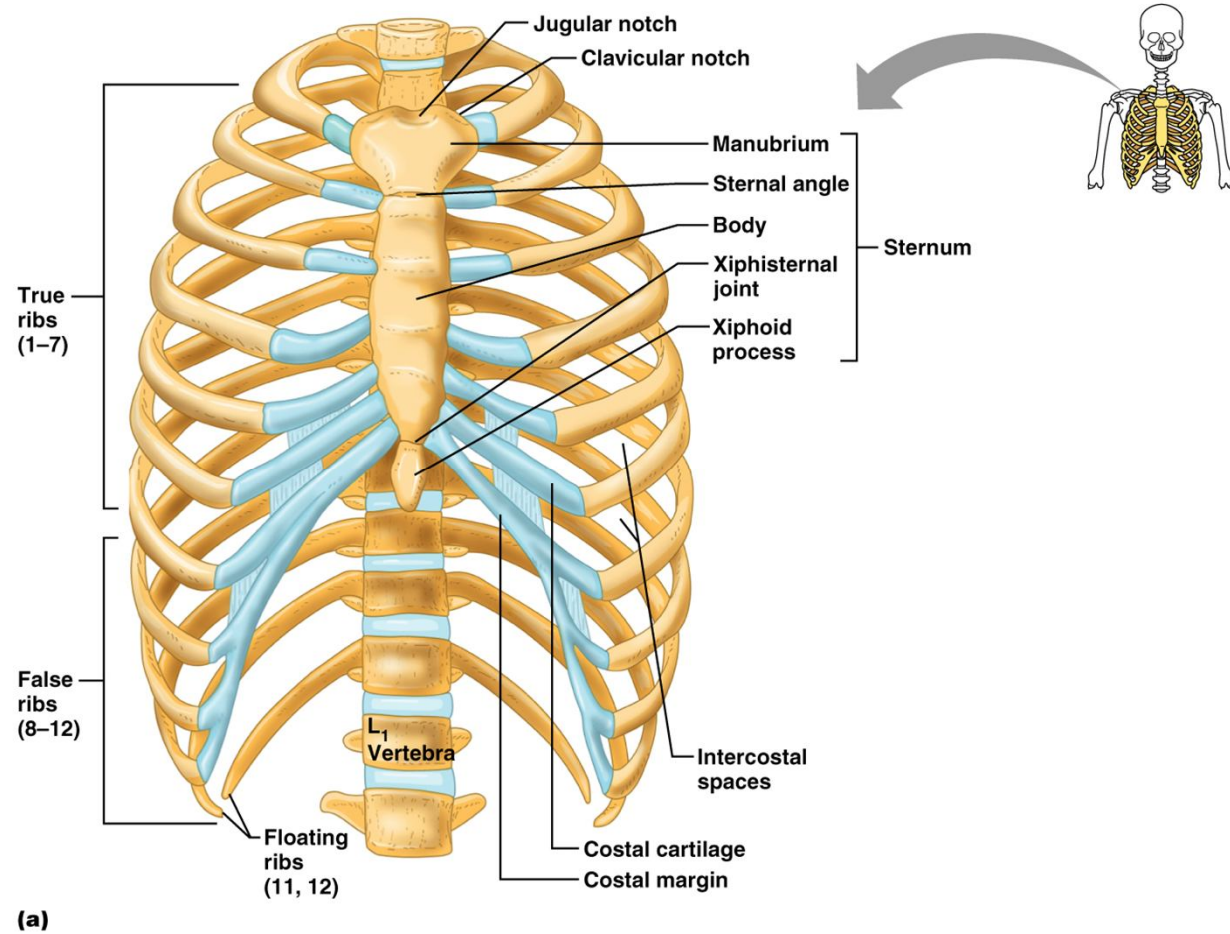
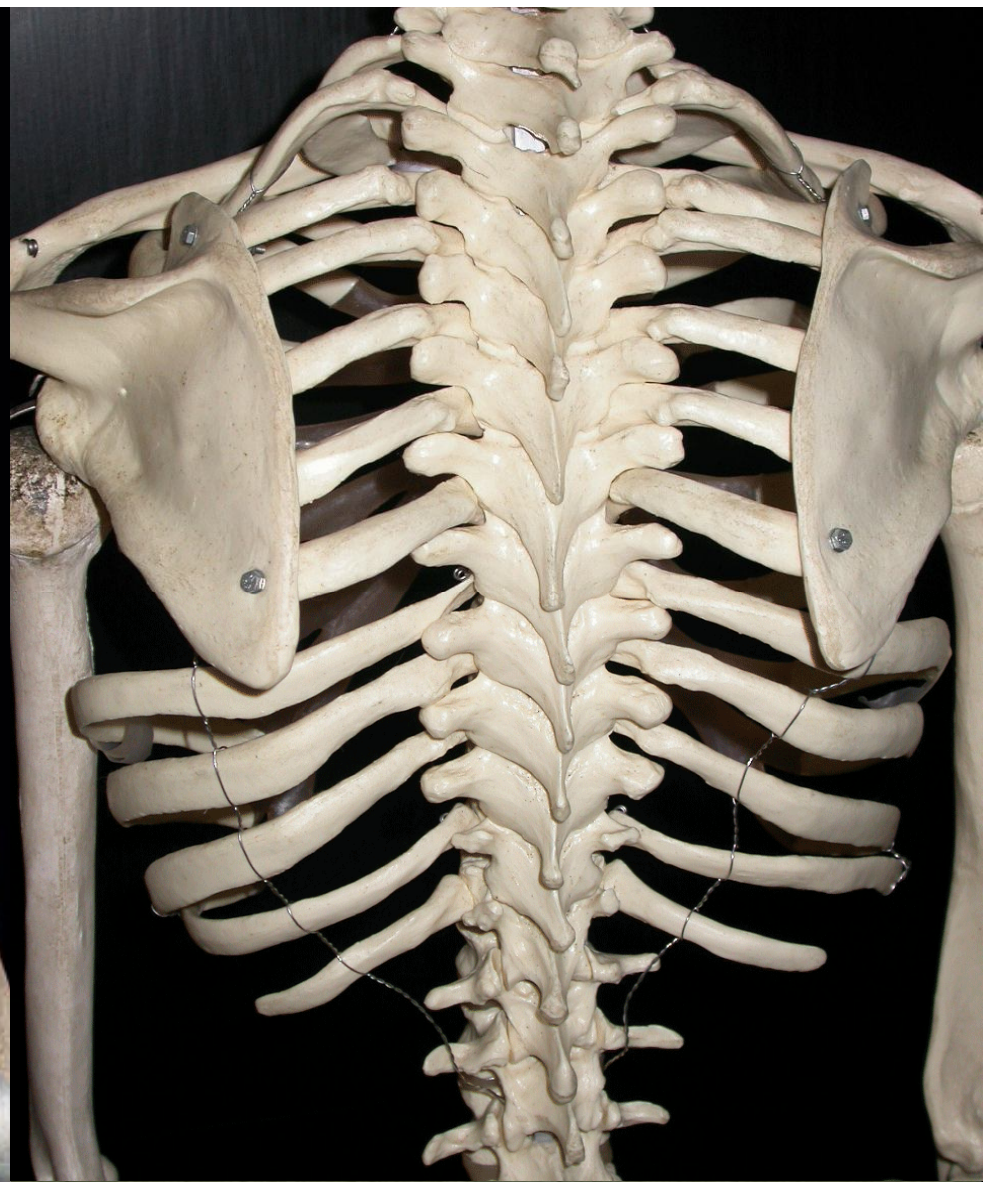
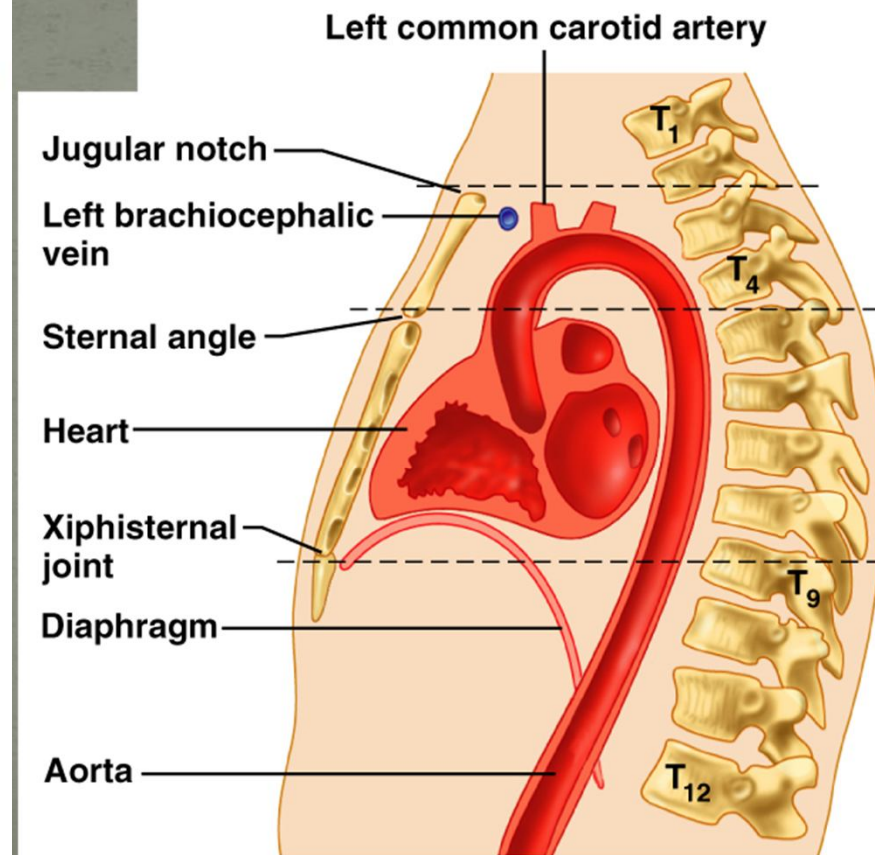
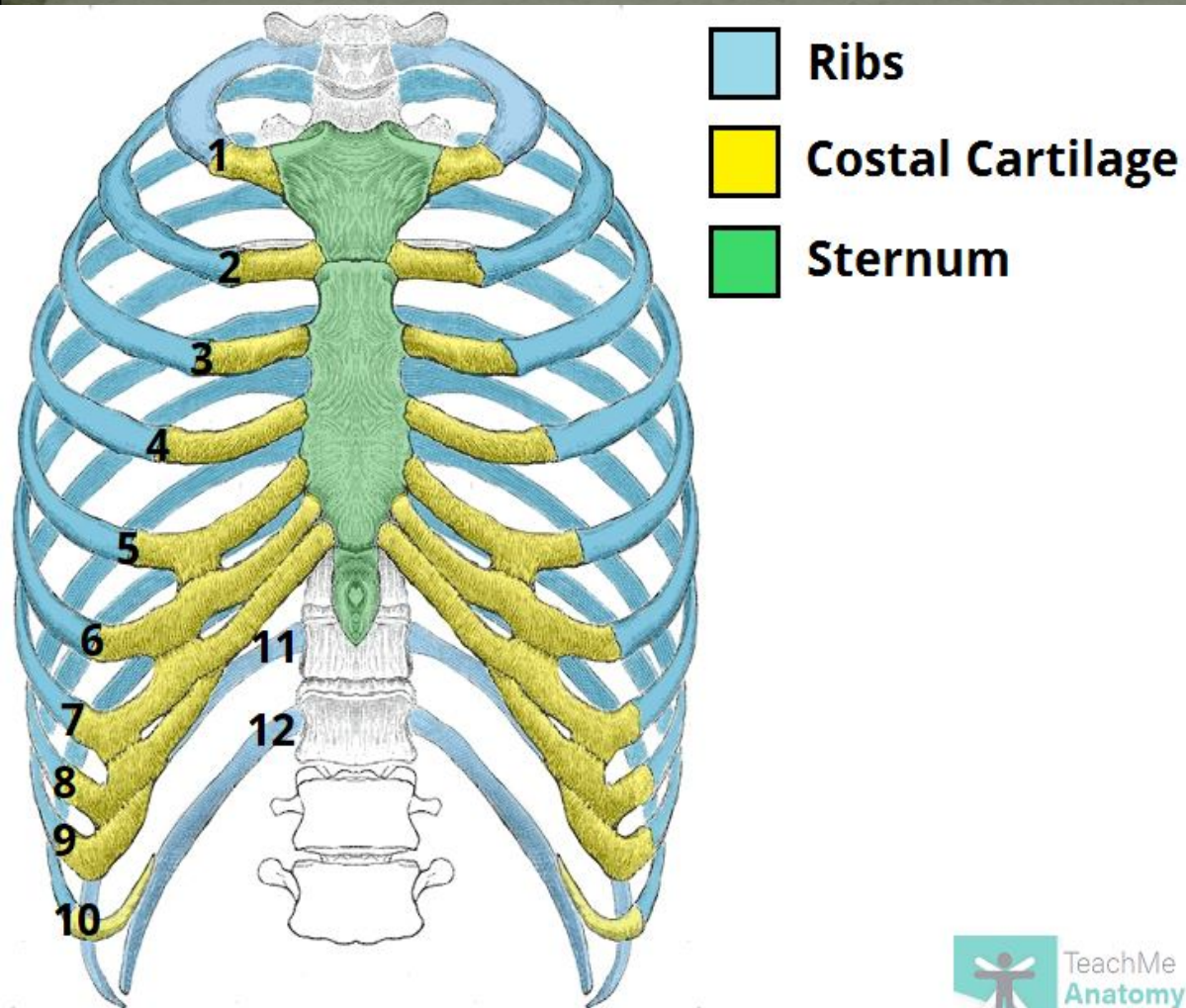


