Structure of the Thoracic Wall
Surface Anatomy
Diaphragm

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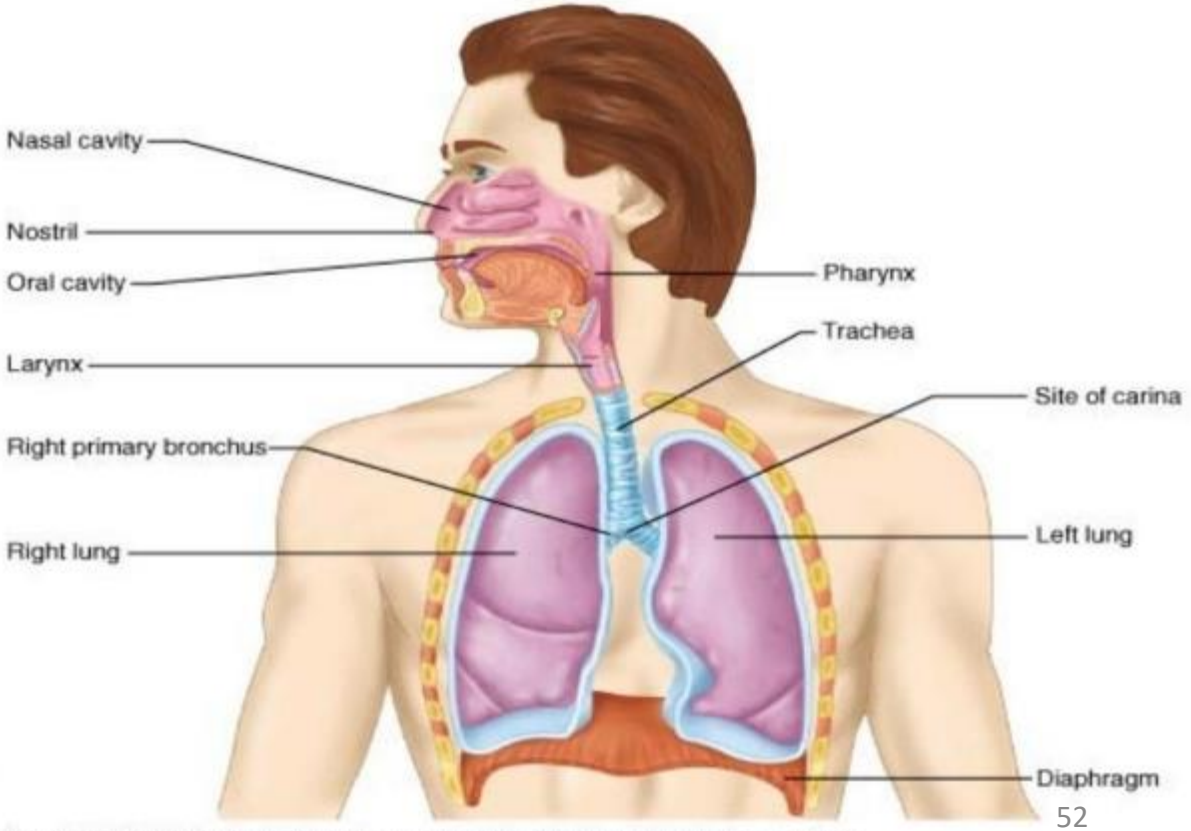
THE CHEST WALL

- The chest wall is comprised of skin, fat, muscles, and the thoracic skeleton.

Function;

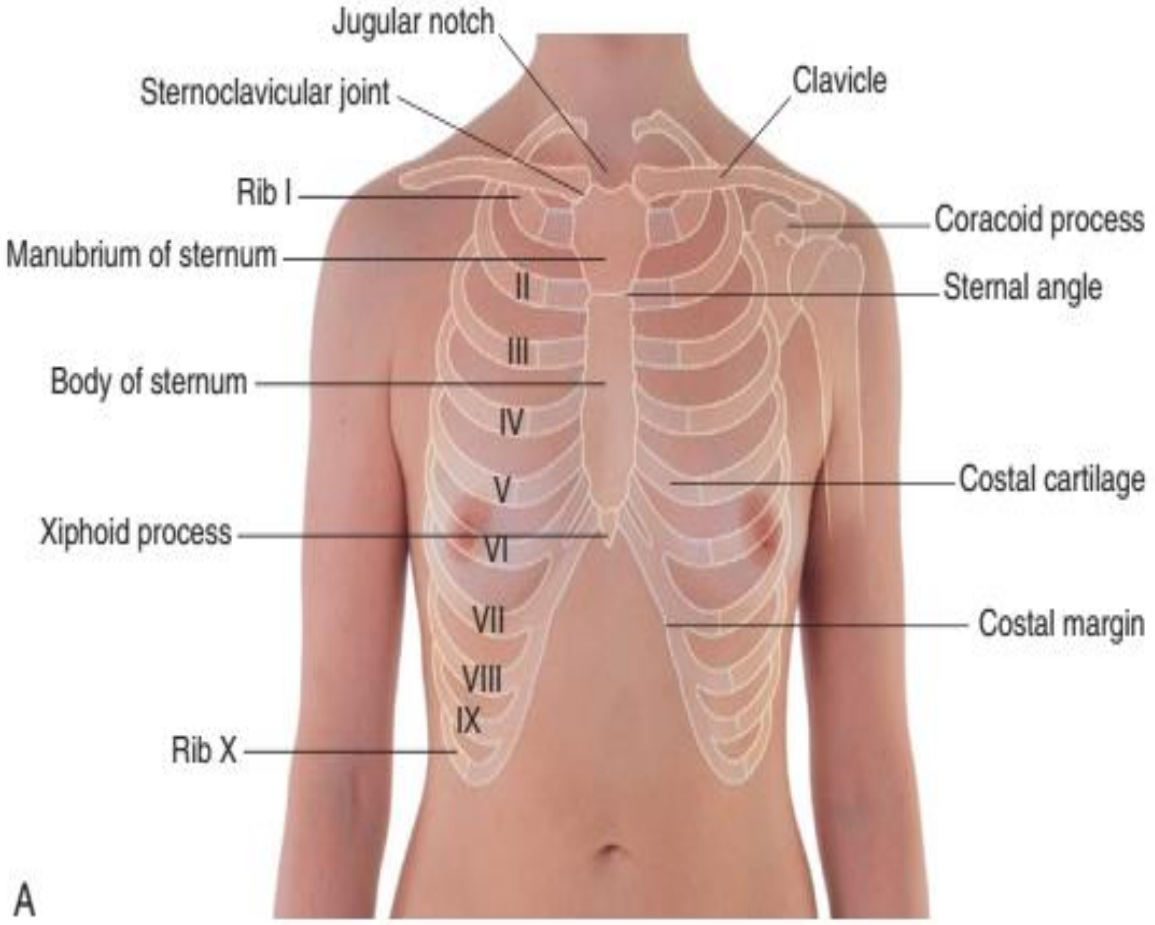
- protection to vital organs (eg, heart and major vessels, lungs, liver) and provides stability for movement of the shoulder girdles and upper arms.
- provides the mechanical function of breathing

