كلية المستقبل الجامعة

قسم تقنيات التخدير

Anatomy

المرحلة الاولي

2022-2023

Lecture Four : Chapter II
The Thorax

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Chapter II
The Thorax

The thorax L1

Structure of the Thoracic Wall

The thoracic wall is covered on the outside by skin and **by muscles** . On the in side, It is lined with parietal pleura.

The thoracic wall is formed; **anteriorly** by the **sternum and costal cartilages** (Fig. 2.1); **posteriorly** by the **thoracic part of the vertebral column, laterally** by **the ribs and intercostal spaces**; **superiorly** by the **supra pleural membrane**; and **inferiorly by the diaphragm,** which separates the thoracic cavity from the abdominal cavity.

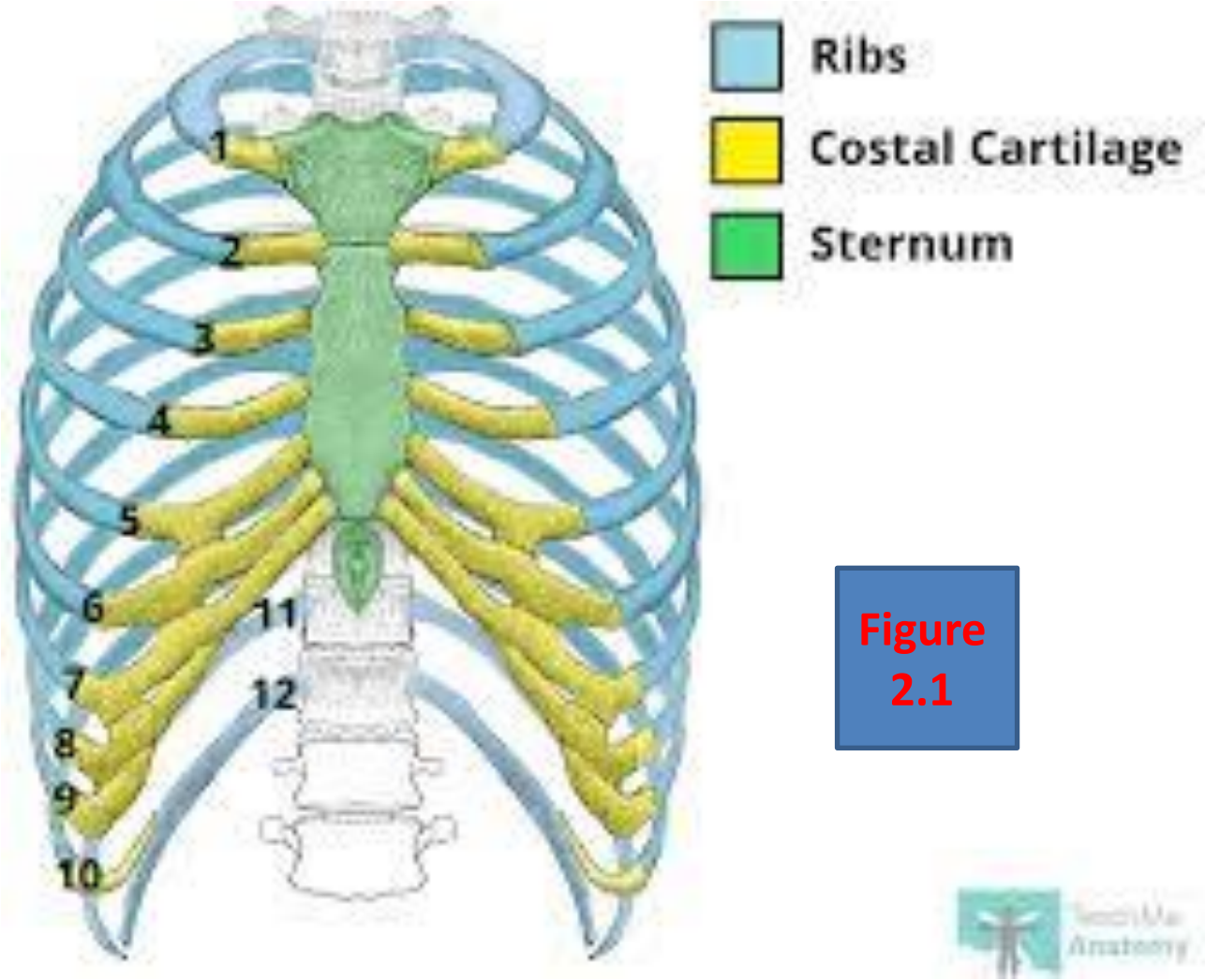


Figure 2.1

The Thorax L1

Sternum

The sternum lies in the midline of the anterior chest wall.