Figure 7.19a

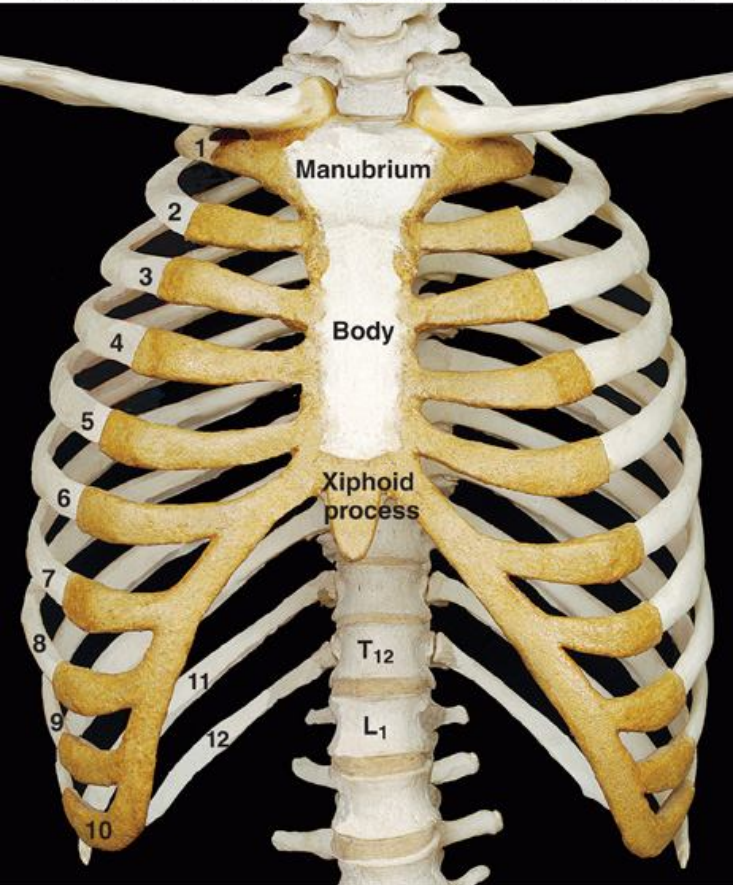


Bony Thorax (Thoracic Cage)



2. Thoracic Cage

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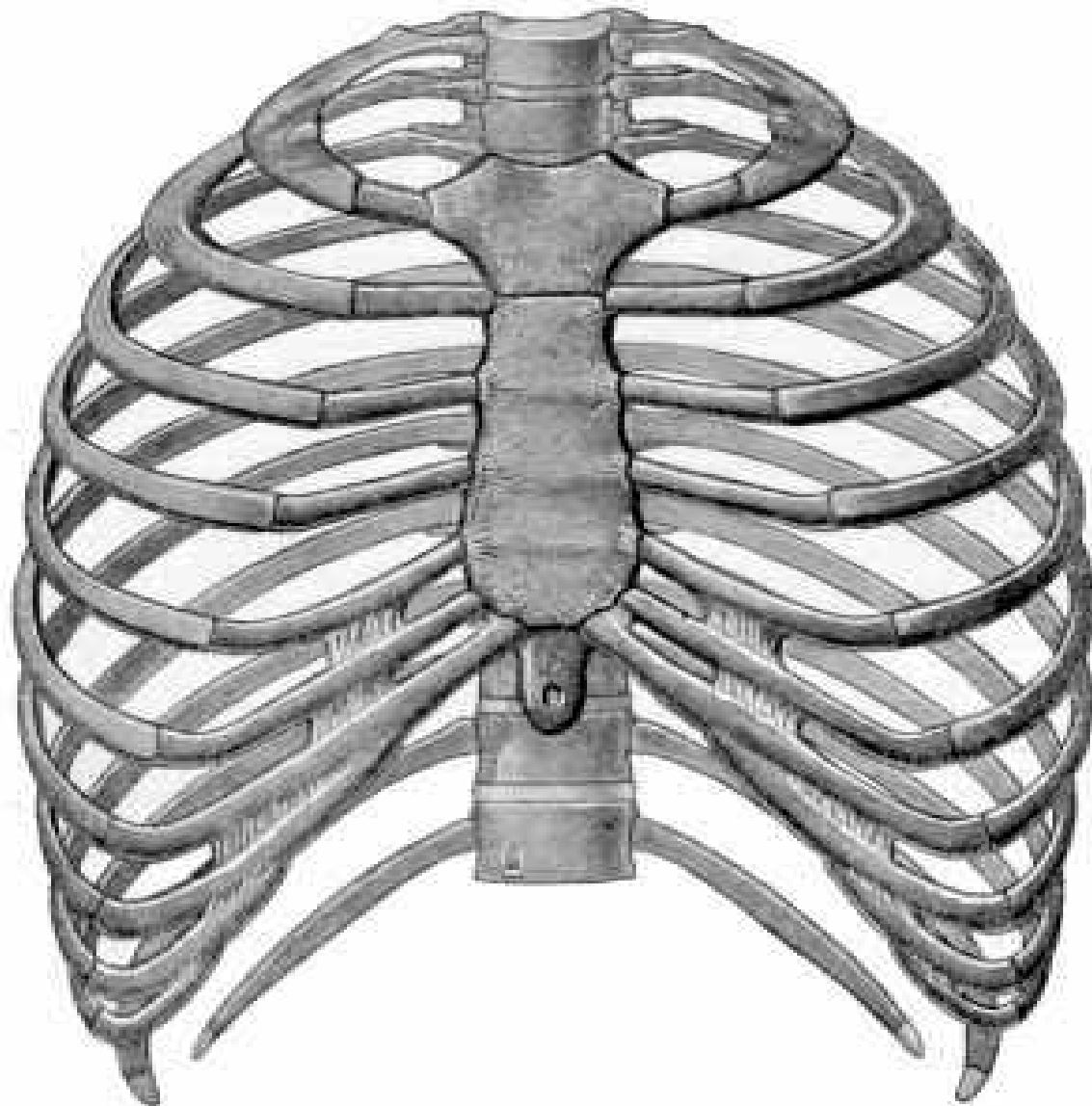
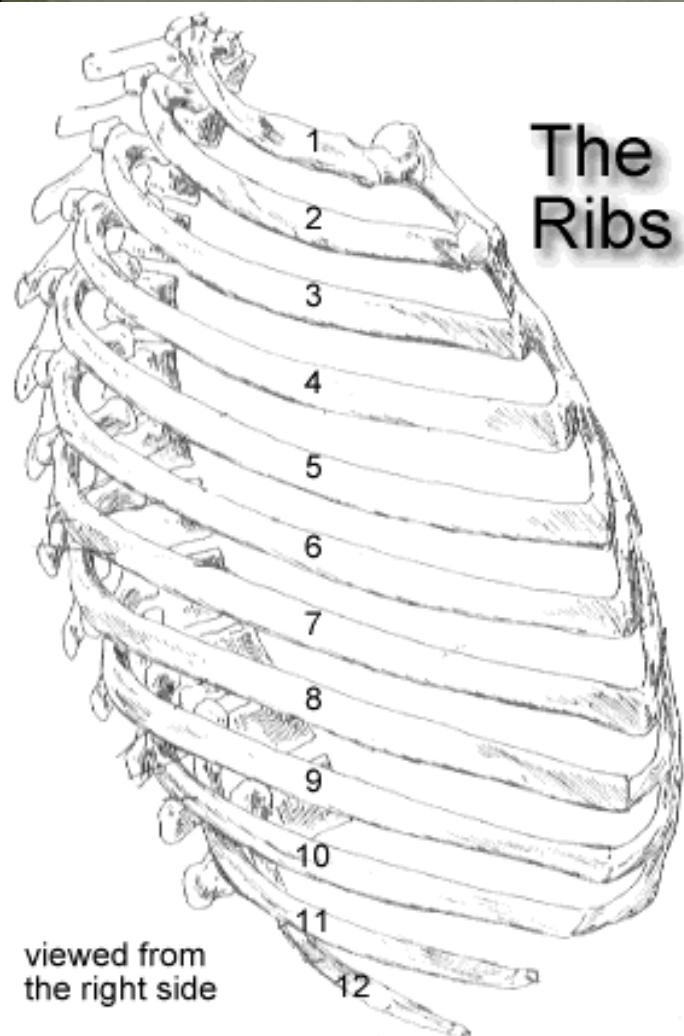


Anterior view

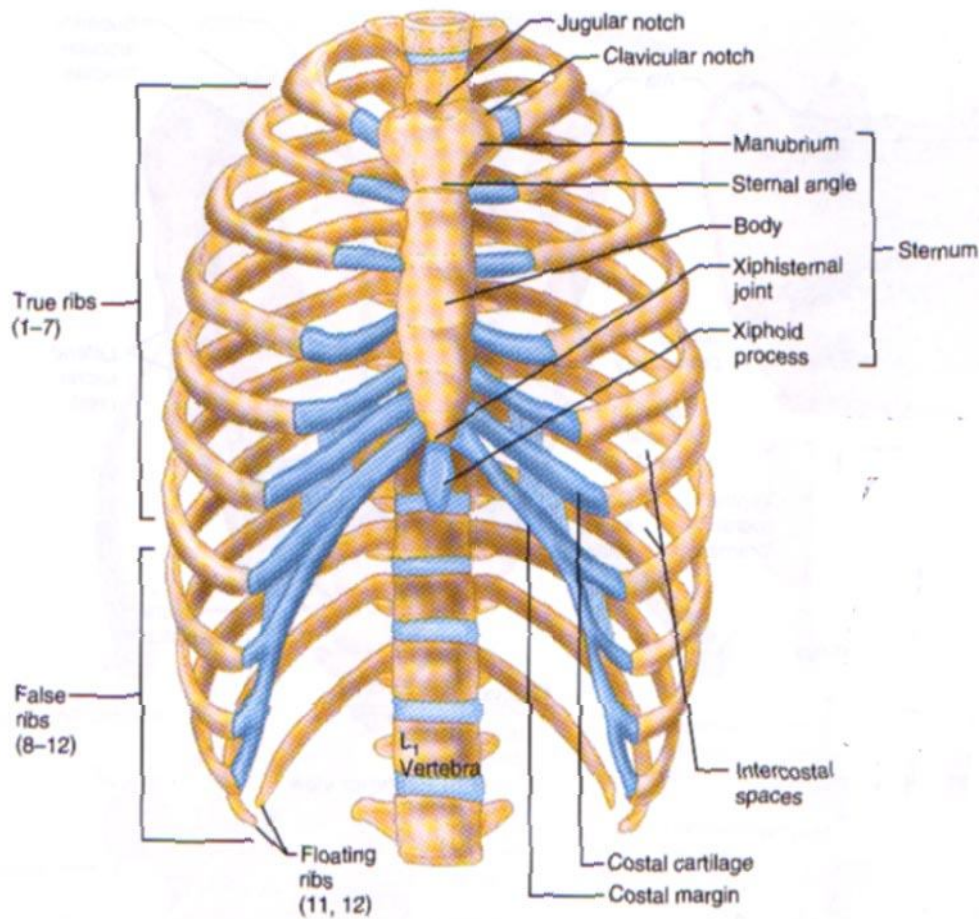
- Borders:
 - Thoracic vertebrae posteriorly
 - Ribs laterally
 - Sternum and costal cartilages anteriorly
- Forms protective cage @ heart, lungs, and other organs
- Composed of:
 - Sternum
 - Ribs

RIBS

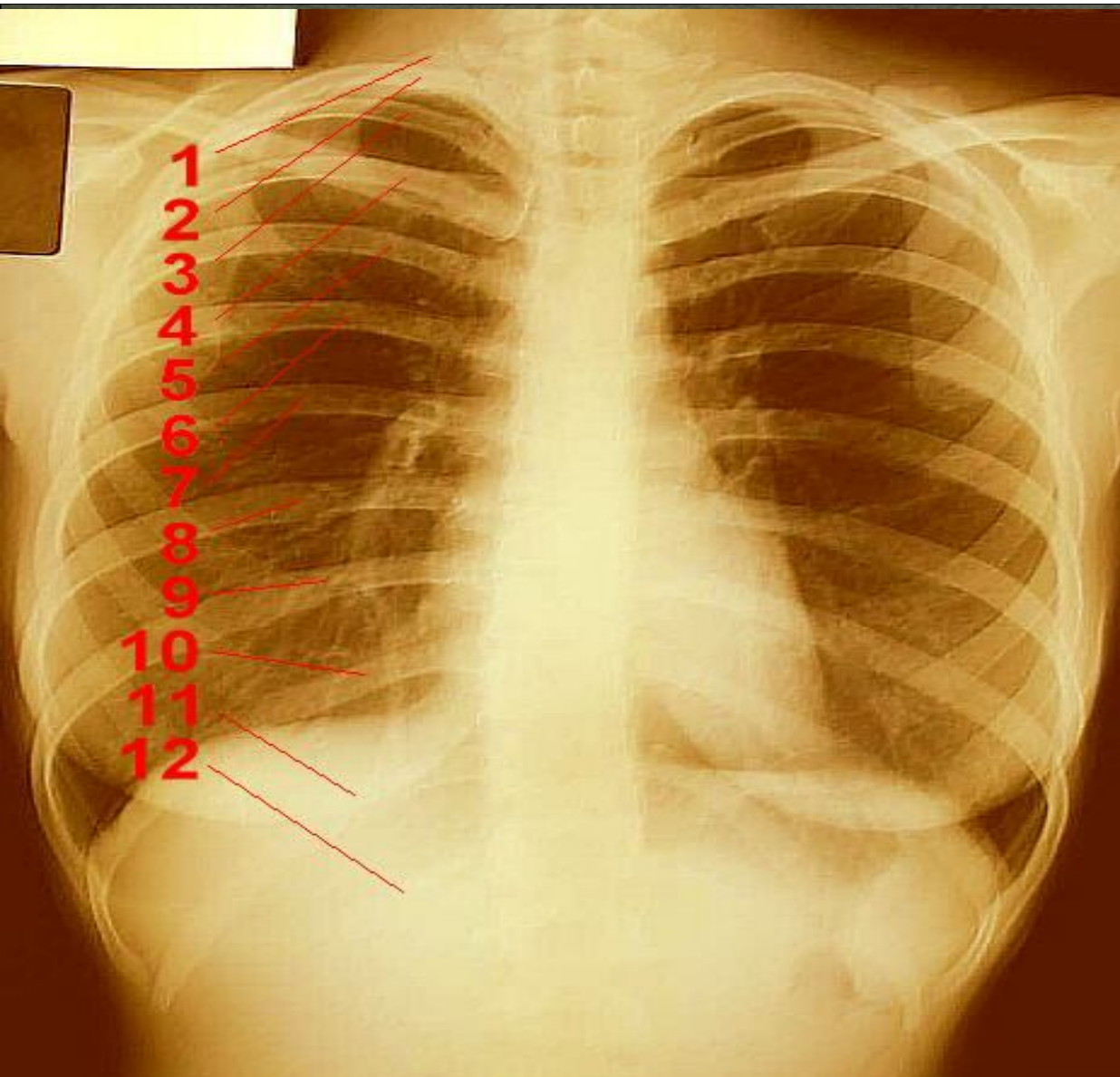
The Ribs



Thoracic Cage - Ribs



- 12 pairs
 - True ribs
 - Superior 7 pairs that attach directly to sternum by CC
 - False ribs (8-12)
 - Inferior 4 pairs (8-10) and attach indirectly to sternum
 - Floating ribs
 - Ribs 11 and 12 and have no anterior attachments (muscles)