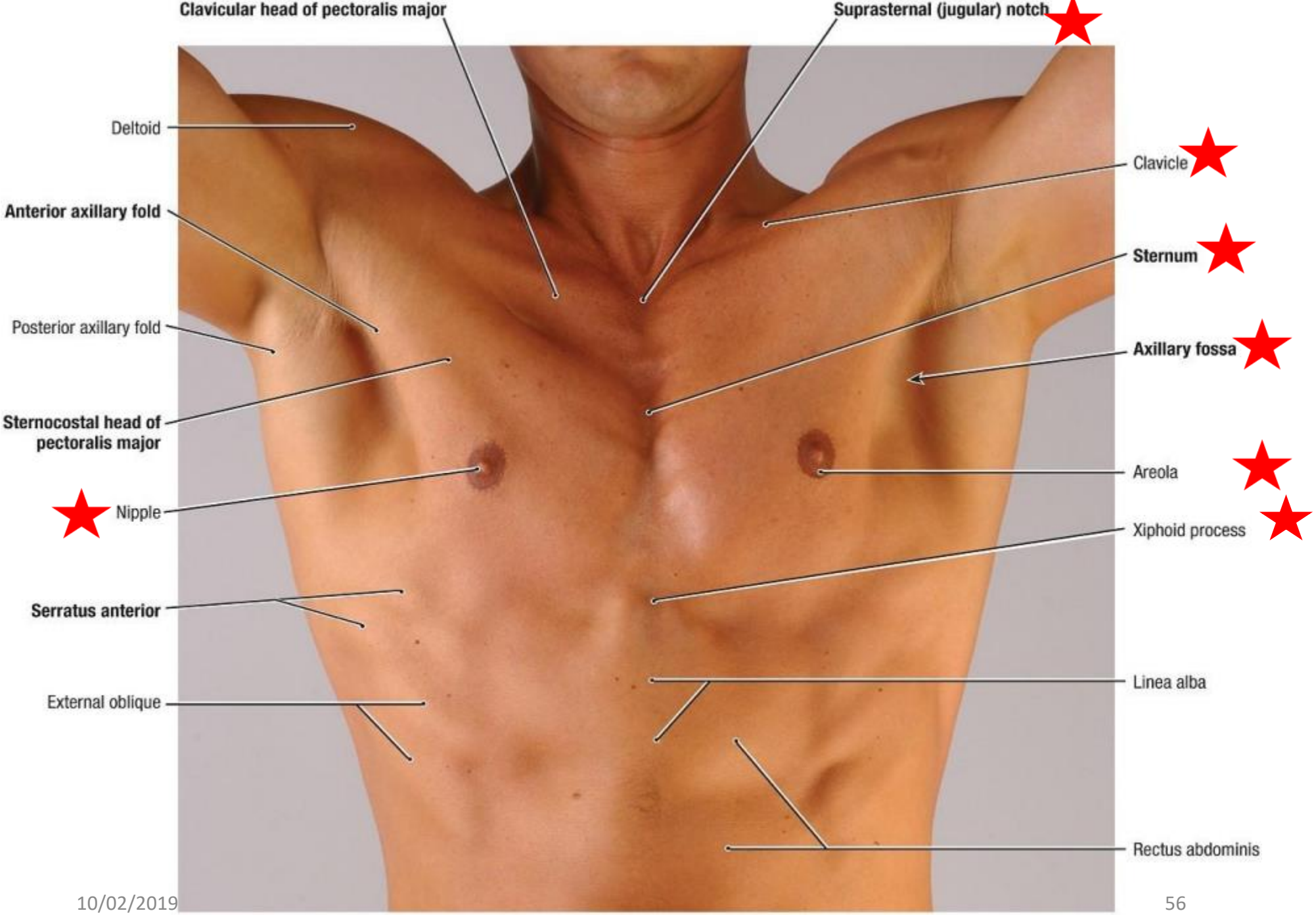


SURFACE ANATOMY

Anterior landmarks of the chest include the

- Nipple.
- Suprasternal notch
- Clavicle
- Sternal angle
- Xiphoid process
- Sternal attachments for ribs
- 2nd rib joins the sternum at the level of the sternal angle (palpable landmark).
- The scapula covers the 2 to 7 ribs posteriorly (important landmark for defining lung fields).




Clavicular head of pectoralis major
Suprasternal (jugular) notch
Deltoid
Anterior axillary fold
Posterior axillary fold
Sternocostal head of pectoralis major
Nipple
Serratus anterior
External oblique
Clavicle
Sternum
Axillary fossa
Areola
Xiphoid process
Linea alba
Rectus abdominis

Axilla

is bounded ;

Superiorly

- first rib,
- the middle third of the clavicle,
- superior border of the scapula.

Inferiorly

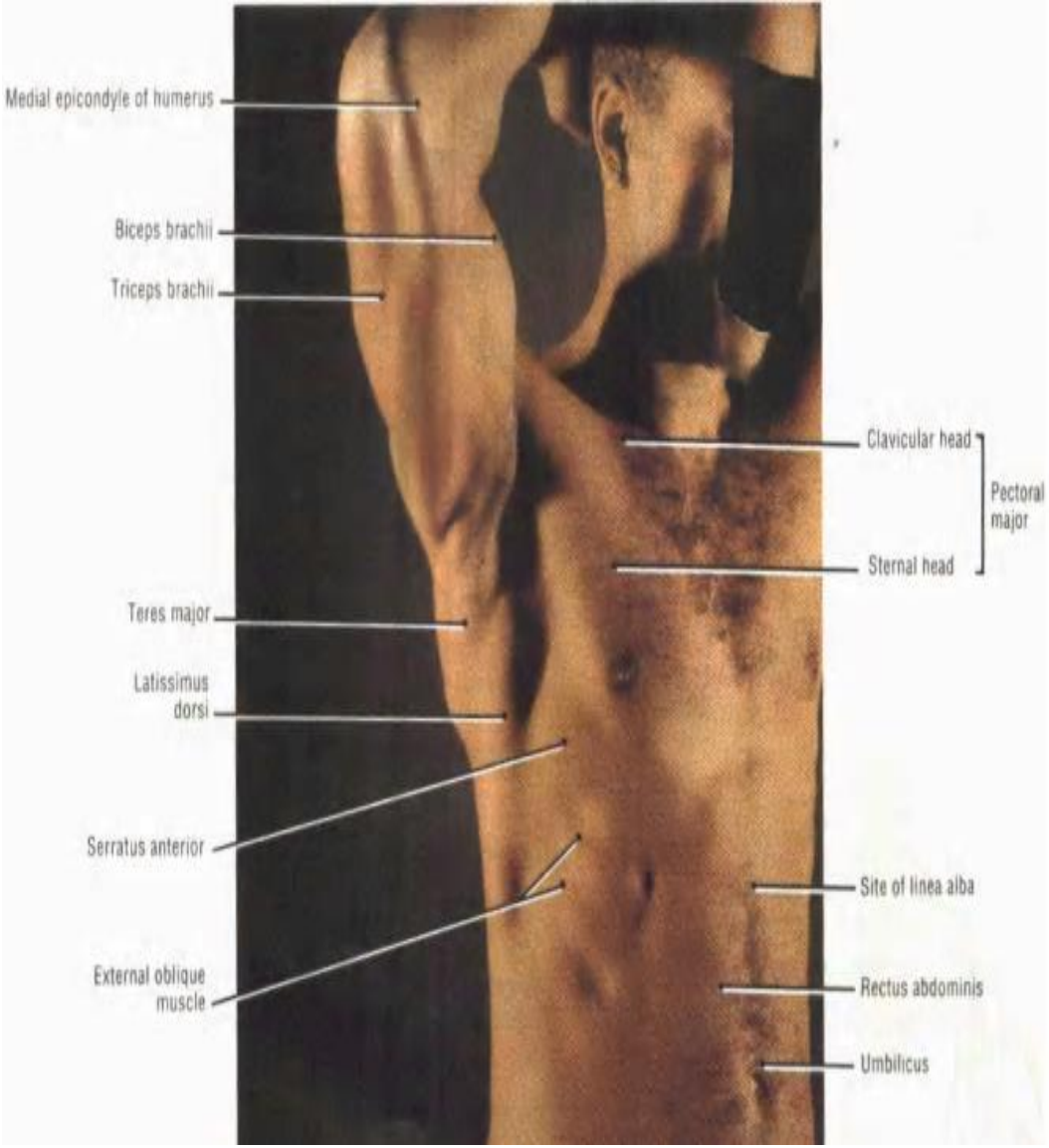
- axillary fossa.

Anterior border

- pectoralis muscles

Posterior border

- latissimus dorsi

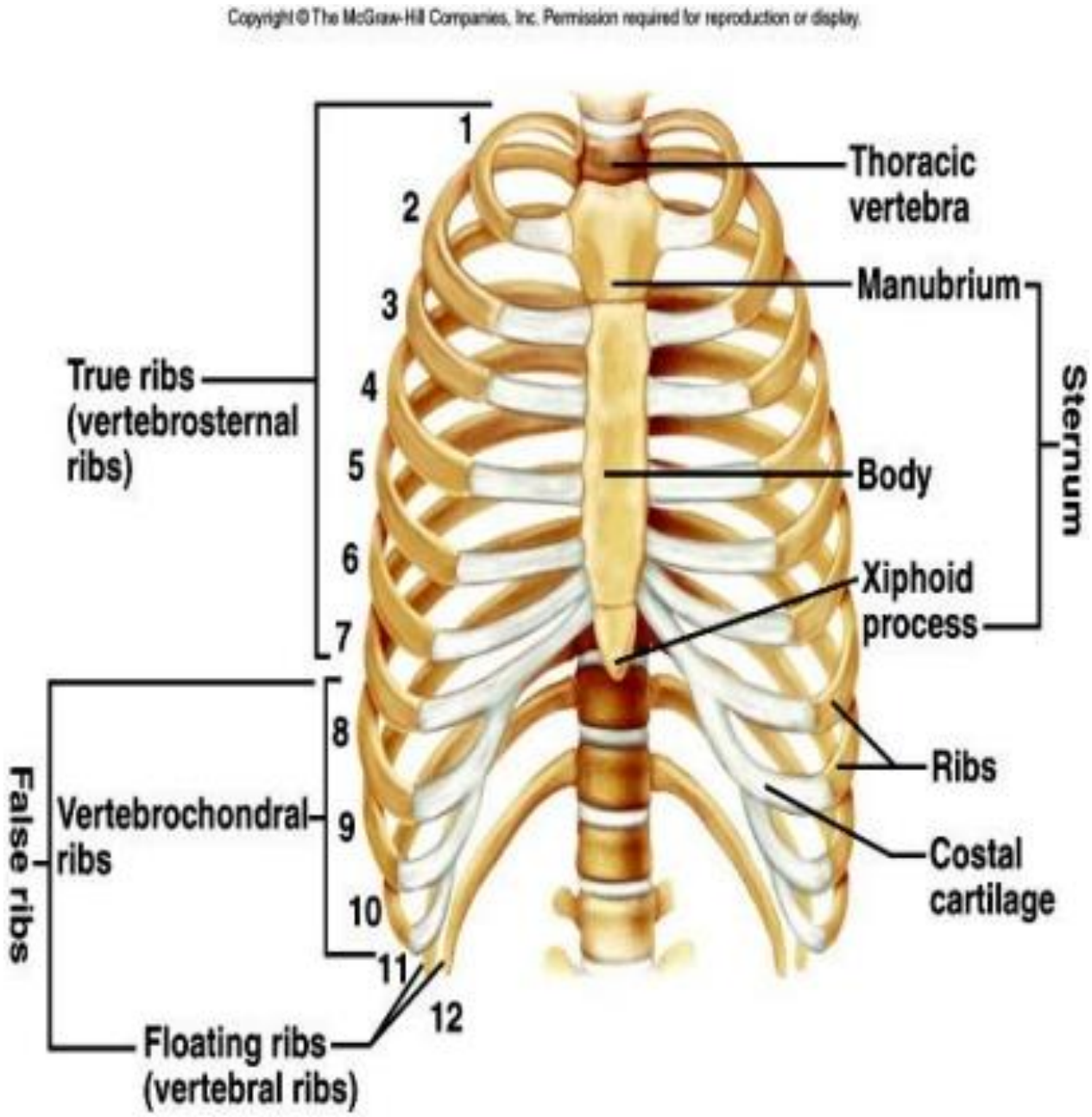


Thoracic skeleton

THORACIC CAGE (RIB CAGE)