It is a **flat bone** that can be divided into three parts: **manubrium sterni**, **body of the sternum, and xiphoid process.**

(figure 2.2).

The sternum

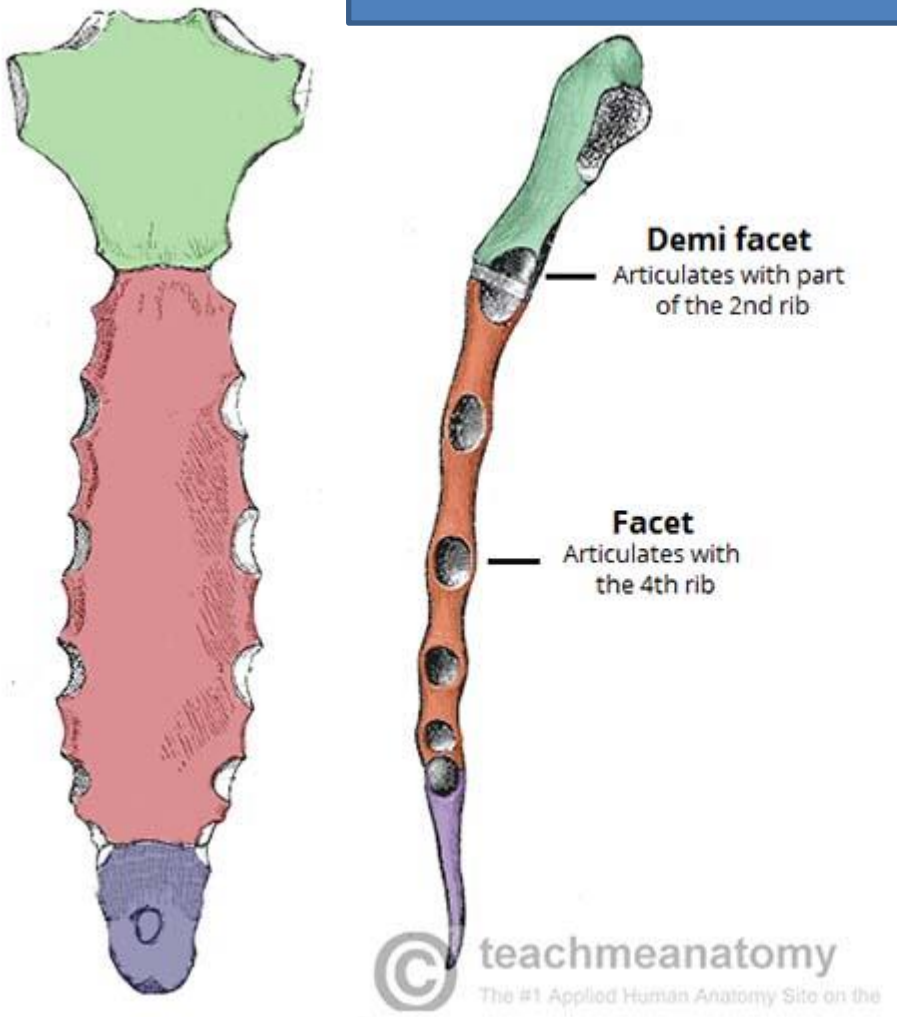


Figure 2.2

The Thorax L1

The body of the sternum (figure 2.3)

The sternal angle (angle of Louis), formed by the articulation of the **manubrium with the body of the sternum**, at the level of the **2nd costal cartilage**, it is the point from which all costal cartilages and ribs are counted.