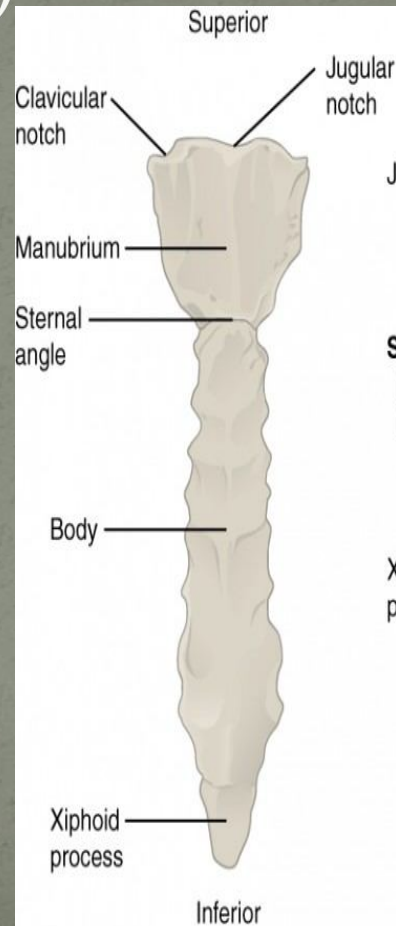


Ribs

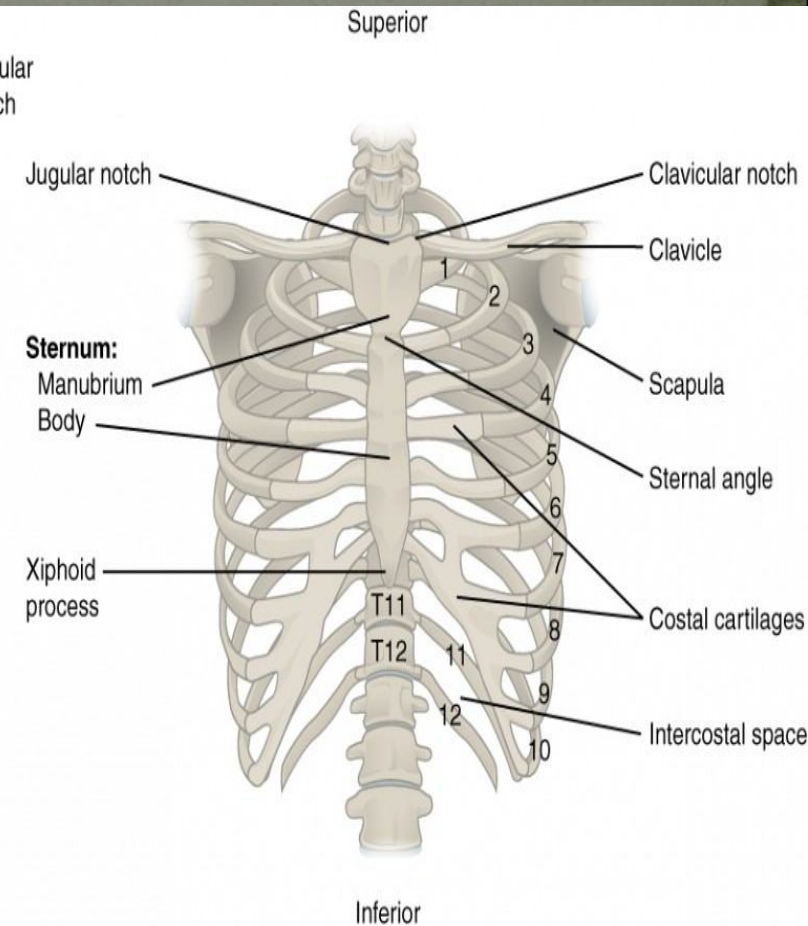
- Typical ribs
 - # 2-9
- Atypical ribs
 - # 1, 10-12
- Increase in length from 1-7
- Decrease in length from 8-12
- Costal margin

Sternum (Breastbone)

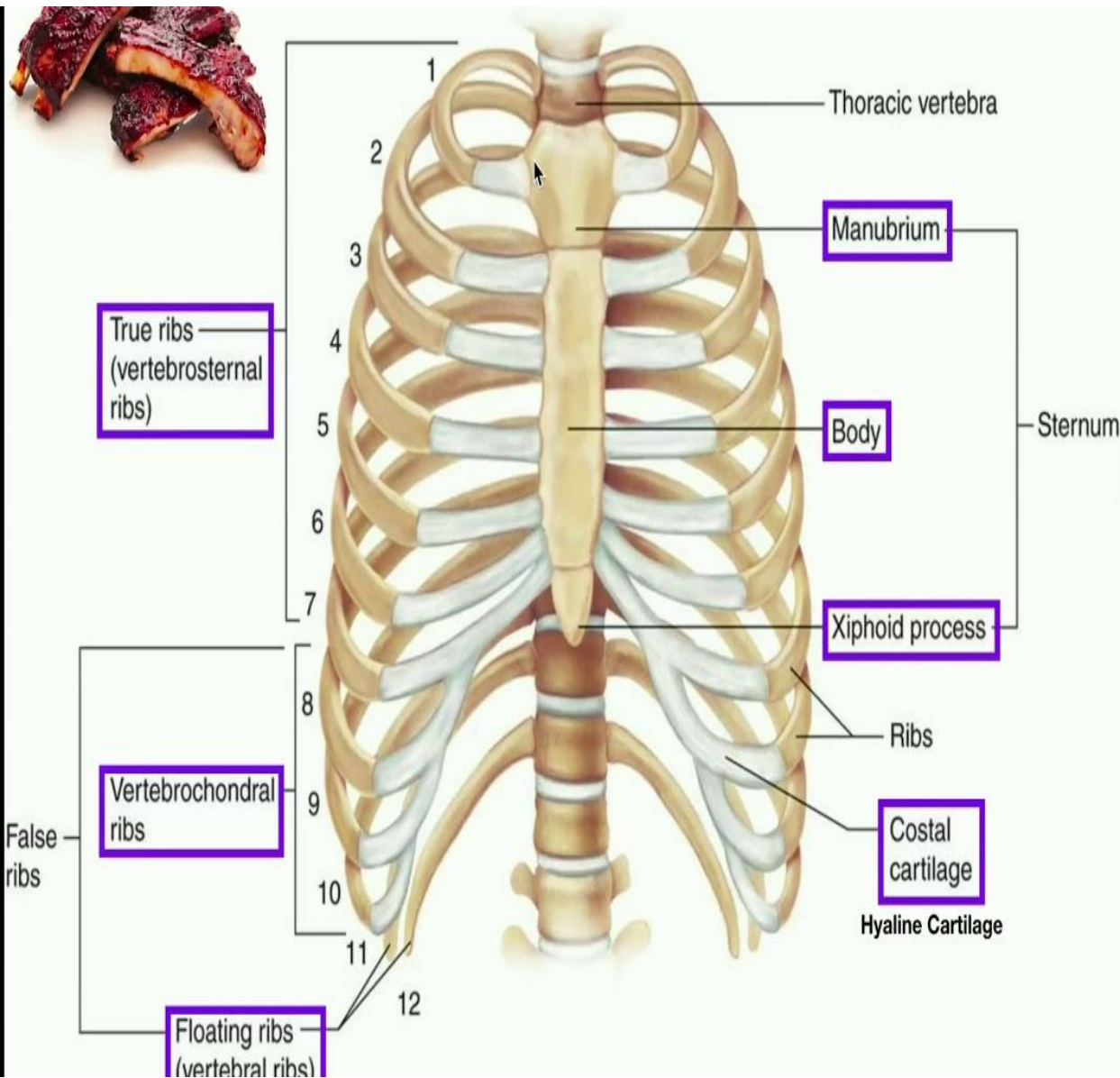
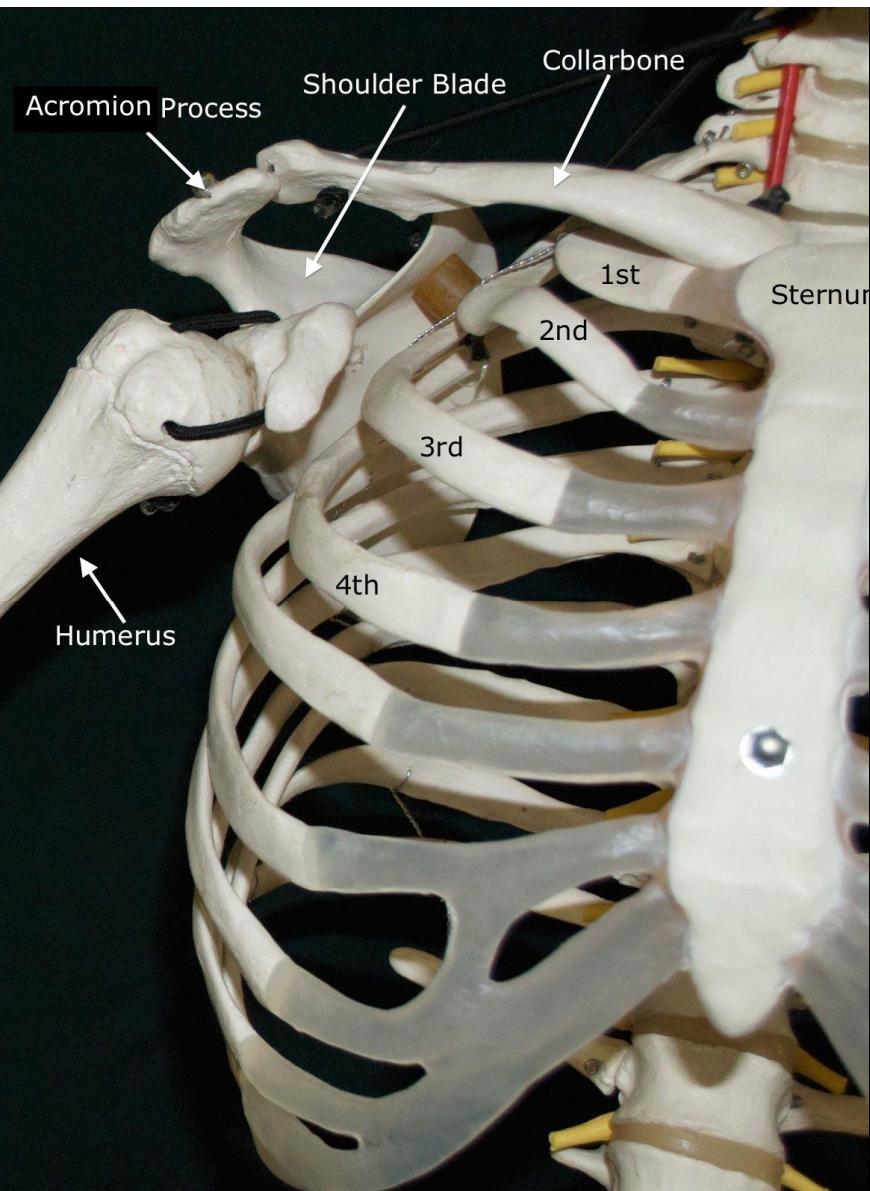
- A dagger-shaped, flat bone that lies in the anterior midline of the thorax
- Results from the fusion of three bones – the superior manubrium, the body, and the inferior xiphoid process
- Anatomical landmarks include the jugular (suprasternal) notch, the sternal angle, and the xiphisternal joint