Structure of the Thoracic Cage ;

- Posteriorly ;12 thoracic vertebrae (T1 - T12)
- laterally and anteriorly ;12 sets of ribs ;articulate, forming the posterior and lateral borders of the thoracic skeleton.
- Medial / Anterior ;sternum and costal cartilages.
- Intercostal muscles



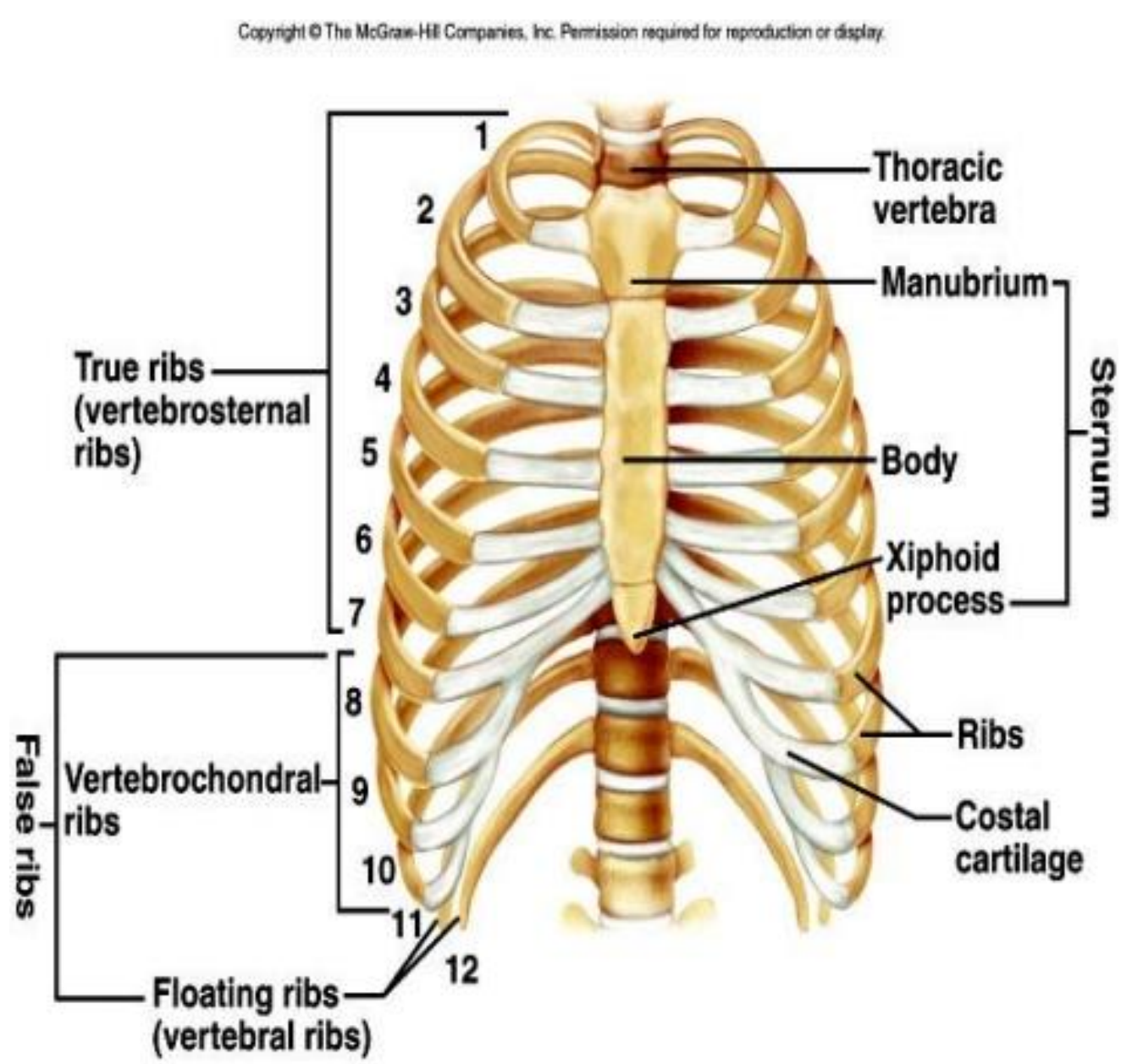
Thoracic outlet

Superior outlet Boundary

- First thoracic vertebra
- First pair of ribs and costal cartilages
- Manubrium

Inferior outlet Boundary

- Twelfth thoracic vertebra
- Twelfth pair of ribs and costal cartilages
- Xiphisternal joint



Ribs

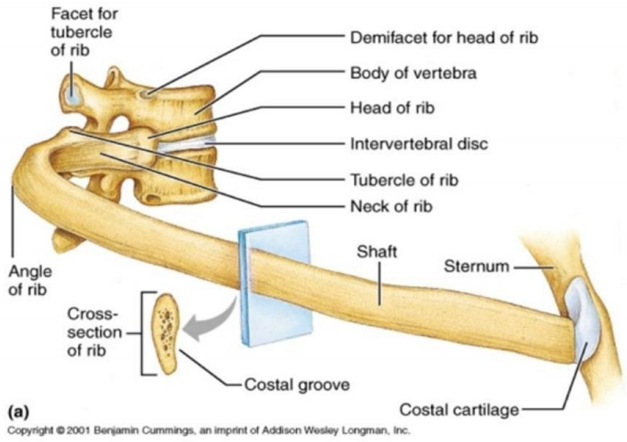
Flat curved bones with high resilience form most of thoracic cage. They divided into three types:

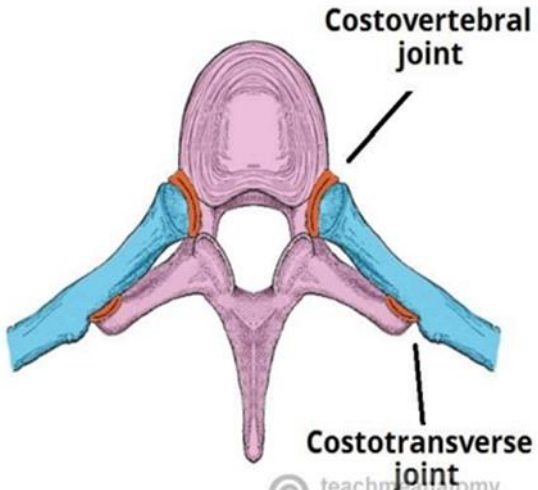
1-True (Typical)1- 7

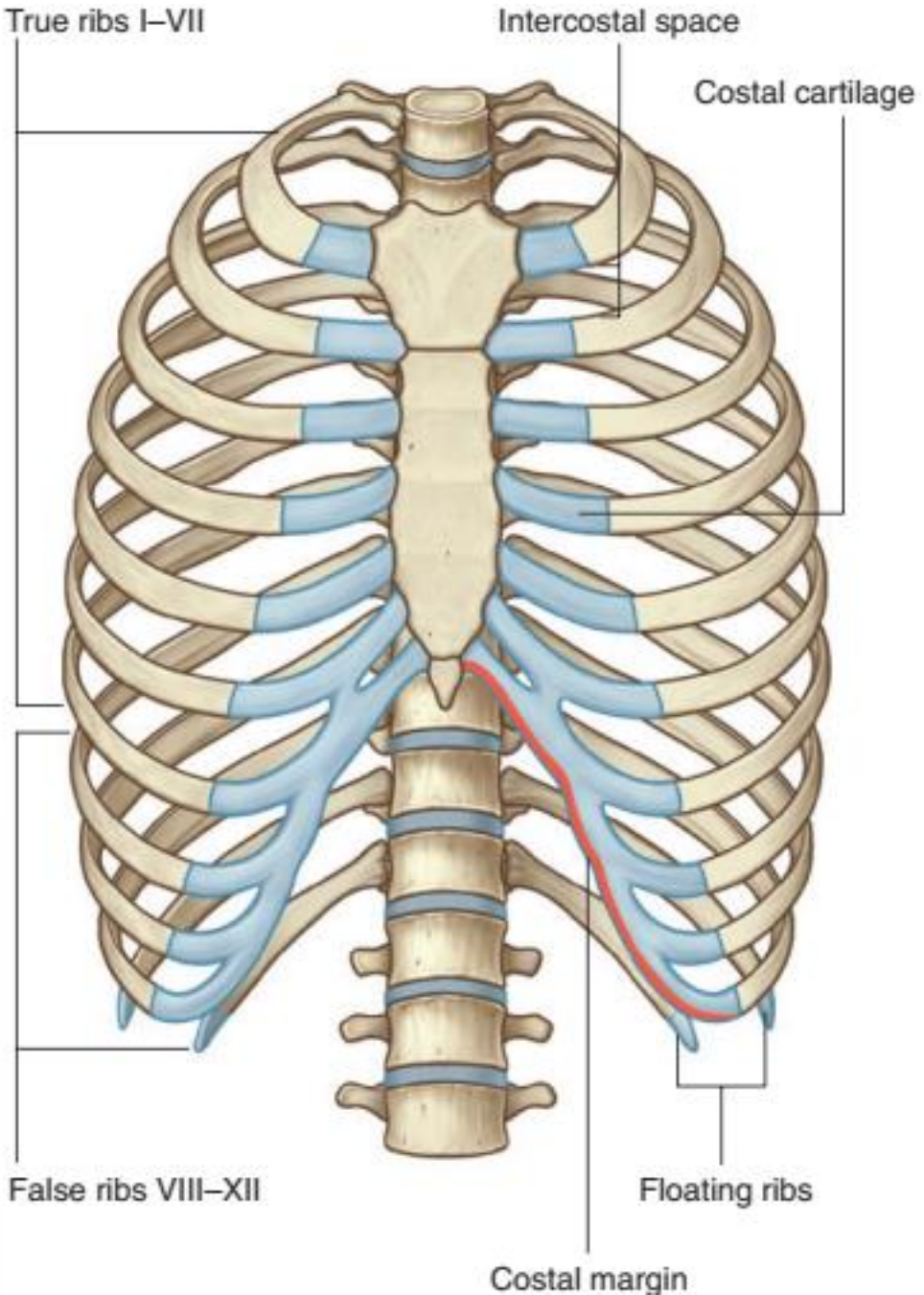
2-Fals 8-10

3-Floating 11-12

- The twelve thoracic vertebrae (T1-T12) , have artiulations with thoracic vertebra posteriorly ; costovertebral joint & costotransverse joint.





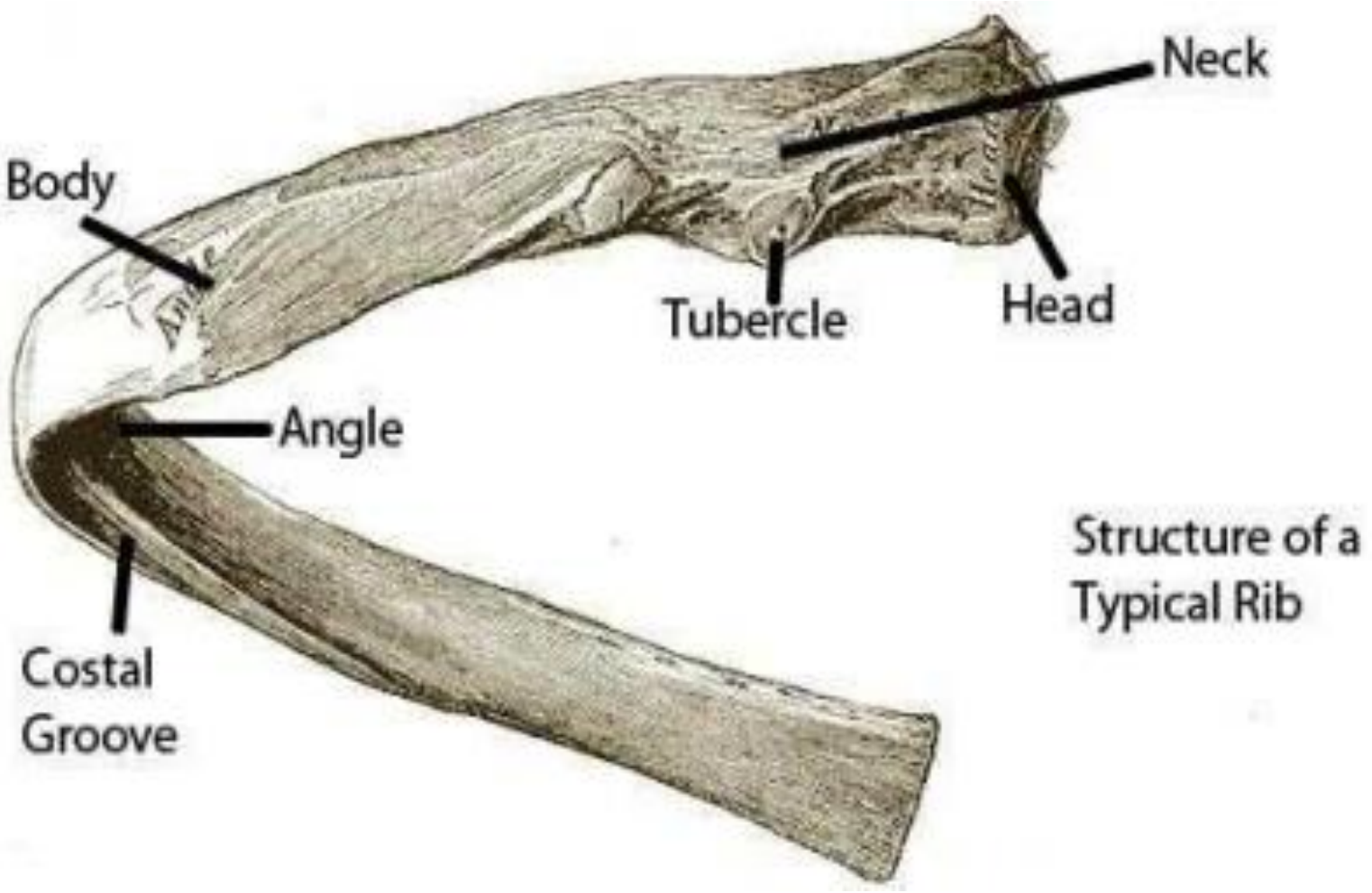


RIBS

- True ribs thy call true ; because they connect to the sternum and manubrium directly.
- False ribs because their costal cartilages conjoin to form a single indirect connection to the sternum via the costal arch .
- Floating ribs because their anterior extremity lies freely in the posterolateral abdominal wall with no attachment to the sternum .

Features of typical Ribs 3-9

- **Head:** wedge-shaped with 2 articular facets
- **Neck:** connects the head with the body
- **Tubercle:** articular &non-articular parts
- **Shaft (Body):** angle & costal groove



Structure of a Typical Rib

Blood supply of the chest wall

Is derived from the;

- superior thoracic artery
- thoracoacromial trunk
- lateral thoracic artery
- thoracodorsal artery

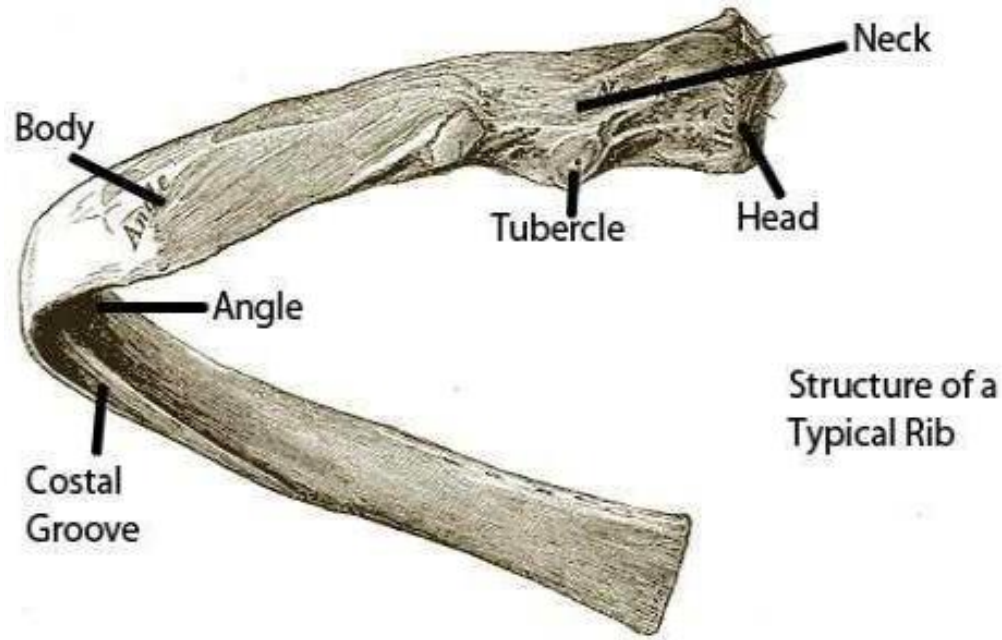
NEUROVASCULAR BUNDLES

The nerve and blood supply of the **thoracic** wall consists largely of the **neurovascular** elements that course through the intercostal spaces. ... The primary **neurovascular** bundle courses along the costal groove of the upper rib, between the internal and innermost intercostal muscles

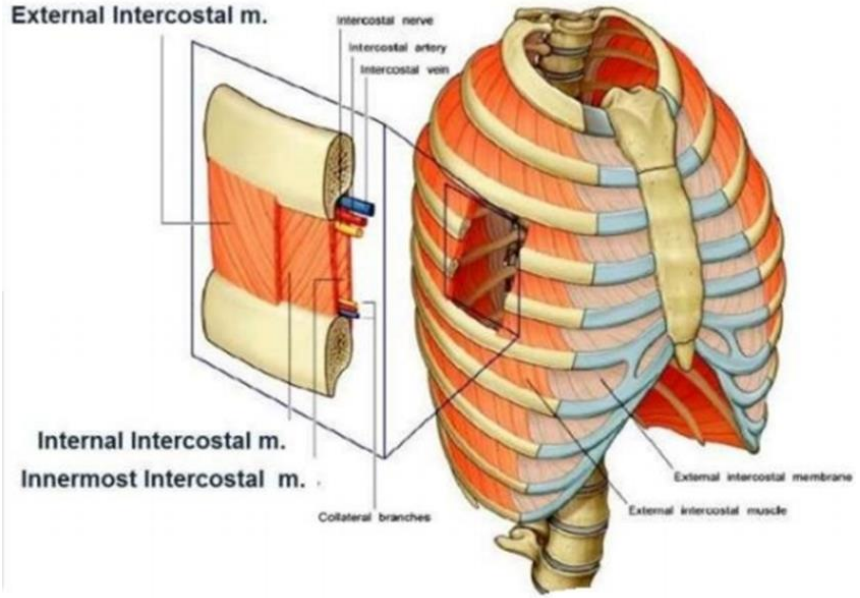
Run into the costal groove contains ;

superior to inferior:

- Intercostal vein
- Intercostal artery
- Intercostal nerve



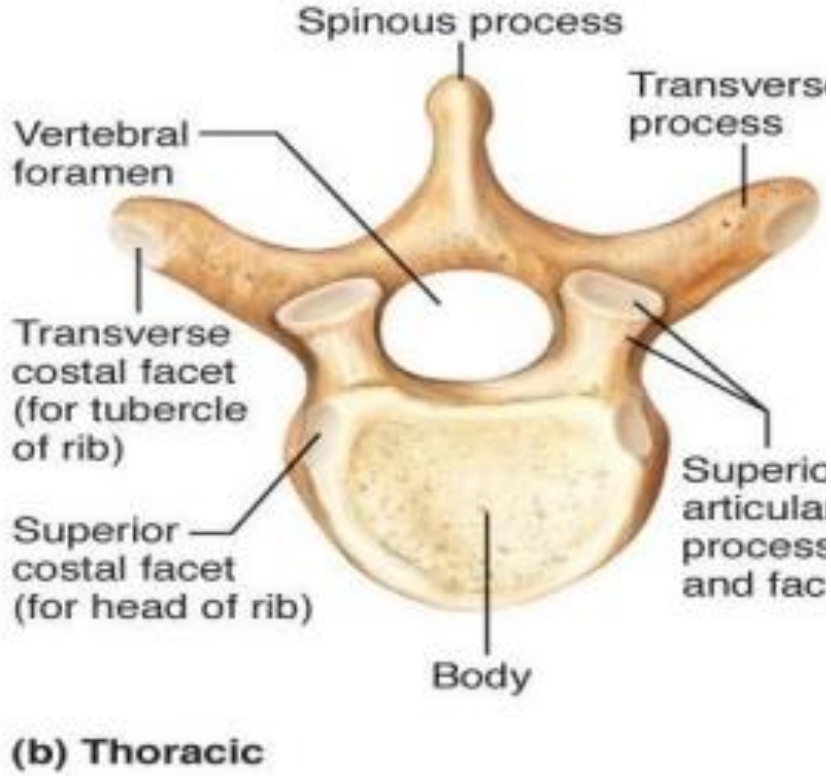
Structure of a Typical Rib

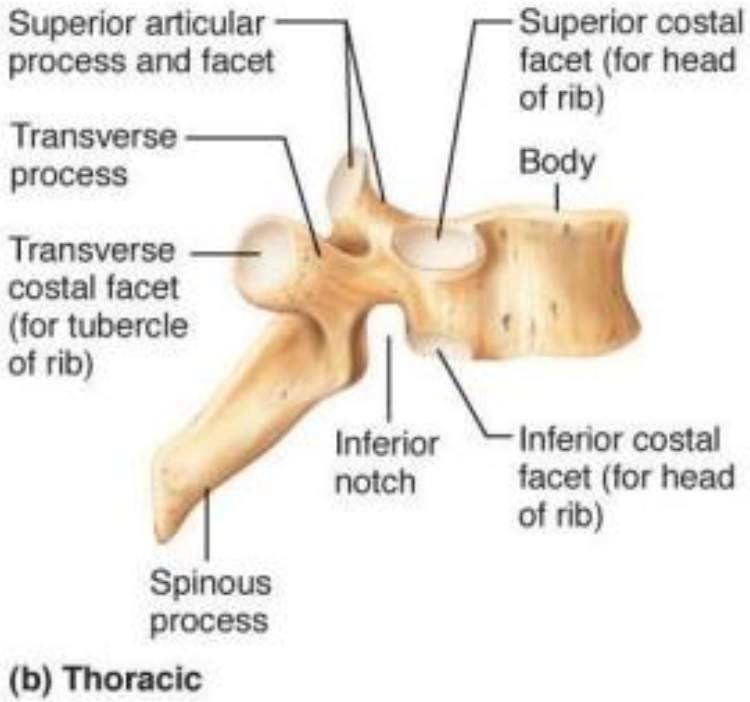


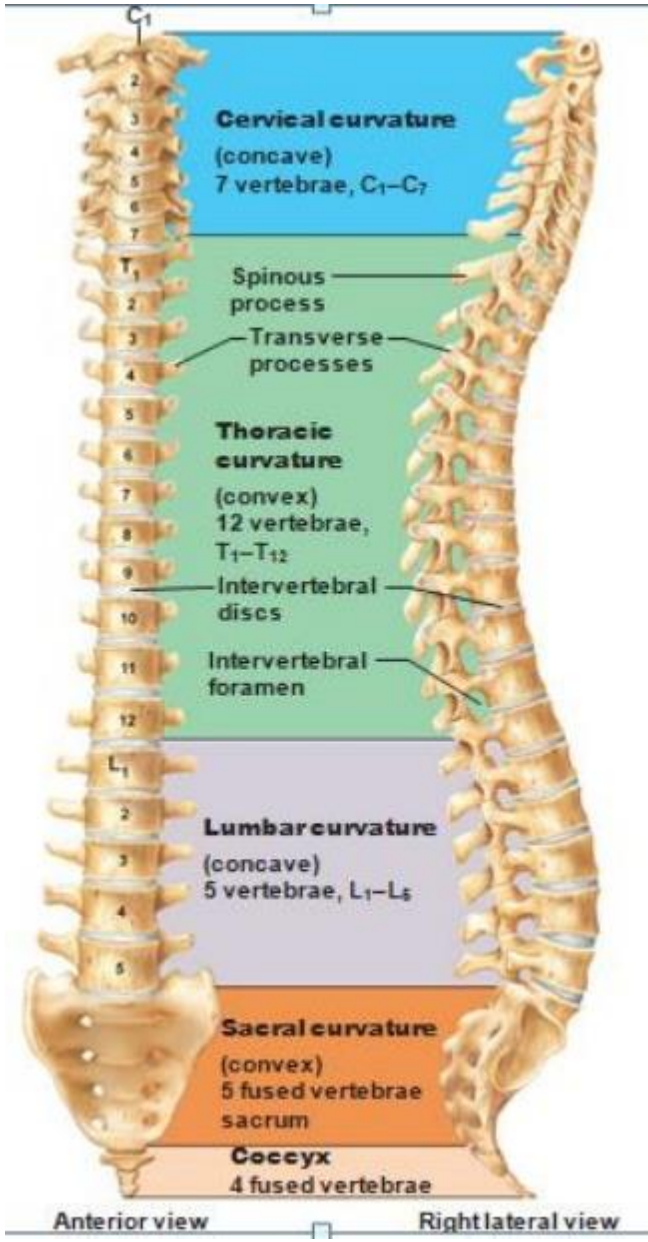
Thoracic vertebrae

Thoracic vertebrae compose the middle segment of the vertebral column, between the cervical vertebrae and the lumbar vertebrae

- T_1 to T_{12}
- All articulate with ribs at facets .
- Long spinous process
- Location of articular facets allows rotation of this area of spine

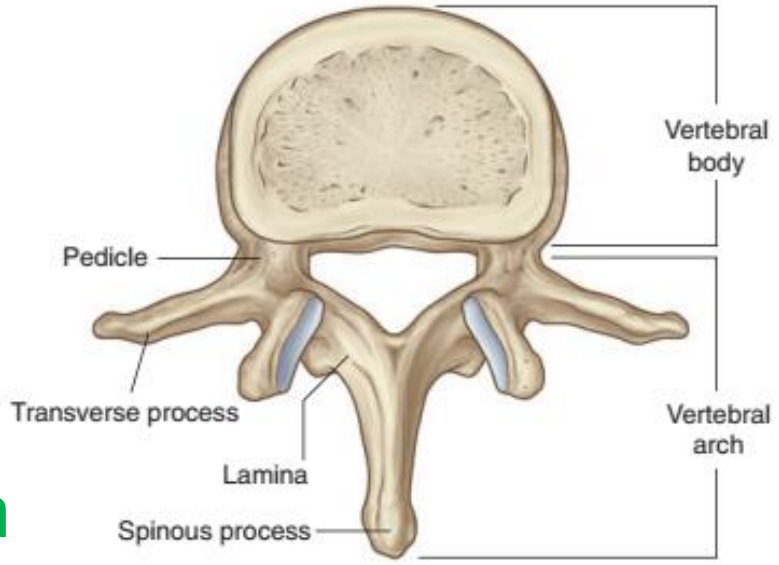




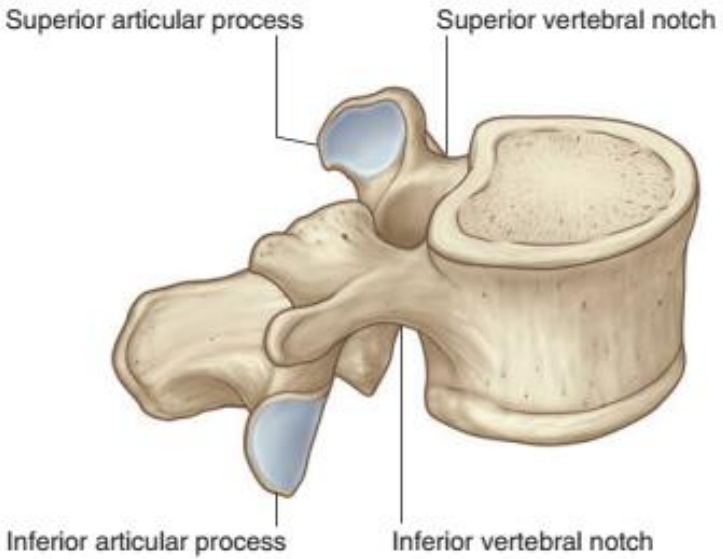


Thoracic vertebrae

- Body
- Pedicle
- Laminae
- Vertebral formina
- Transverse process
- Spinous process