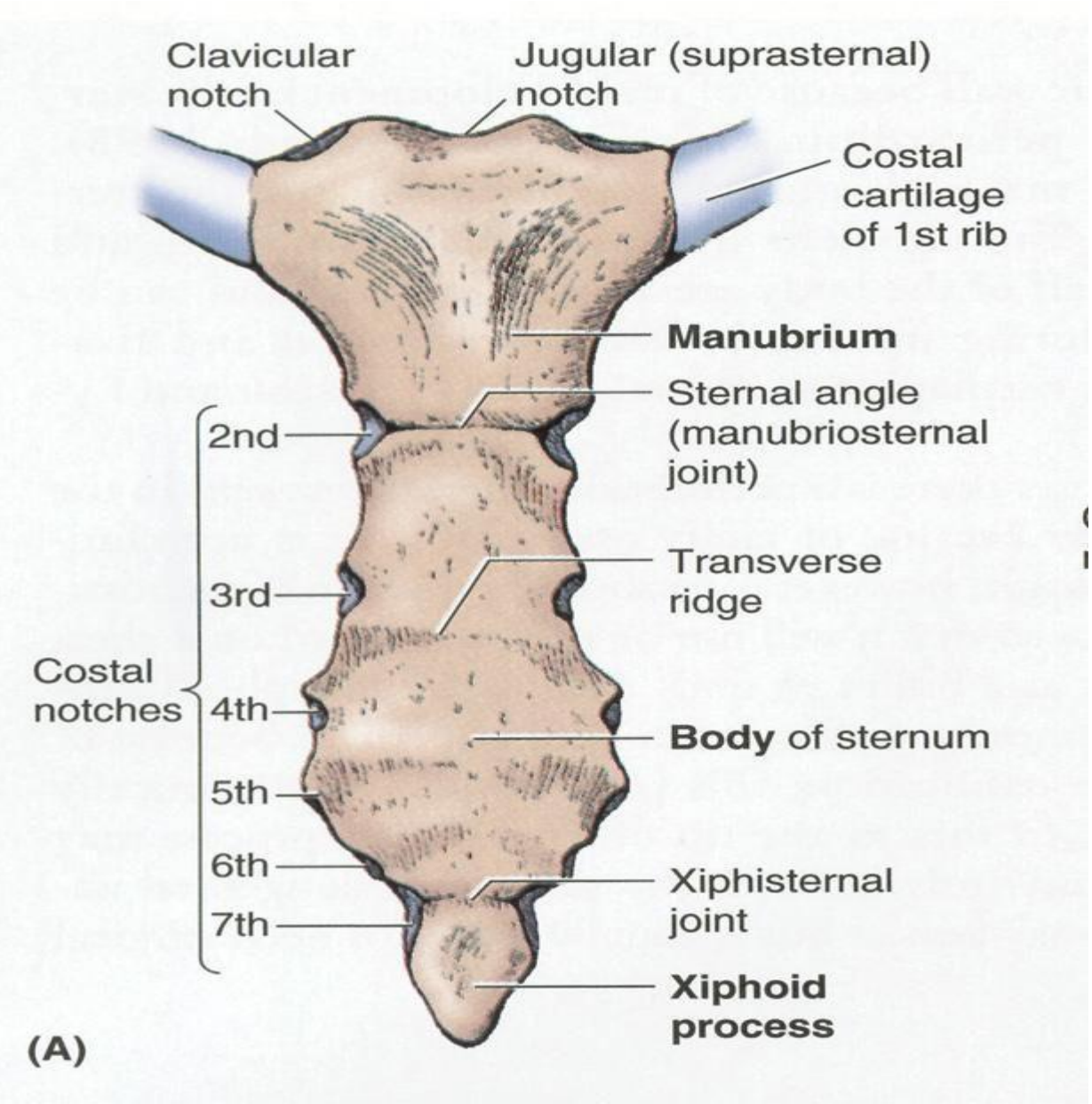

Clavicular notch
Jugular (suprasternal) notch
Costal cartilage of 1st rib
Manubrium
Sternal angle (manubriosternal joint)
2nd
3rd
Transverse ridge
Costal notches
4th
Body of sternum
5th
6th
Xiphisternal joint
7th
Xiphoid process
(A)

Figure 2.3

The Thorax L1

Ribs

There are **12 pairs** of ribs, all of which are attached posteriorly to the thoracic vertebrae, while only the first seven pairs are attached anteriorly to the sternum by their costal cartilages , and are called **true ribs**.

The false ribs are the 8th, 9th, and 10th pairs , they are attached anteriorly to each other and to the 7th rib by means of their costal cartilages.

Floating ribs **t**hey are the 11th and 12th pairs, they have no anterior Attachment. (Figure 2.4).