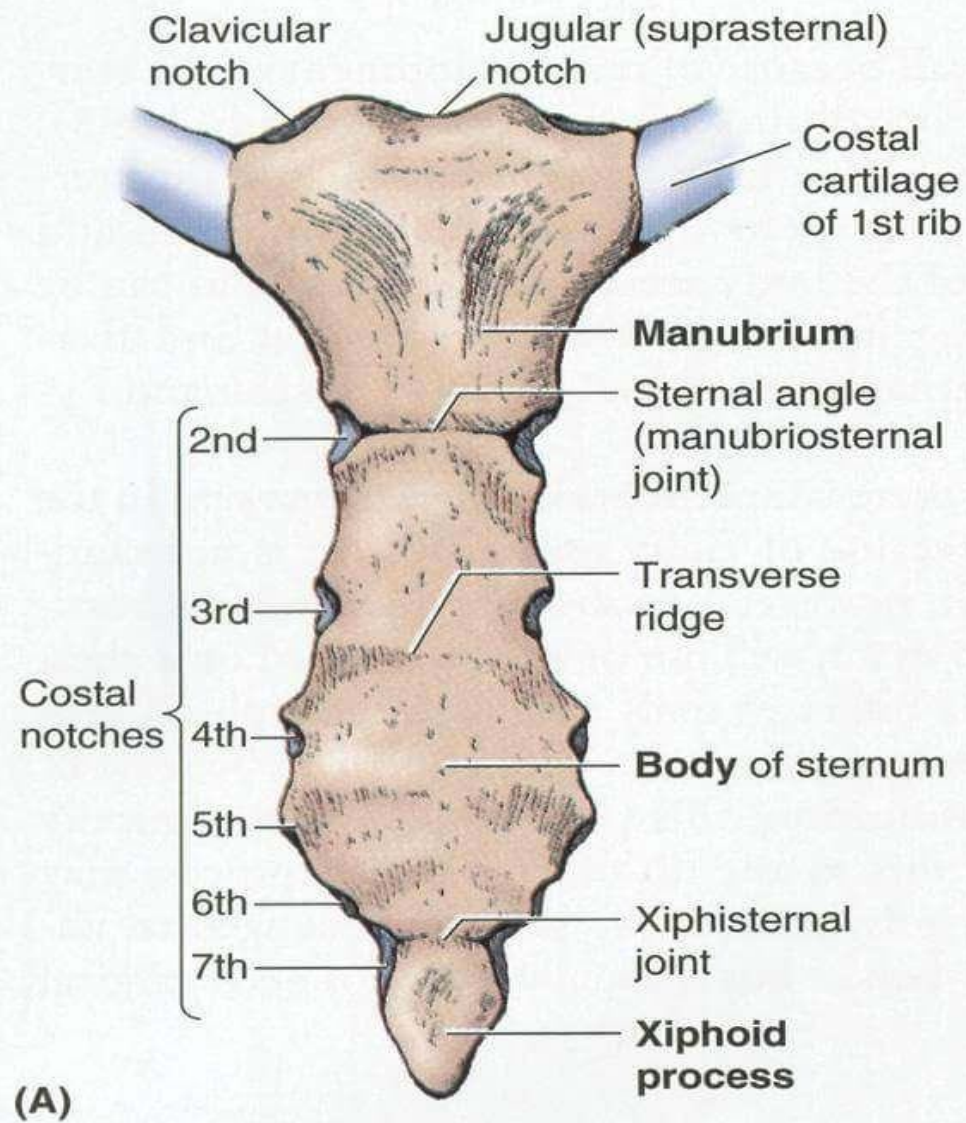
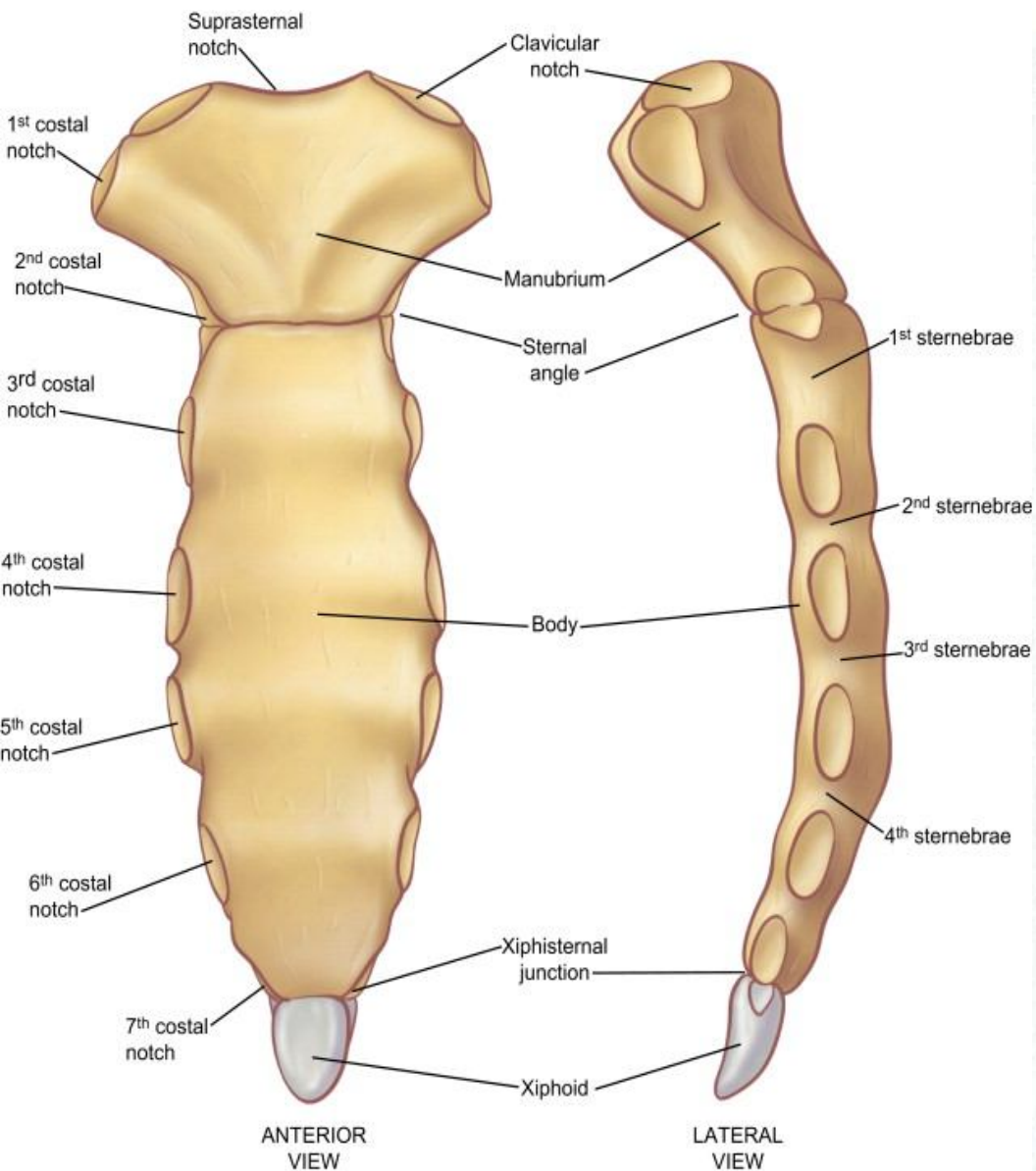


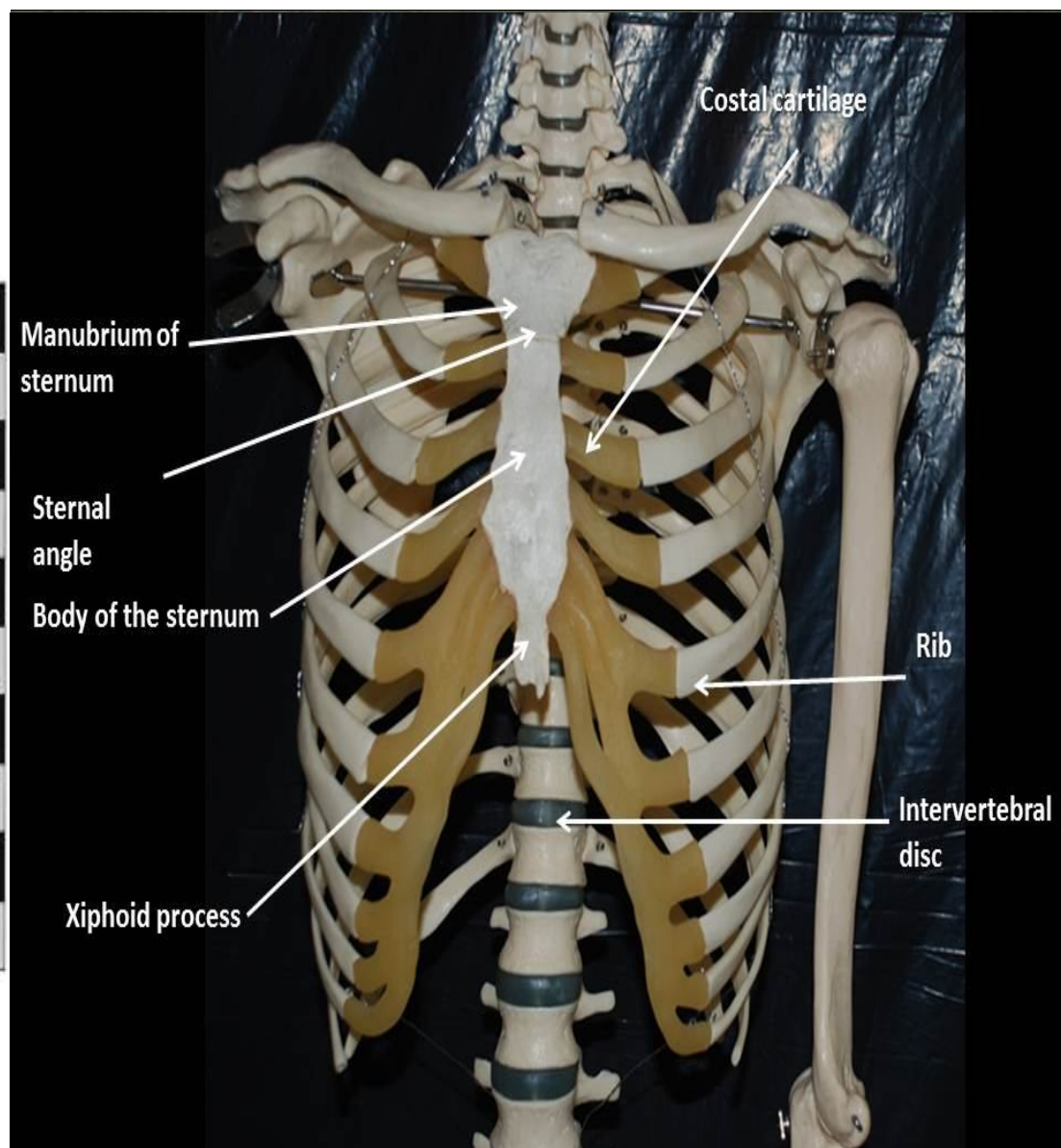
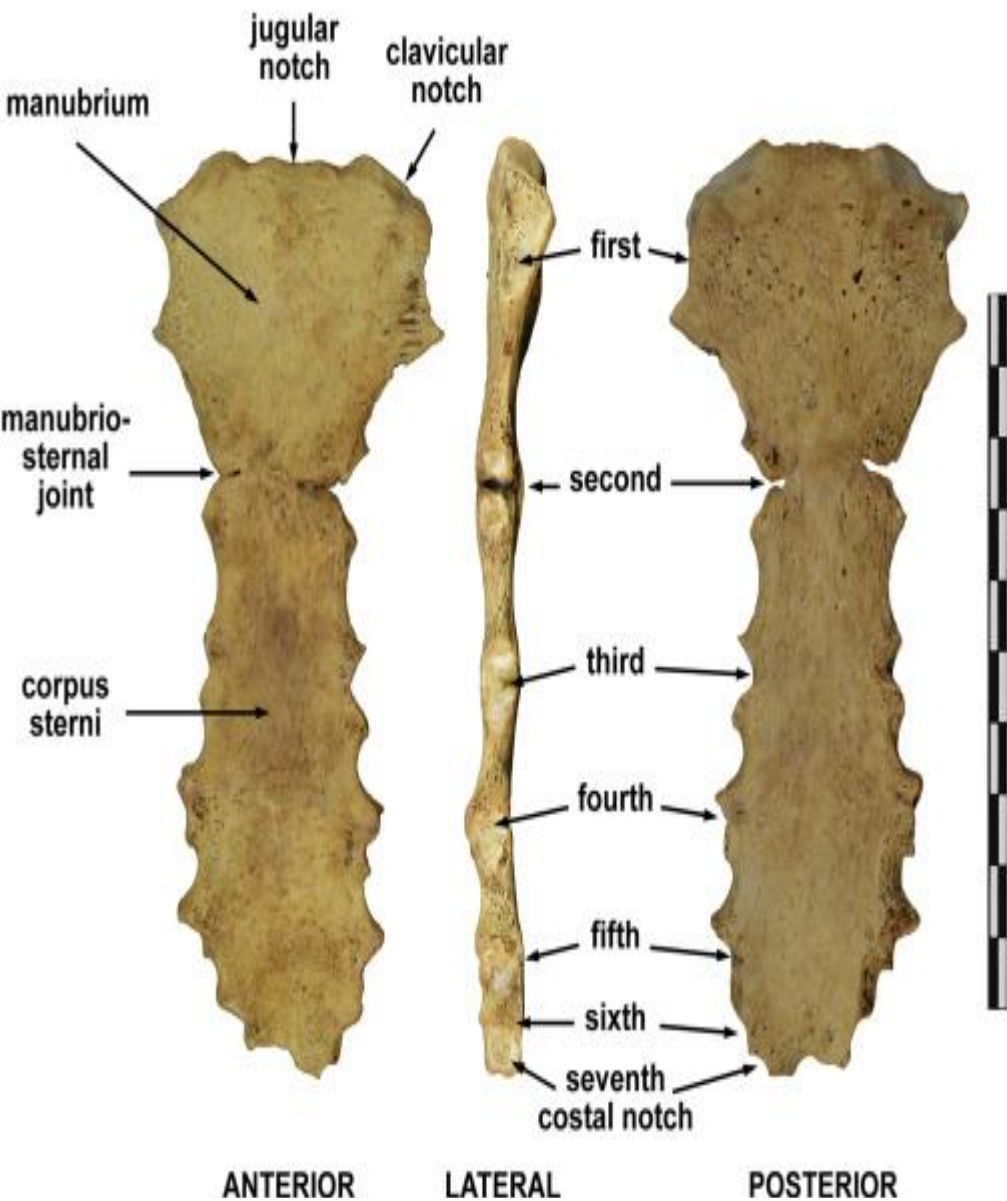
(a) Anterior view of sternum