Superior view



Superolateral oblique view

STERNUM

Consists of 3 flat bones:

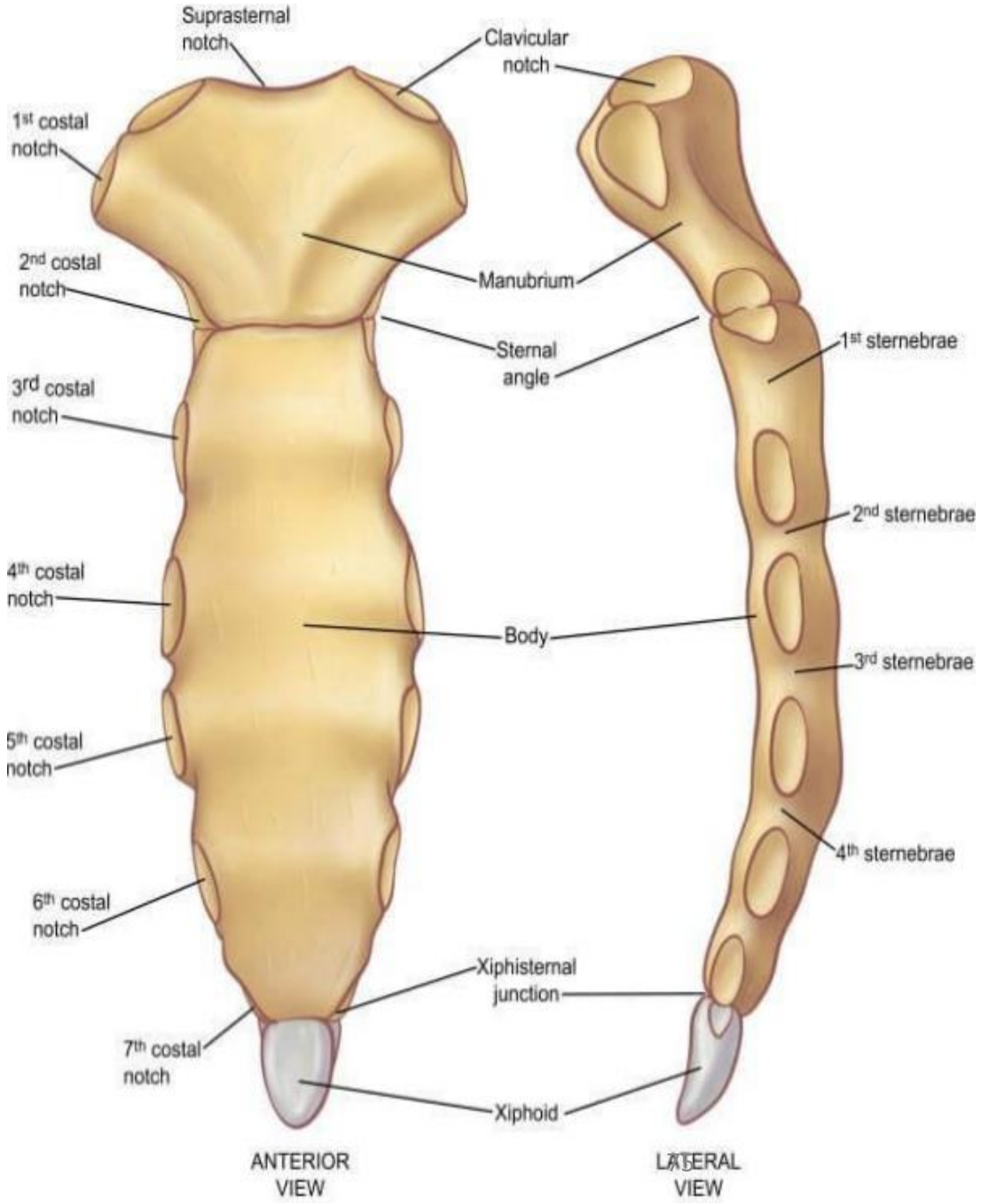
- Manubrium
- sternal body
- xiphoid process.

.A palpable landmark on the manubrium is the jugular or suprasternal notch, which is bounded on either side by the medial attachments of the clavicles.

Landmarks;

- Manubrium
- Jugular notch
- Xiphoid Process
- Sternal angle or Angle of Louis

(at the junction of the manubrium & body of sternum)

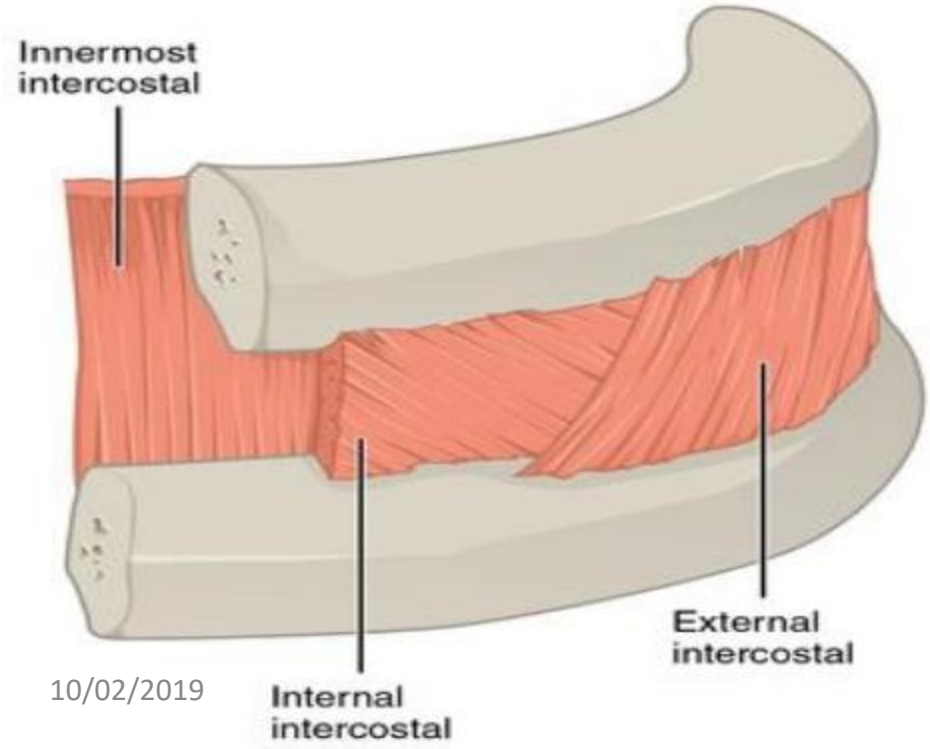


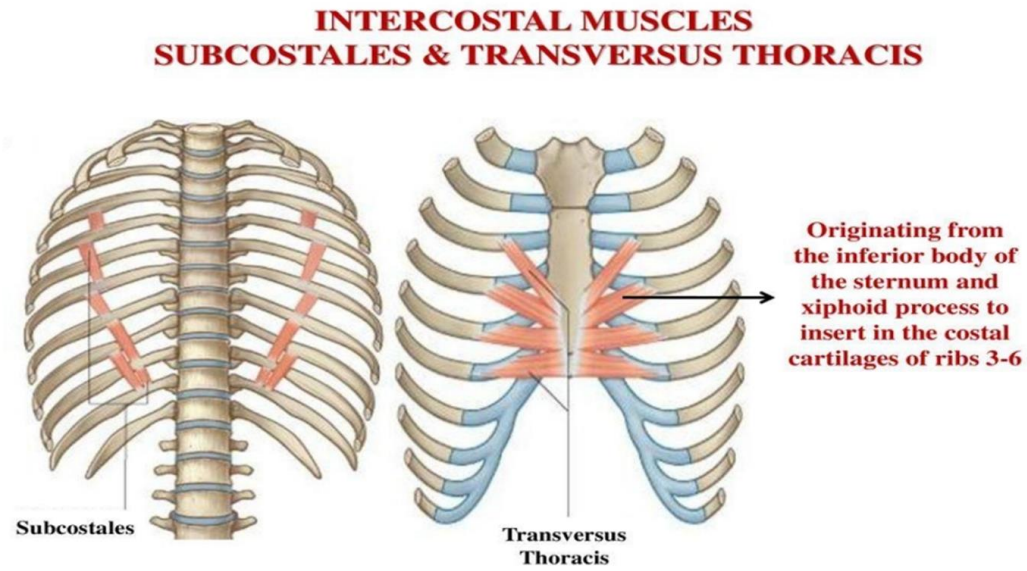
MUSCLES OF THE CHEST

1. Intercostal muscles

Each intercostal space is **spanned** by a **three layers of muscle**.