Types of ribs

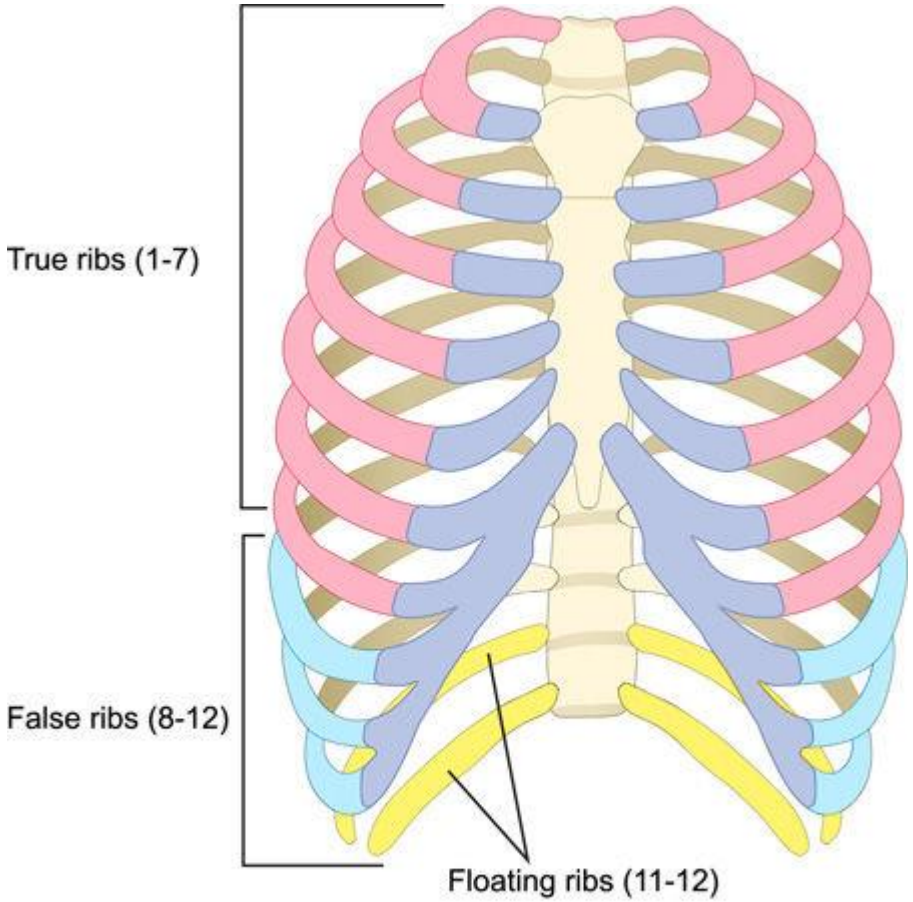


Figure 2.4

The Thorax L1

Typical Rib

A typical rib is a long flat bone having a rounded, smooth superior border and a sharp, thin inferior border (see Figs. 2.4 and 2.5). The inferior border overhangs and forms the **costal groove,** which accommodates the intercostal vessels and nerve. The anterior end of each rib is attached to the corresponding costal cartilage .

A rib has a **head, neck, tubercle, shaft,** and **angle** .

TYPICAL RIBS

Same features.