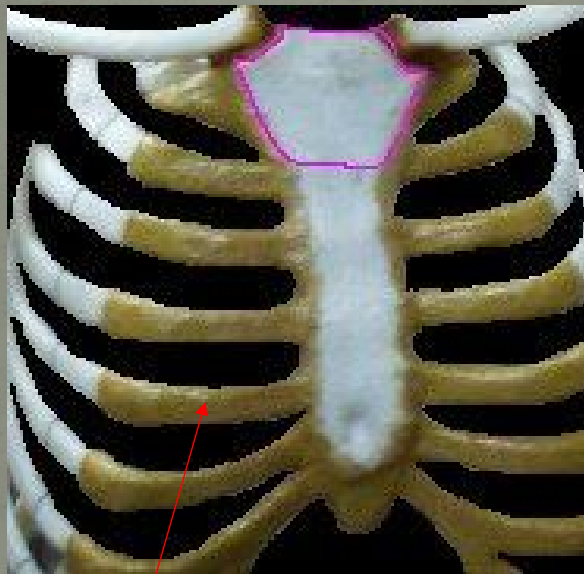
(b) Anterior view of skeleton of thorax







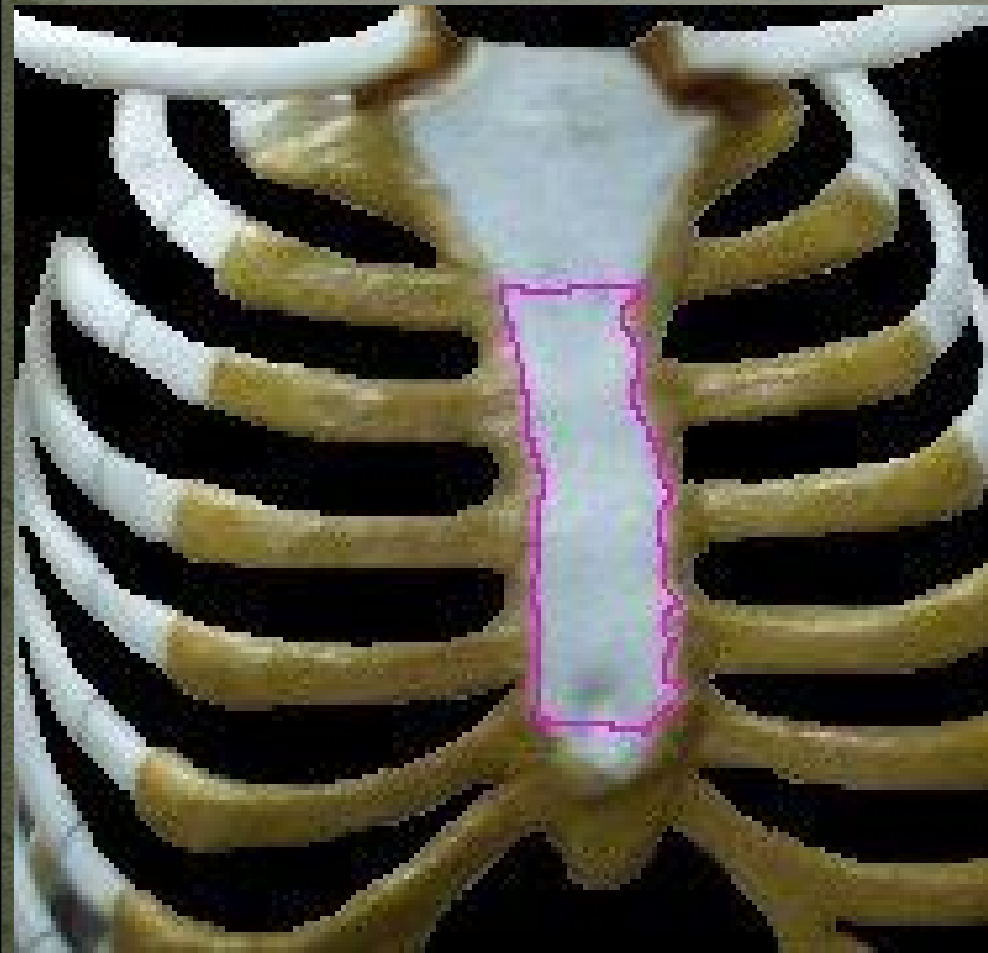
Sternum - Manubrium



Costal Cartilage

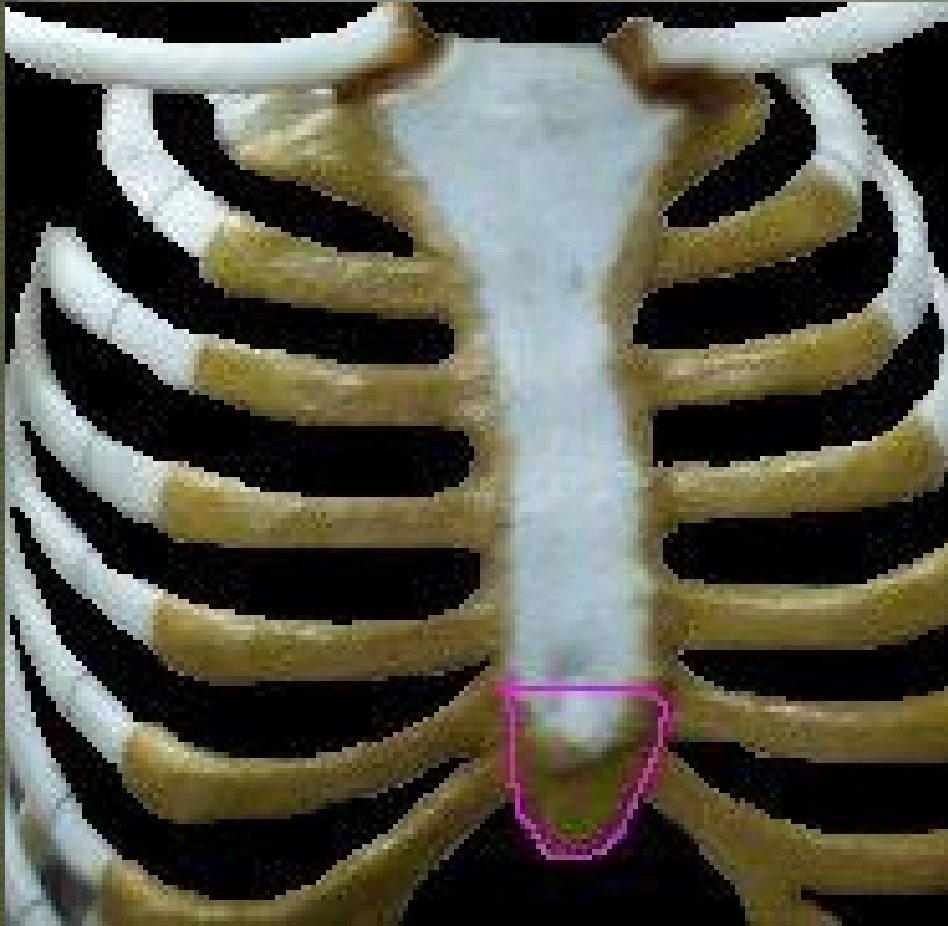
- "Handle"
- Connected to the first 2 ribs
- Clavicular notches articulate with clavicles (collarbone)
- Clavicular Articular facets

Sternum - Body



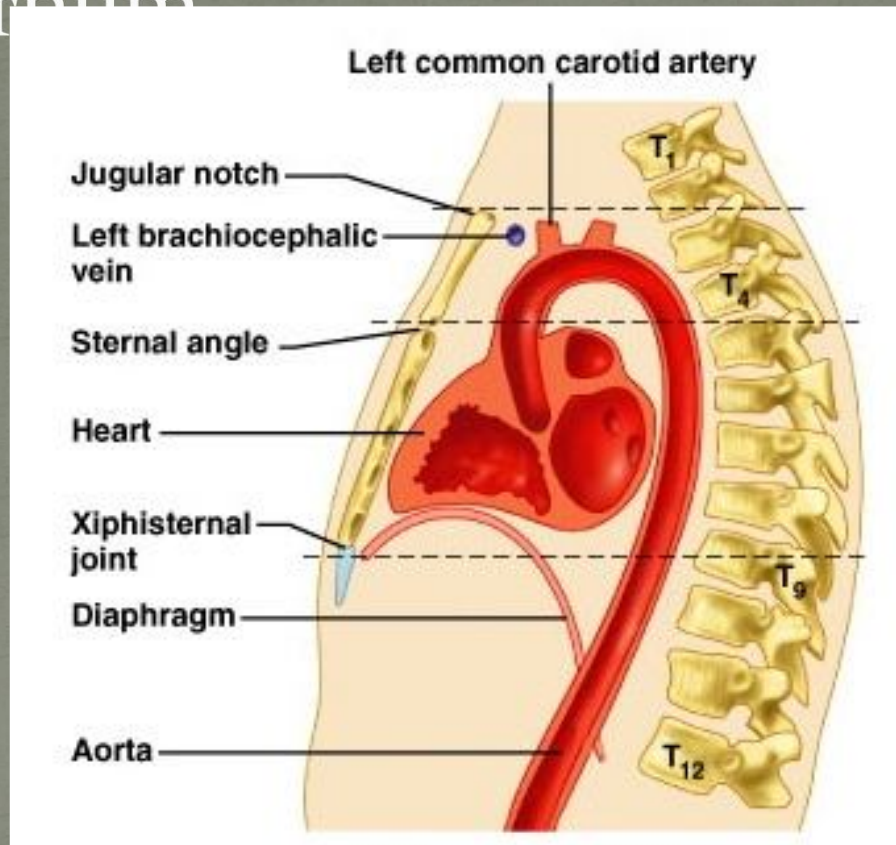
- “Blade” or “gladiolus”
- Connects with ribs 2-7
- Sides are notched where it articulates with the costal cartilages
- 4 separate parts until after puberty

Sternum – Xiphoid Process



- “Tip”
- Cartilaginous (hyaline) that becomes bony over the years (@40)
- Partial attachment of many muscles

Sternum



- 3 major anatomical landmarks:
 - 1. **Jugular notch**
 - Central indentation in manubrium
 - 2. **Sternal angle**
 - Manubrium joins the body
 - 3. **Xiphisternal joint**
 - Cartilaginous union between xiphoid process and body

STERNUM

1.	Jugular Notch
2.	Manubrium
3.	Sternal Angle
4.	Body (Gladiolus)
5.	Xiphoid Process

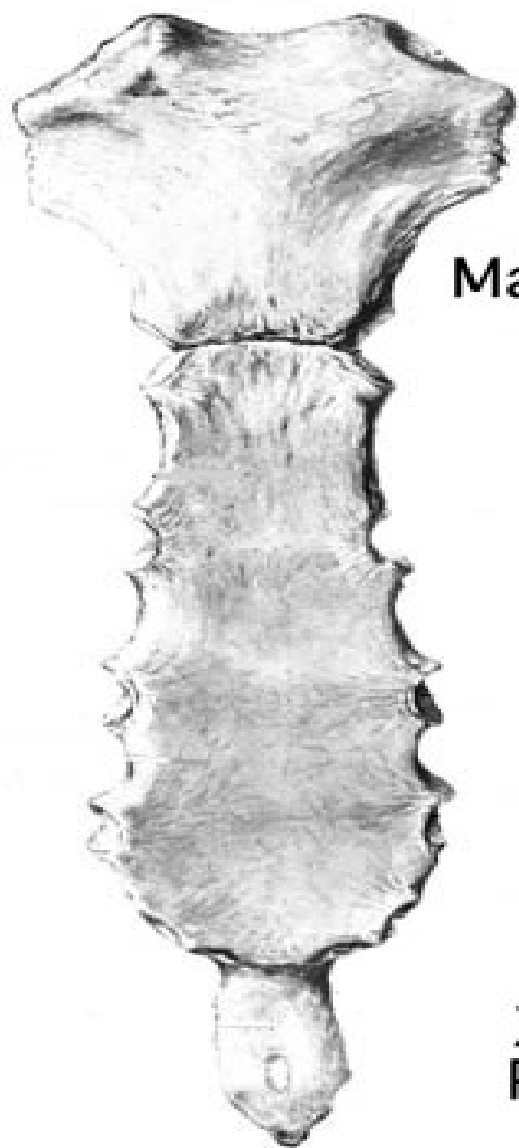
- The **sternum** or **breastbone** is a long, flat bone located in the center of the thorax (chest).
- It connects to the rib bones via cartilage, forming the rib cage with them, and thus helps to protect the lungs , heart and major blood vessels from physical trauma.
- The sternum is sometimes cut open (a median sternotomy) to gain access to the thoracic contents when performing cardiothoracic surgery.

The sternum is composed of three parts:

- The **manubrium**, also called the "handle", is located at the top of the sternum and moves slightly. It is connected to the first two ribs.
- The **body**, also called the "blade" or the "gladiolus", is located in the middle of the sternum and connects the third to seventh ribs directly and the eighth through tenth ribs indirectly.
- The **xiphoid process**, also called the "tip", is located on the bottom of the sternum. It is often cartilaginous (cartilage), but does become bony in later years.

These three segments of bone are usually fused in adults.

The sternum serves an important function in the body. The ribs are connected to it by the costal cartilage. Without the sternum, there would be a hole in the bone structure in the middle of your chest, right above your heart and lungs. The sternum protects this vital area and completes the circle of the rib cage.

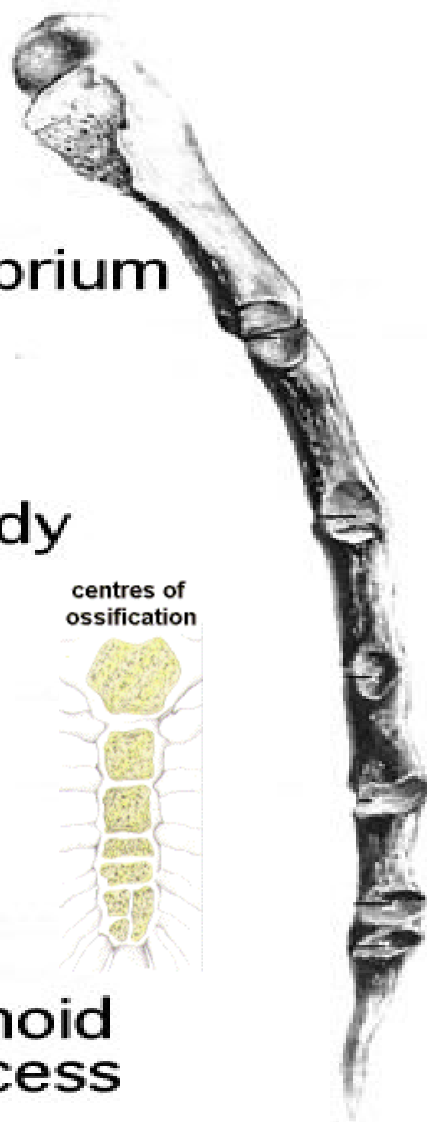


Manubrium

Body

**Xiphoid
Process**

centres of
ossification



manubrium sterni

cartilaginous joint

body of sternum

xiphoid process

Ribs

- There are twelve pair of ribs forming the flaring sides of the thoracic cage
- All ribs attach posteriorly to the thoracic vertebrae
- The superior 7 pair (true, or vertebrosteral ribs) attach directly to the sternum via costal cartilages
- Ribs 8-10 (false, or vertebrocondral ribs) attach indirectly to the sternum via costal cartilage
- Ribs 11-12 (floating, or vertebral ribs) have no anterior attachment