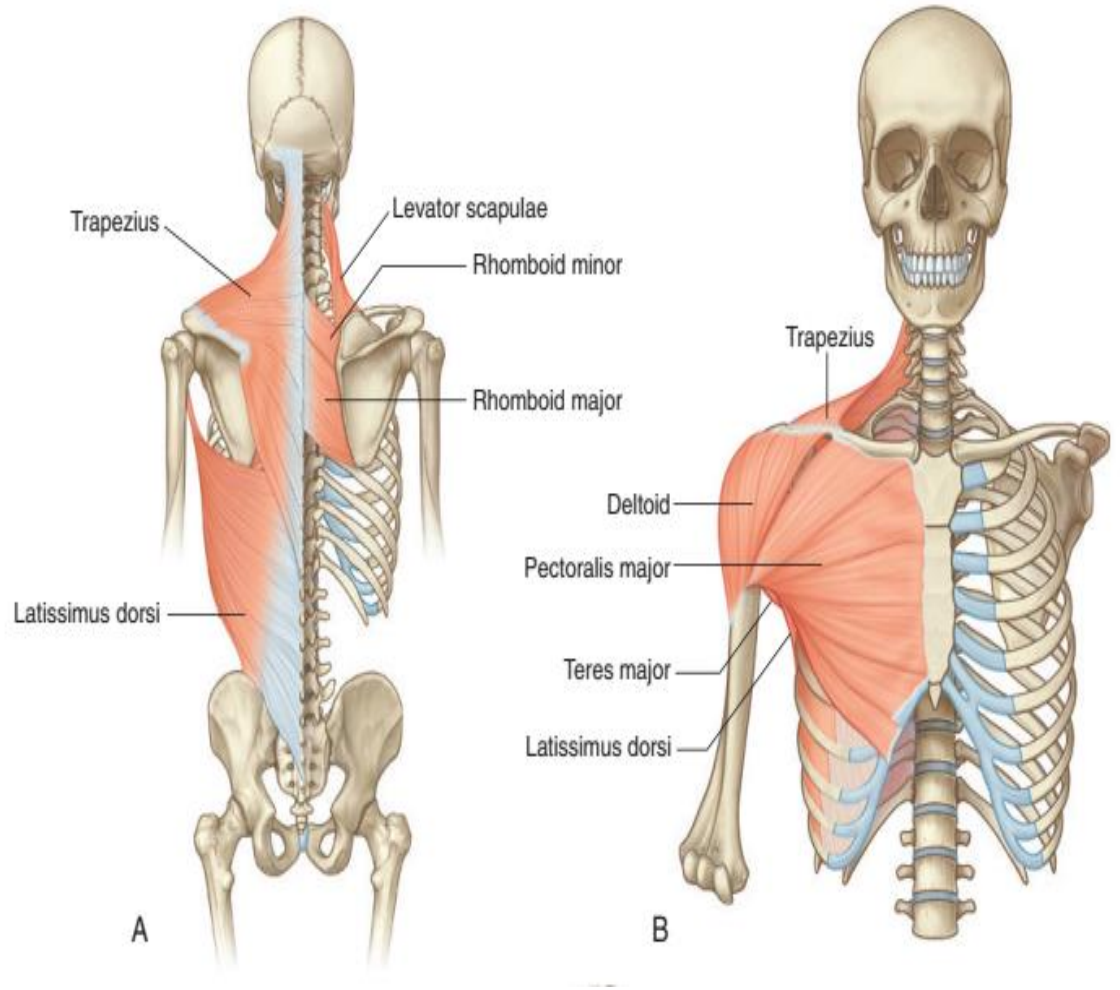
- The outermost external intercostal muscles are obliquely oriented
- The internal intercostals are obliquely oriented in a posteroinferior direction and functions to depress the ribs.
- The innermost intercostals are a thin variable layer of muscle



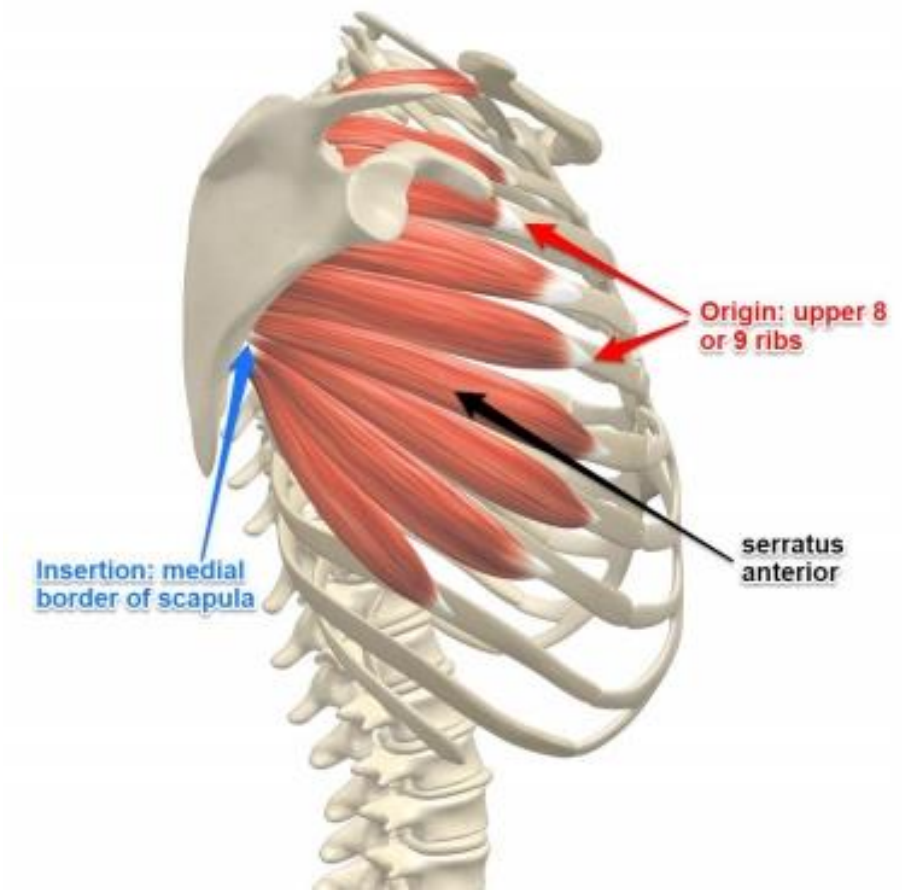


2. Pectoralis major/minor

Both the pectoralis minor and major are accessory musc
respiration

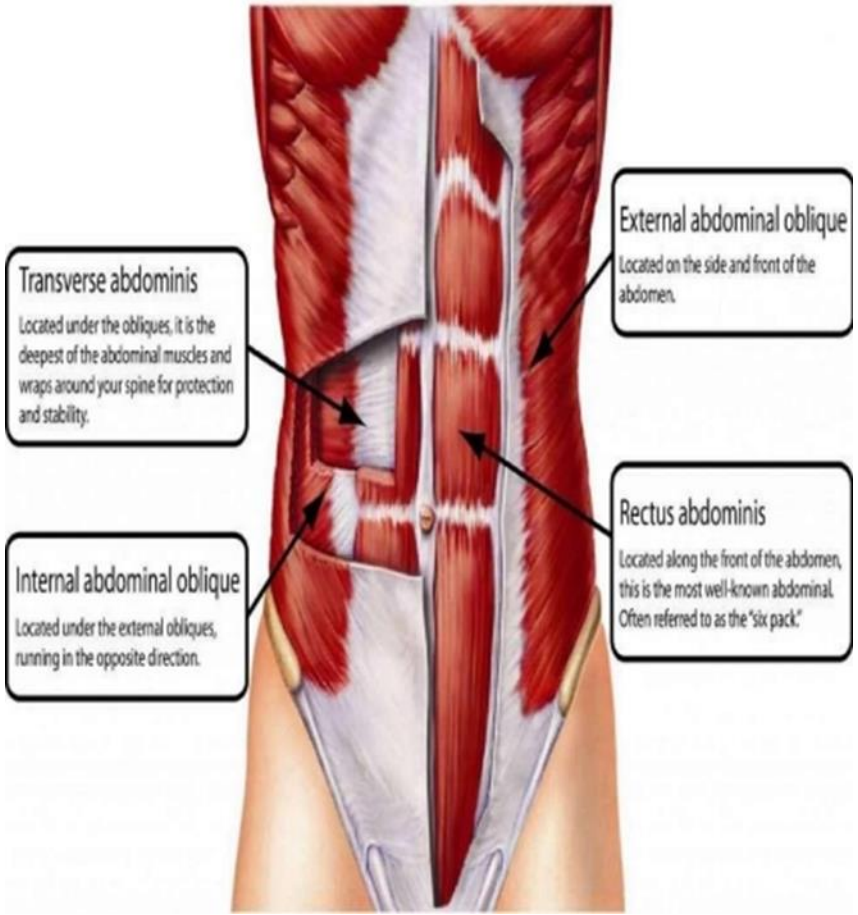


3. Serratus anterior



4. Other muscles with attachments to the thoracic skeleton

- Subclavius muscle
- Latissimus dorsi
- Serratus posterior superior and inferior
- Abdominal muscles
- External oblique
- Internal oblique
- Transversus abdominis muscle