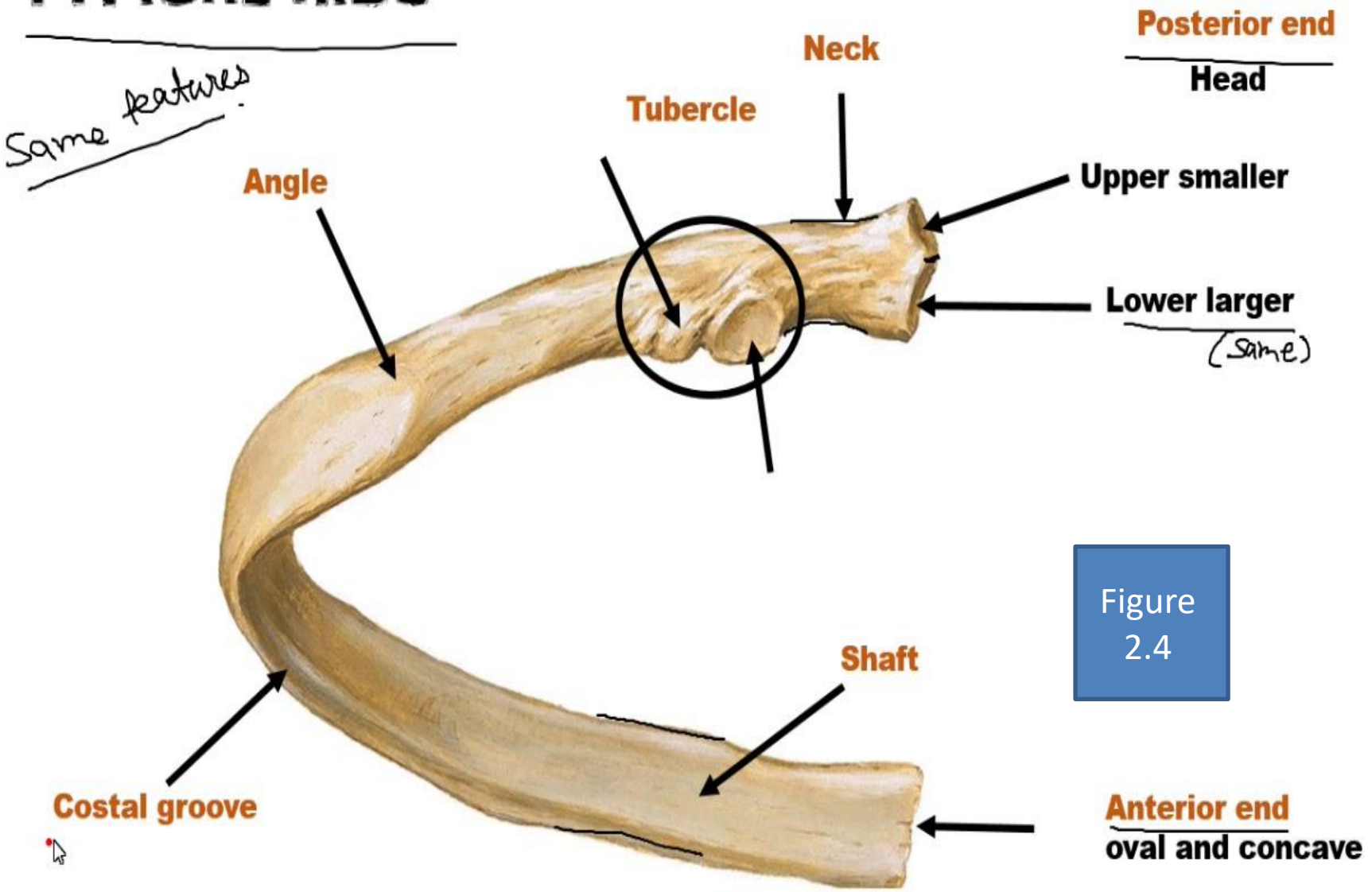


Figure 2.4

The Thorax L1

Costal Cartilages

Costal cartilages are bars of cartilage connecting the upper seven ribs to the lateral edge of the sternum and the 8th,9th, and 10th ribs to the cartilages of the ribs immediately above. The 11th and 12th ribs end in the abdominal muscles. (figure 2.5).