Structure of a Typical True Rib

- Bowed, flat bone consisting of a head, neck, tubercle, and shaft

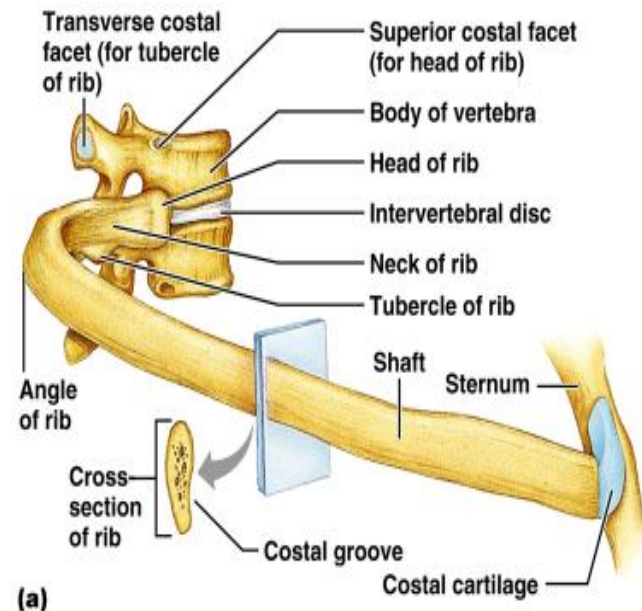
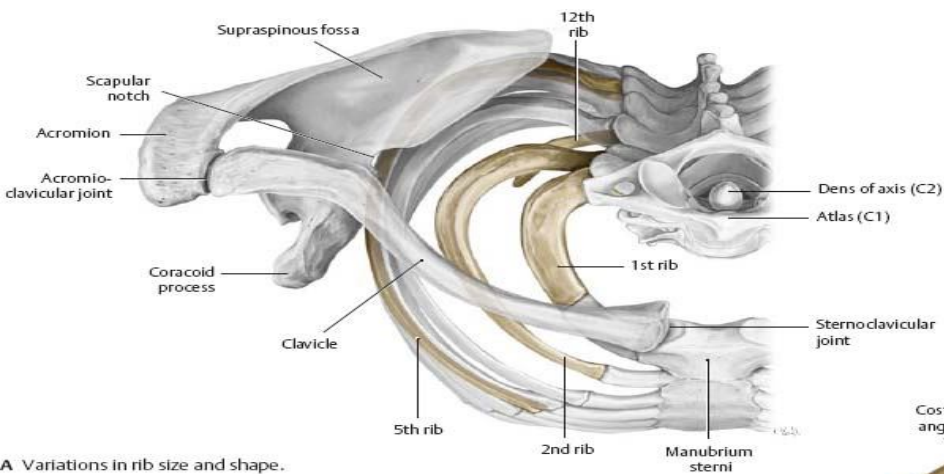
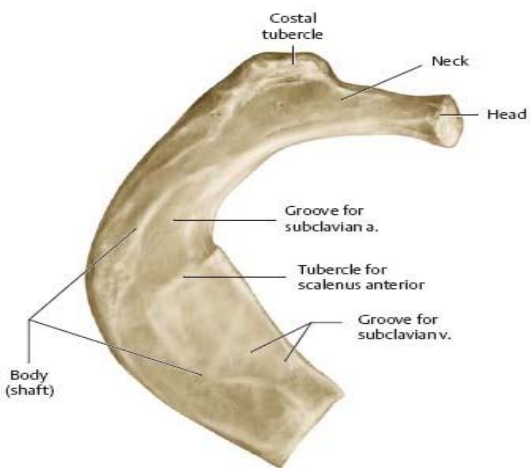


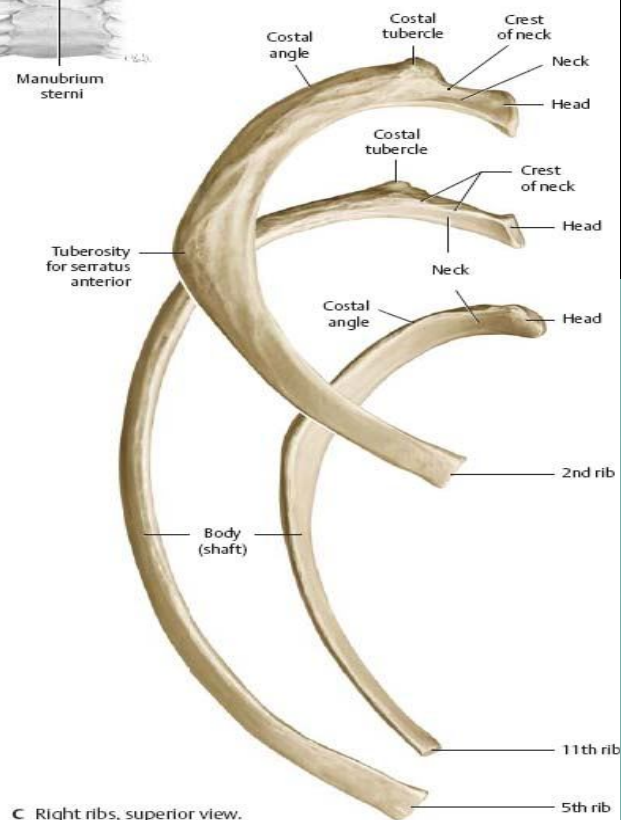
Figure 7.20a



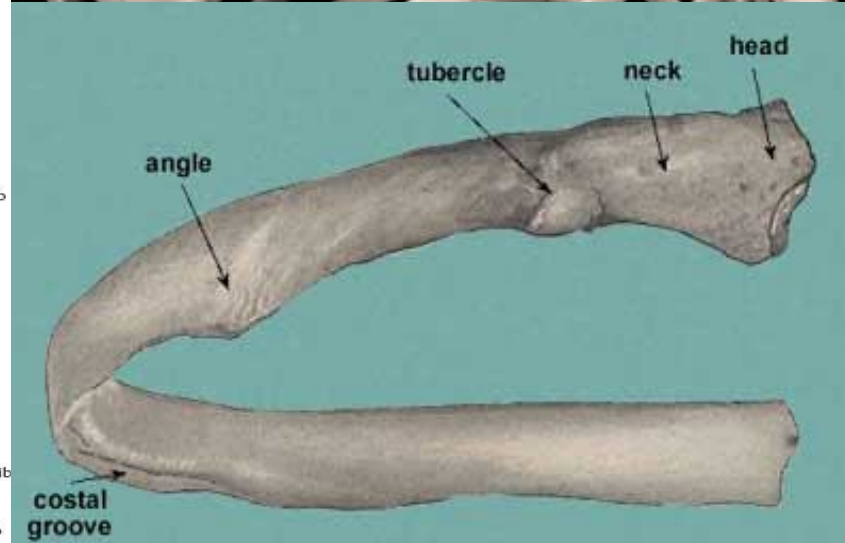
A Variations in rib size and shape.



B 1st rib. Note: Most ribs have a costal groove along the inferior border (not shown), which protects the intercostal vessels and nerves.

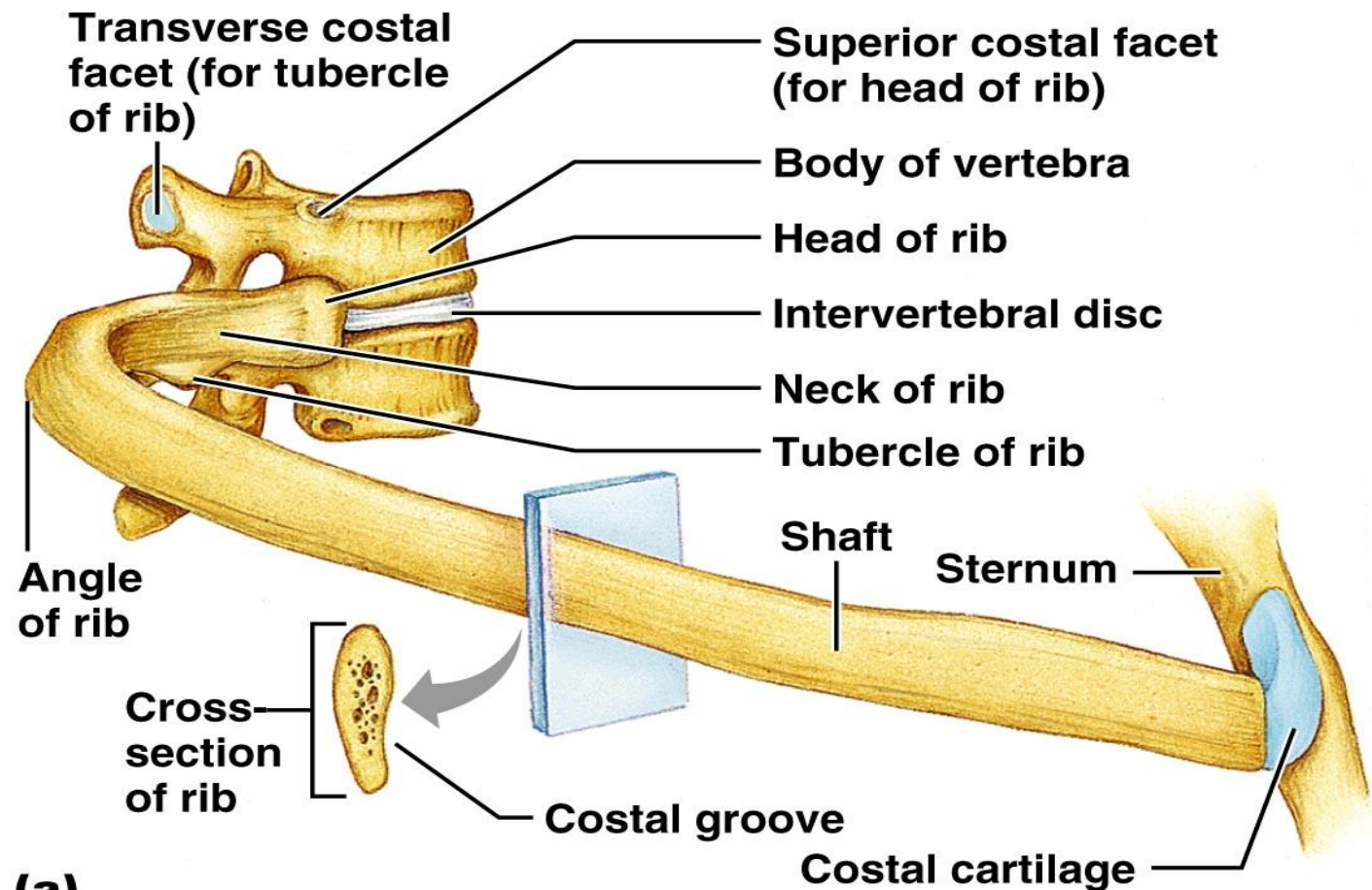


C Right ribs, superior view.



Structure of a Typical True Rib

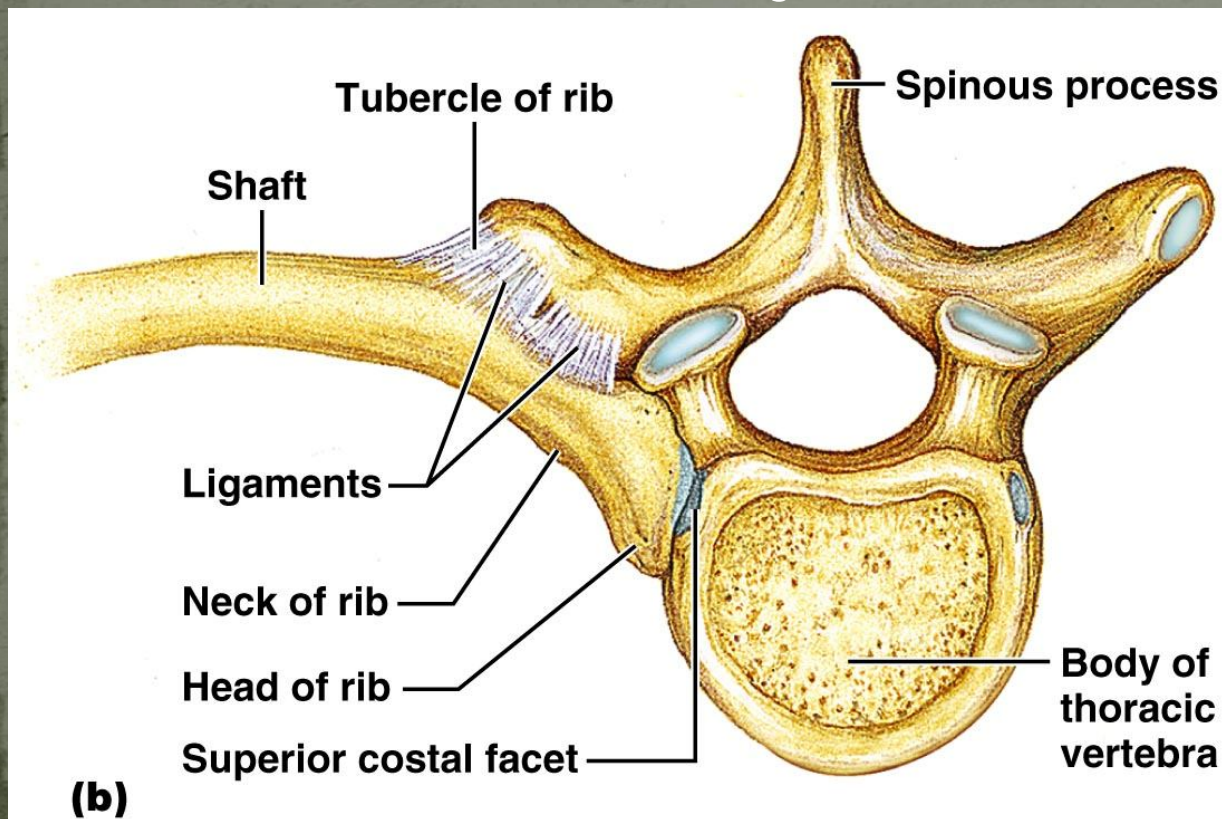
- Bowed, flat bone consisting of a head, neck, tubercle, and shaft

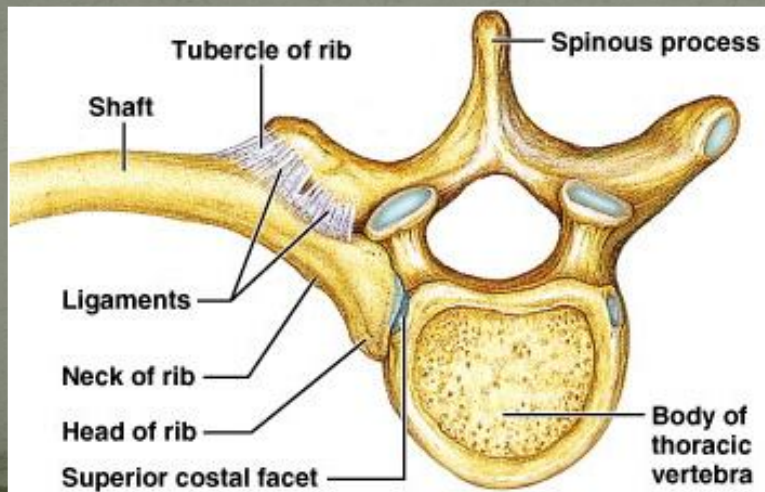
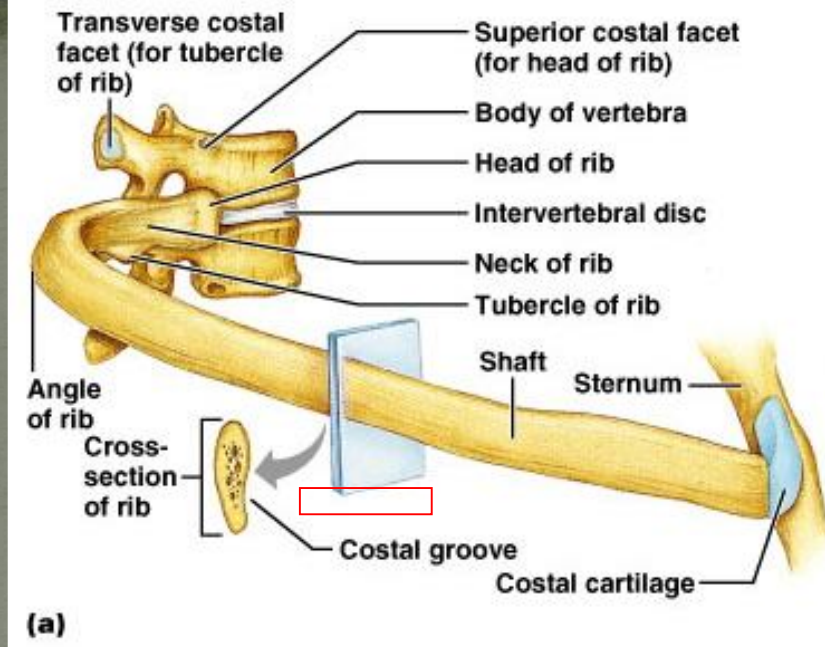