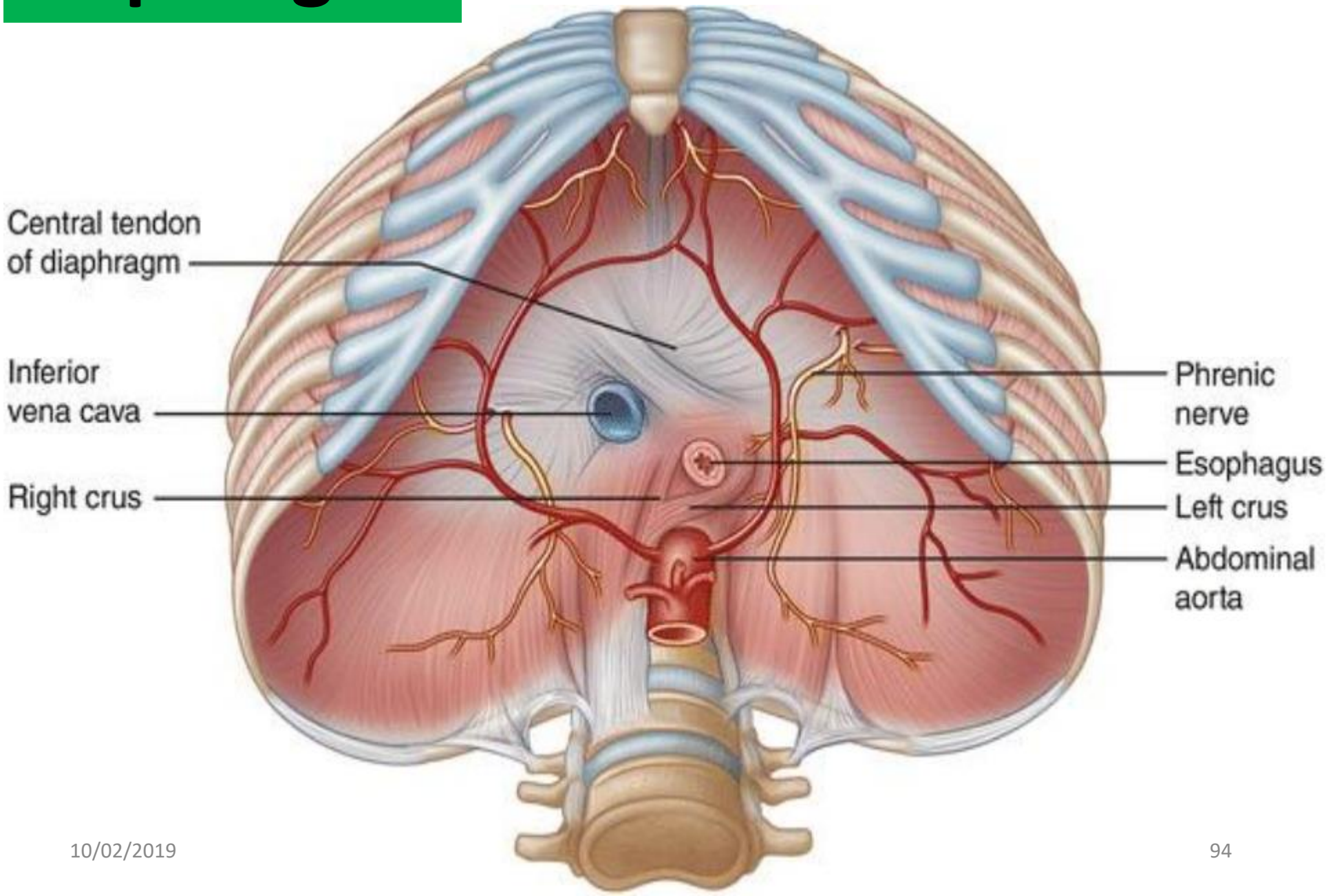


Diaphragm

- Thin skeletal muscle that sits at the base of the chest and separates the abdomen from the chest.
- Anteriorly: attaches at the level of the xiphoid process posteriorly: curves downward to attach below the 12th **thoracic vertebra**
- It contracts and flattens when you inhale. This creates a vacuum effect that pulls air into the lungs (inspiration).
- When you exhale, the diaphragm relaxes and the air is pushed out of lungs(expiration).
- The diaphragm increases abdominal pressure to help the body get rid of vomit, urine, and feces.
- It also places pressure on the esophagus to prevent acid reflux.
- The **phrenic nerve**, which runs from the neck to the diaphragm, controls the movement of the diaphragm.
- There are three large openings in the diaphragm that allow certain structures to pass between the chest and the abdomen;.

- Esophageal opening. The esophagus and vagus nerve, which controls much of the digestive system, pass through this opening.
- Aortic opening. The aorta, the body 's main artery that transports blood from the heart, passes through the aortic opening. The thoracic duct , a main vessel of the lymphatic system, also passes through this opening.
- Caval opening. The inferior vena cava , a large vein that transports blood to the heart, passes through this opening

Diaphragm


Central tendon of diaphragm
Inferior vena cava
Right crus
Phrenic nerve
Esophagus
Left crus
Abdominal aorta

Hemi-Diaphragms

- The diaphragm can be seen as being divided into two halves, or “hemi -diaphragms.” (Hemi is a word that means half.) Each side of the diaphragm is supplied by a nerve (the left phrenic nerve and the right phrenic nerve) which control the muscle.

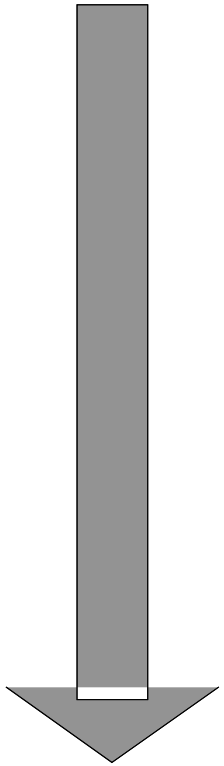
Function of the Diaphragm

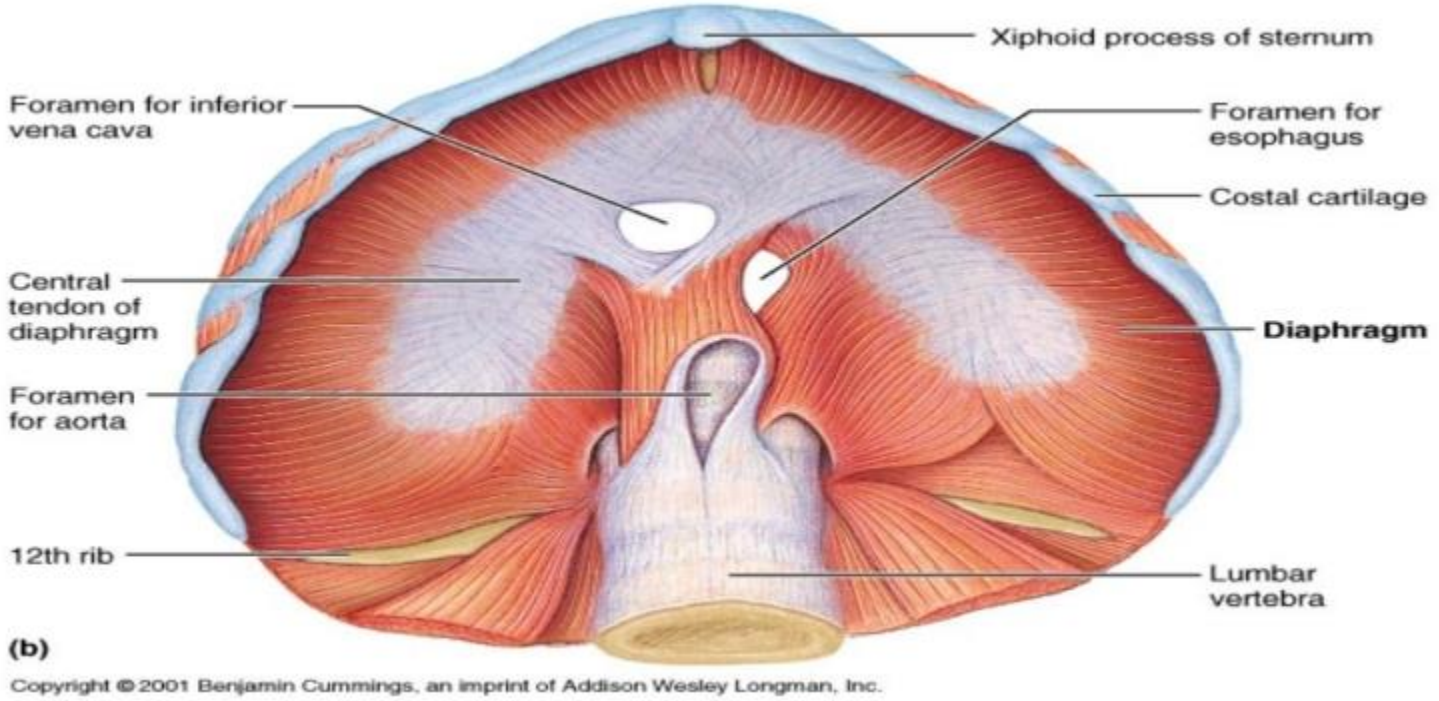
- The diaphragm plays an integral role in breathing (respiration). When the diaphragm contracts and flattens, it decreases pressure in the thoracic cavity, creating a vacuum which air then enters. When the diaphragm relaxes, air is released.
- Most of the time the diaphragm contracts in an involuntary manner (which is the reason we continue to breathe when we sleep), but it can be contracted voluntarily as well .
- The muscle is used not only in inhalation and forced exhalation, but in coughing, sneezing, vomiting, urinating, defecating (passing a bowel movement), and childbirth.

THE DIAPHRGAGM

The primary muscle of respiration

- Innervated by the left and right phrenic nerves (C3, C4, C5)





Patients with damage to the spinal cord above the level of C3 (e.g., broken neck)require mechanical respiration