Costal cartilages

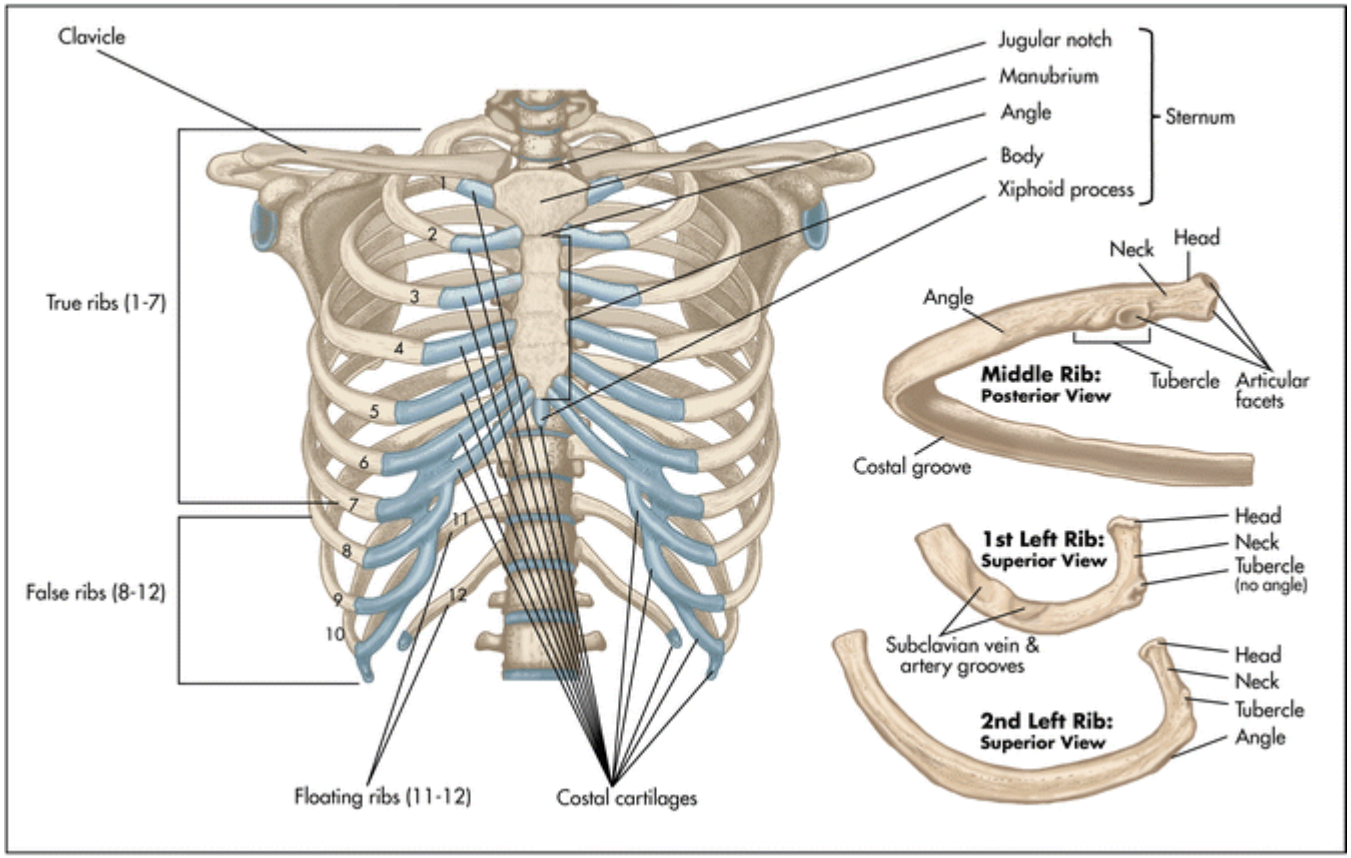


Figure 2.5

The Thorax L1

Openings of the Thorax

The chest cavity communicates with the root of the neck through the **thoracic outlet (figure 2.6).** The opening is bounded **posteriorly by the 1st thoracic vertebra, laterally** by the medial borders of the 1st ribs and their costal cartilages, and **anteriorly by the superior border of the manubrium sterni**

From this opening vessels and nerves leave the thorax to enter the neck and upper limbs as well as the esophagus and trachea and many vessels and nerves pass downward.