(a)

Structure of a Typical True Rib

- Bowed, flat bone consisting of a head, neck, tubercle, and shaft





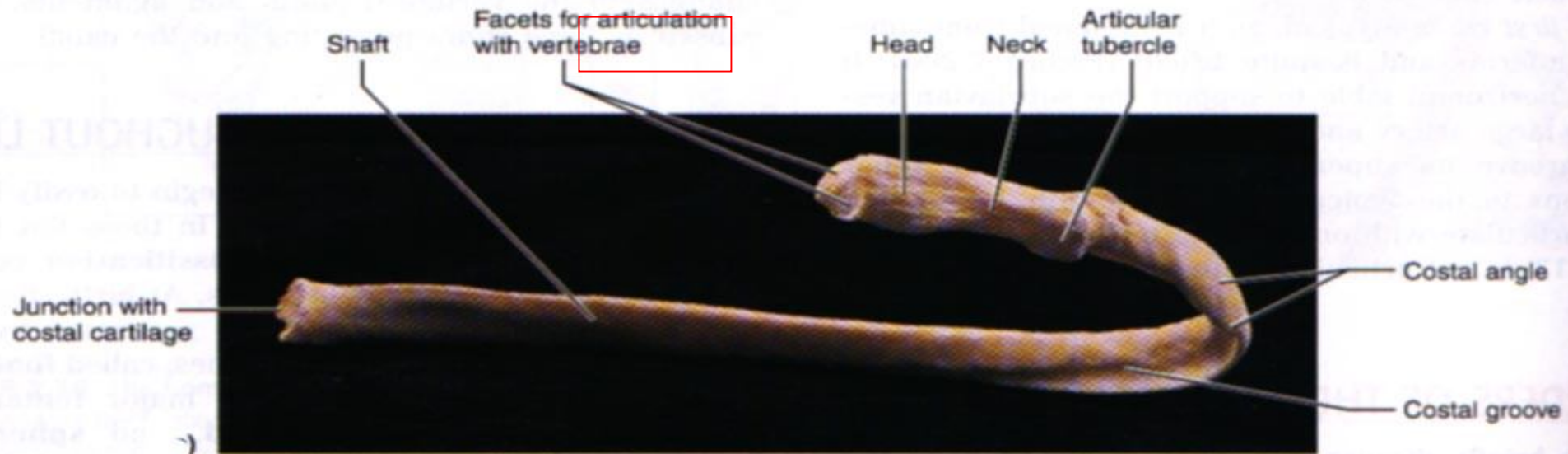
- Rib Anatomy: Typical Ribs

- Dorsal attachment**
 - Head of Rib → 2 Demifacets
 - Superior demifacet
 - Inferior demifacet of vertebra above it
 - Intervertebral disc
 - Tubercle of Rib
 - Articulates with Transverse Costal Facet (Thoracic vertebra)
 - Ex. Rib #4 articulates with Superior Demifacet and Transverse Costal Facet of T4 & Inferior demifacet of T3

- Ventral attachment**

- Costal cartilage

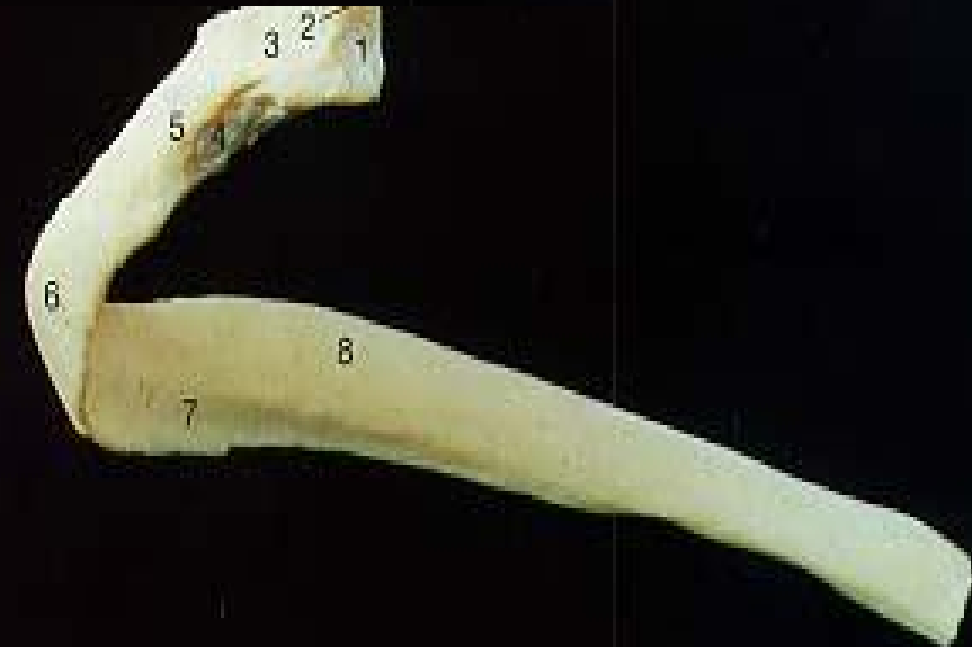
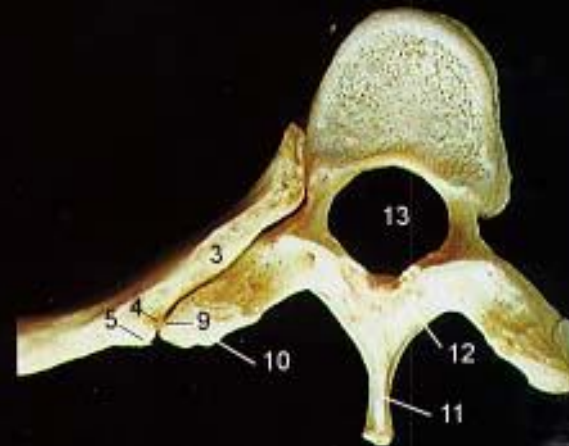
Rib Anatomy – Atypical Ribs

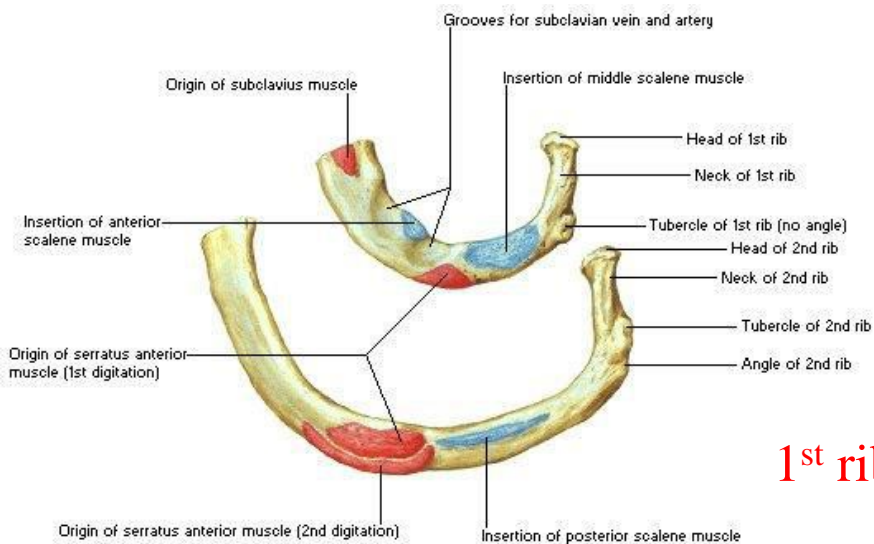


- #1 – flat and broad, supports subclavian vessels
- #1, and 10-12 – articulate with only 1 vertebral body
- #11 and 12 – do not articulate with a vertebral transverse process

RIBS

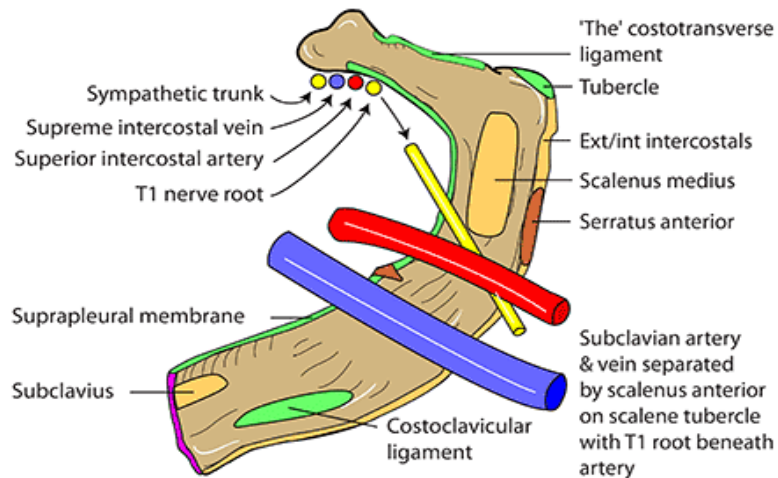
1. Articular Facet
2. Interarticular Crest
3. Neck
4. Articular Portion of Tubercle
5. Nonarticular Portion of Tubercle
6. Angle of Rib
7. Costal Groove
8. Body of Rib
9. Articular Facet of Transverse Process
10. Transverse Process
11. Spinous Process
12. Lamina
13. Vertebral Foramen



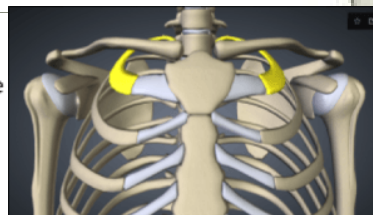
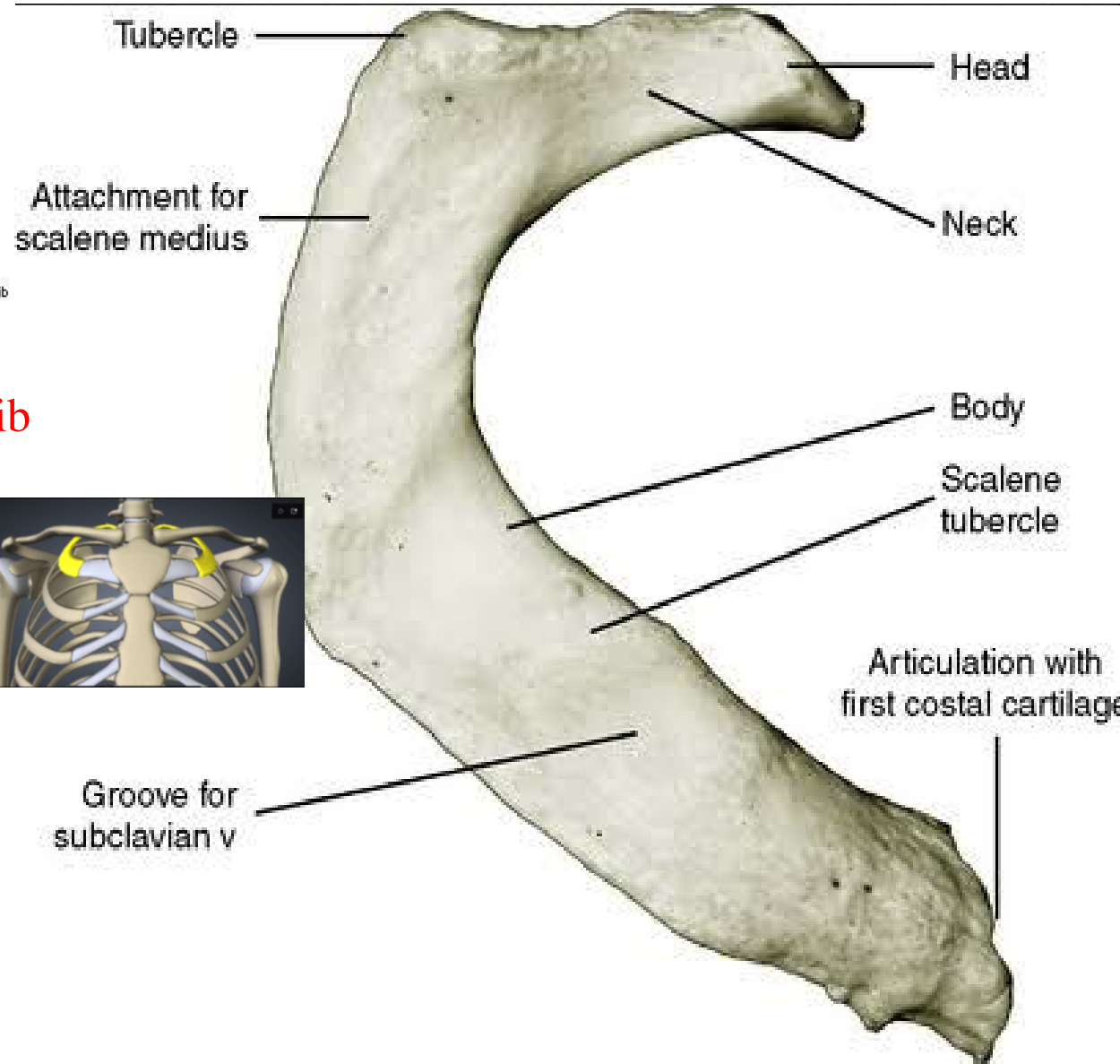