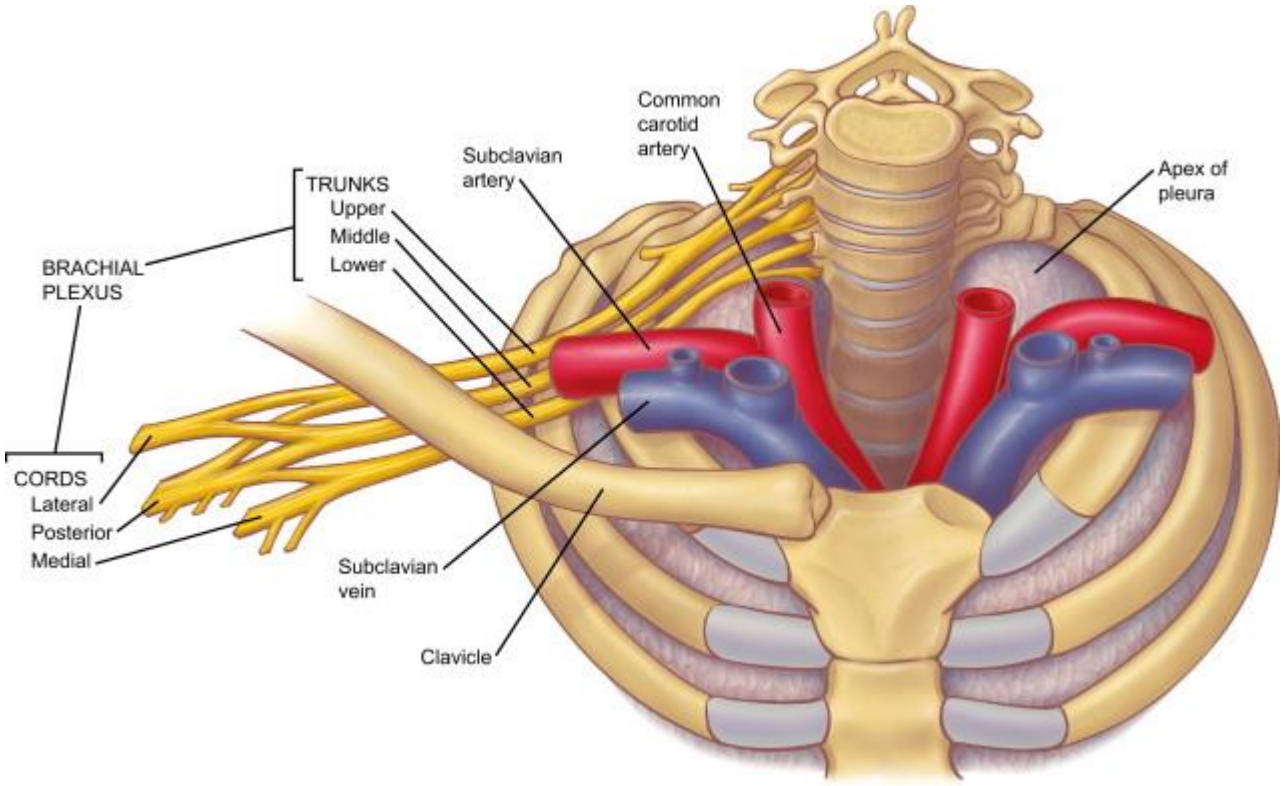
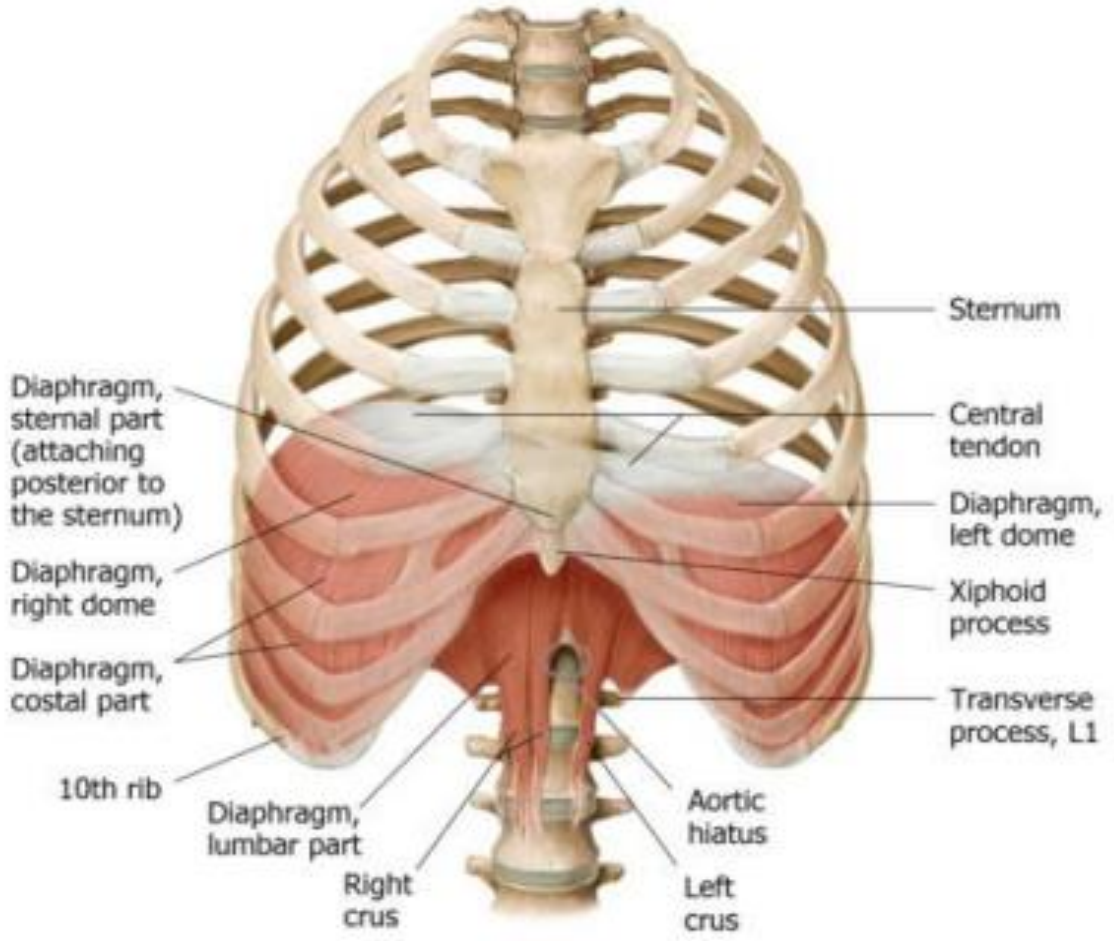

Common carotid artery
Subclavian artery
Apex of pleura
TRUNKS
Upper
Middle
Lower
BRACHIAL PLEXUS
CORDS
Lateral
Posterior
Medial
Subclavian vein
Clavicle

Figure 2.6

The Thorax L1

The thoracic cavity communicates with the abdomen through a large opening which is closed by the **diaphragm.** Through this large opening pass the **esophagus and many large vessels and nerves,** all of which pierce the diaphragm (figure 2.7).