1st rib

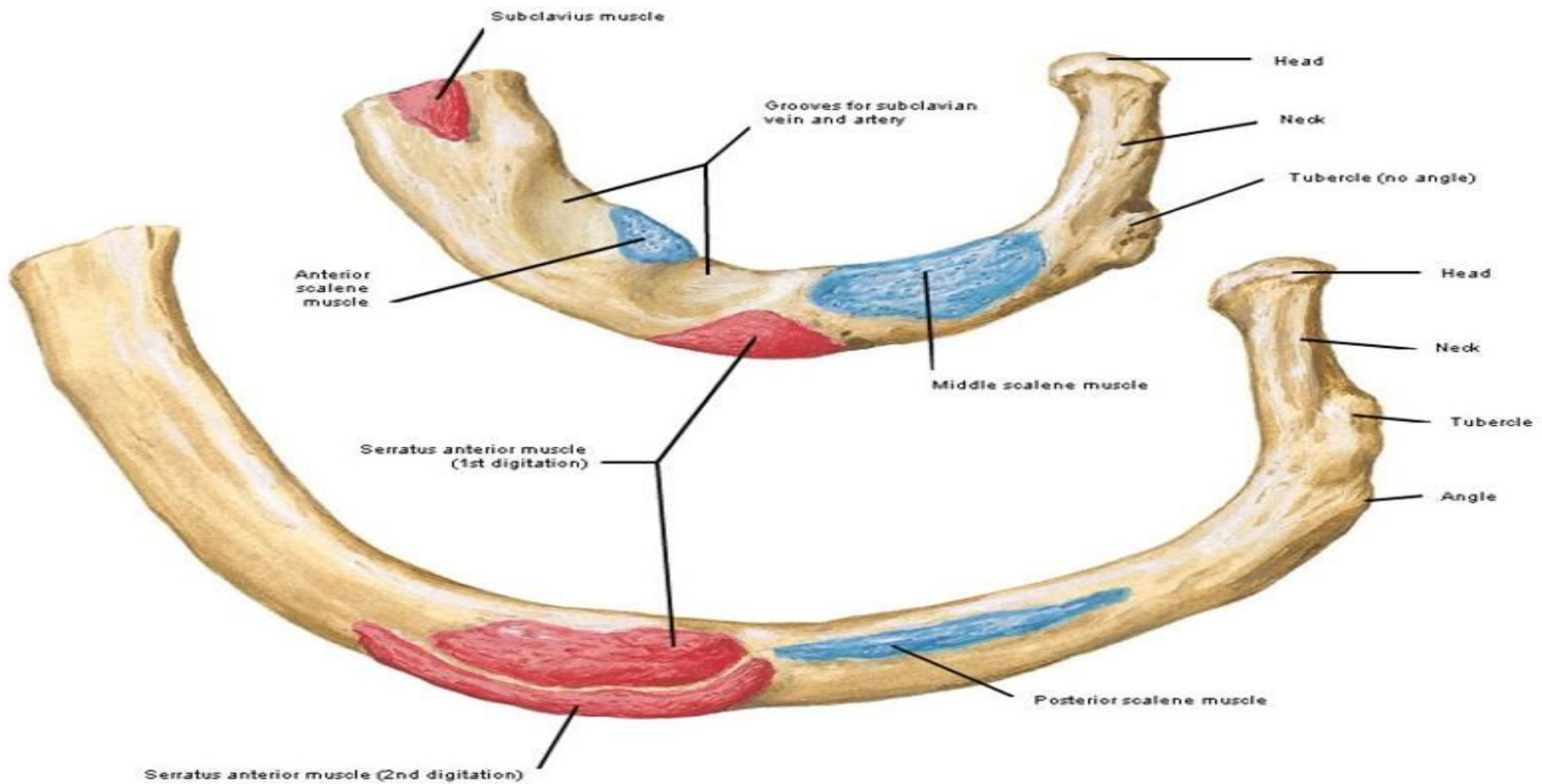
RELATIONS AND ATTACHMENTS OF LEFT FIRST RIB

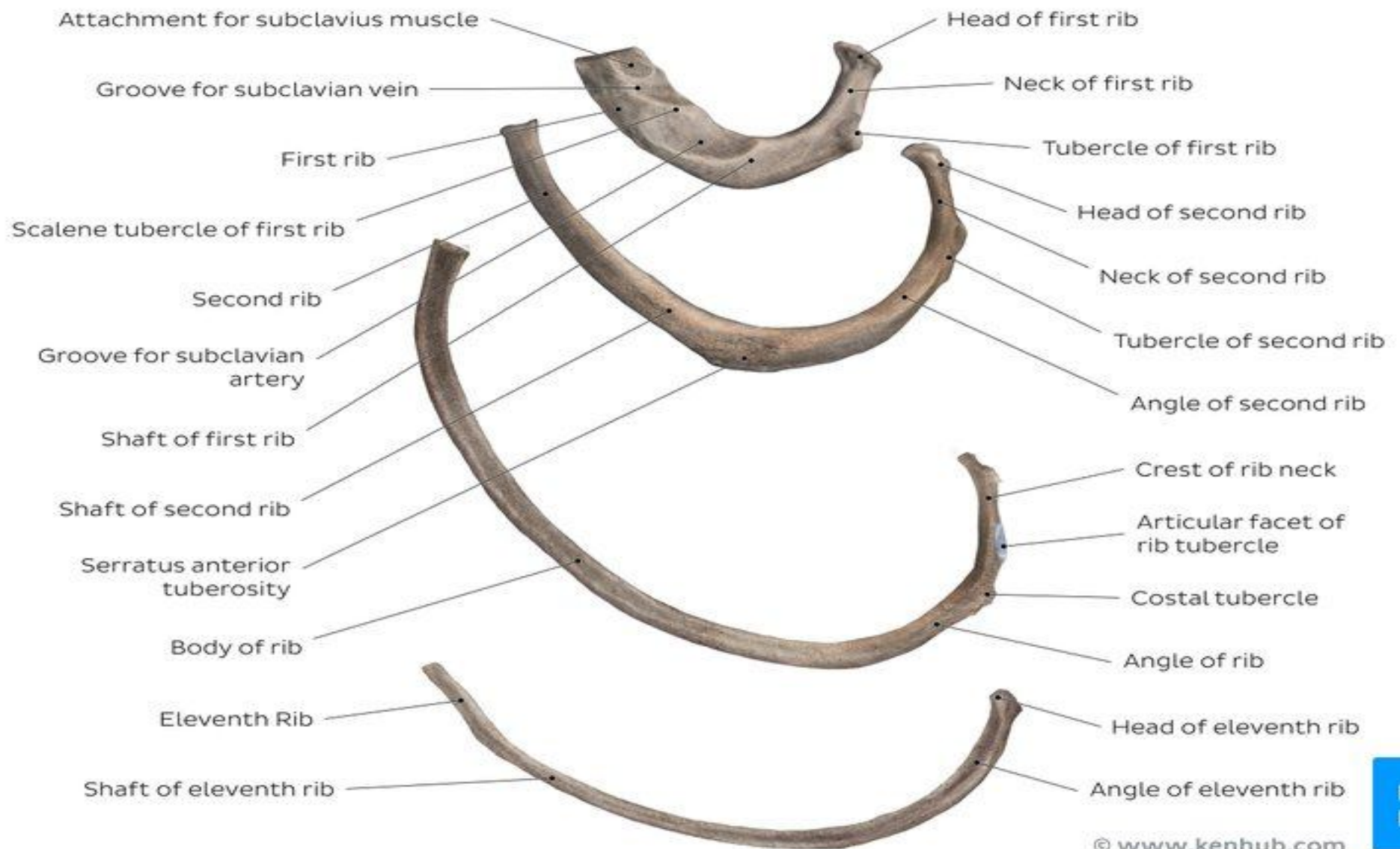


The under surface of the 1st rib is smoother. When the rib is laid on a flat surface, the head touches the flat surface when the rib is the correct way up



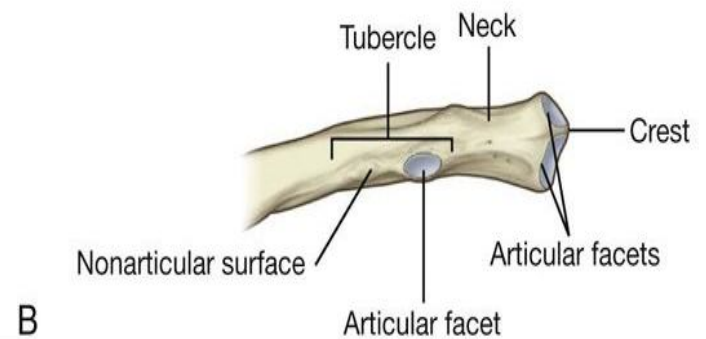
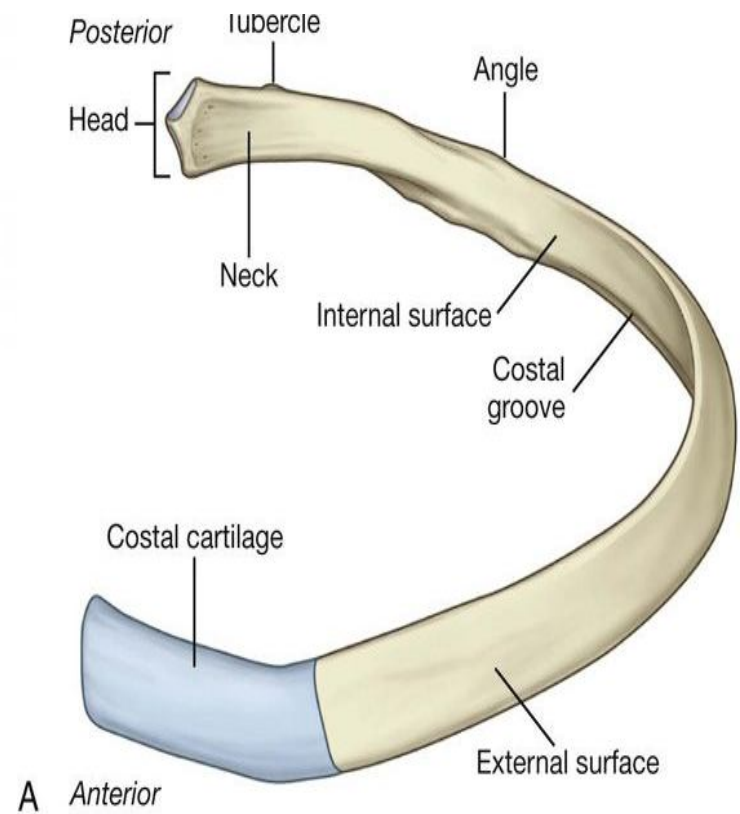
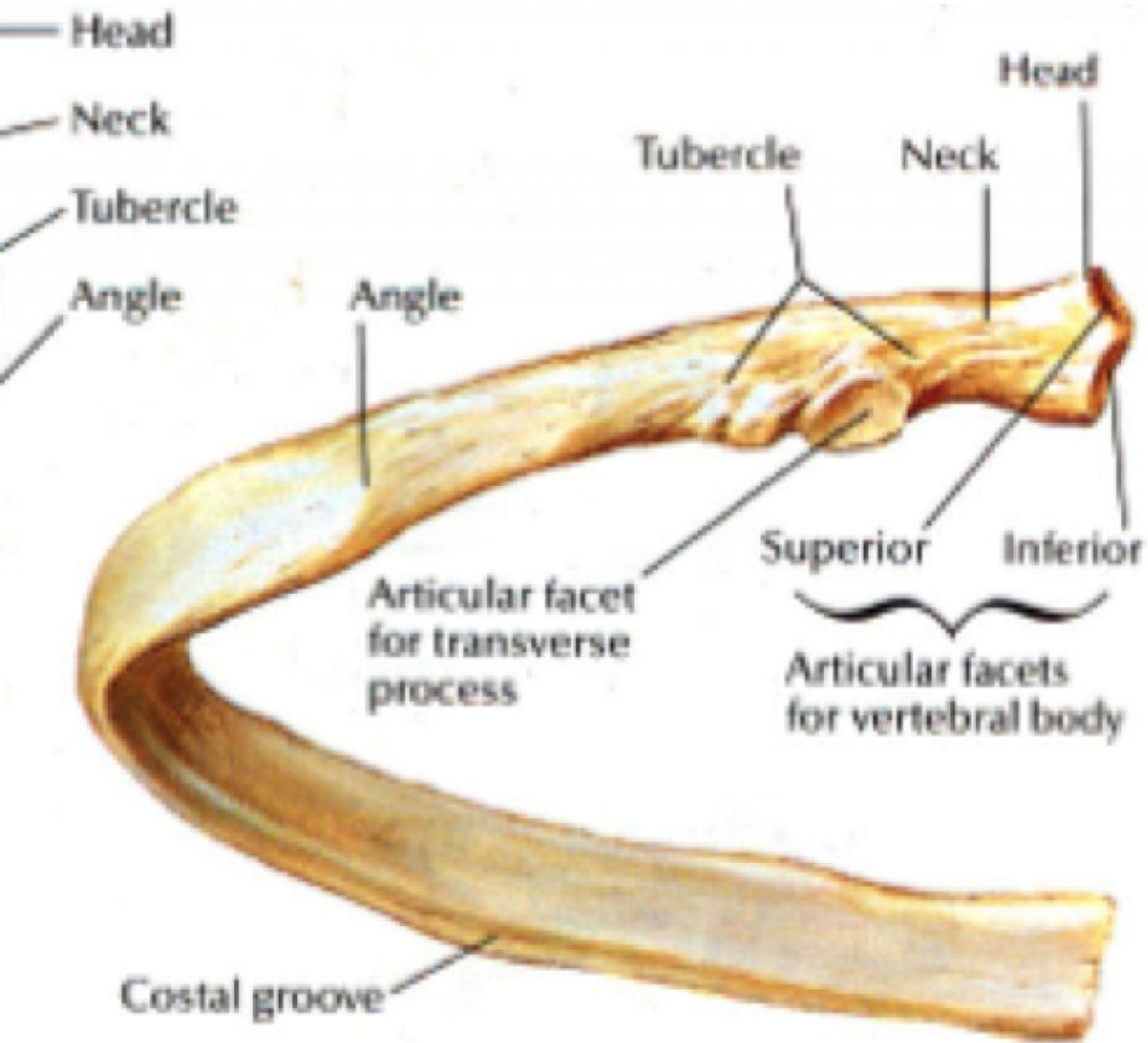
Left 1st and 2nd Ribs Superior View





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