The diaphragm
Figure 2,7

The Thorax L1

Intercostal Spaces

The spaces between the ribs contain three muscles of respiration:

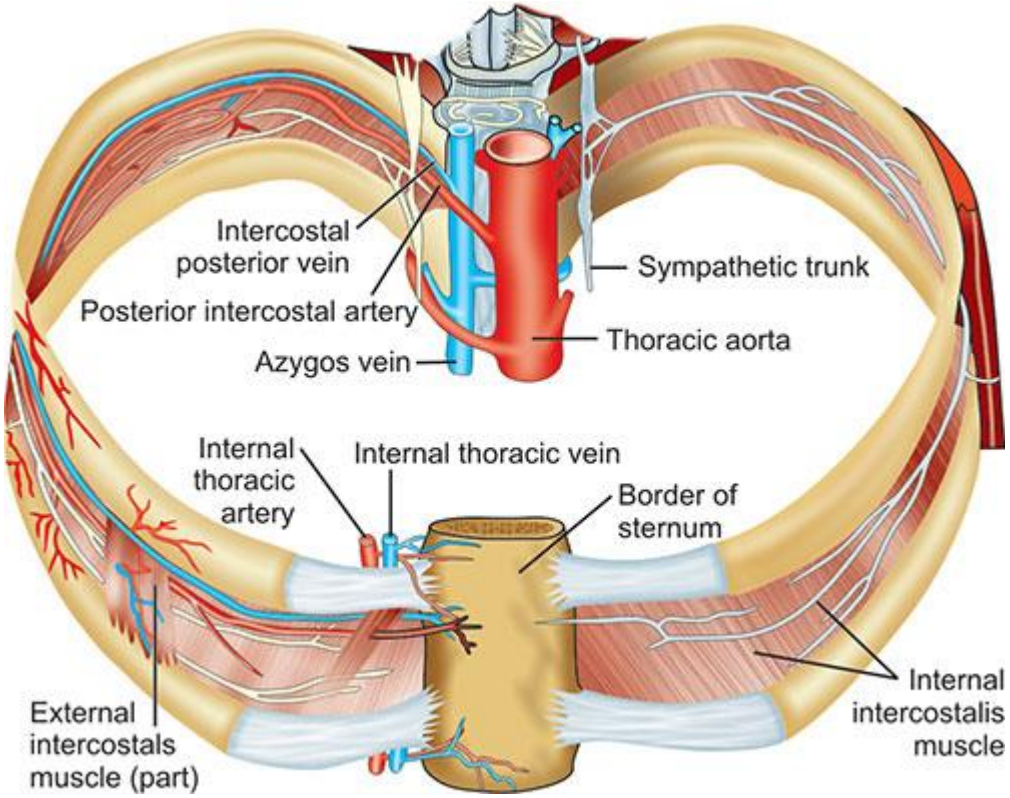
the external intercostal, the internal intercostal, and

the innermost intercostal muscle. The intercostal

nerves and blood vessels run between the intermediate and deepest layers of muscles . They are arranged in

the following order from above downward: **intercostal vein, intercostal artery, and intercostal nerve (i.e., VAN) (Figure 2.8)**

Intercostal space
Figure 2.8



The Thorax L1

Action of intercostal muscles

When the intercostal muscles contract, they all pull the **ribs nearer to one another**. If the 1st rib is fixed by the contraction of the muscles in the root of the neck,(the scaleni) the intercostal muscles raise the 2nd to the 12th ribs toward the 1st rib, as in **inspiration**.

On the other hand, If the 12th rib is fixed by the quadratus lumborum muscle and the oblique muscles of the abdomen,. the 1st to the 11th ribs will be **lowered by the contraction of the intercostal muscles, as in expiration.**

The Thorax L1

Nerve supply of the intercostal muscles

The intercostal muscles are supplied by the corresponding intercostal nerves. The intercostal nerves and blood vessels (the neurovascular bundle), run between the middle and innermost layers of muscles. They are arranged in the following order from above downward: intercostal vein, intercostal artery, and intercostal nerve (i.e., VAN).

The Thorax L1

The intercostal nerves

The intercostal nerves are the **anterior rami of the first 11 thoracic spinal nerves** . The anterior ramus of the 12th thoracic nerve lies in the abdomen and runs forward in the abdominal wall as the **subcostal nerve.**

Each intercostal nerve enters an intercostal space, it then runs forward inferiorly to the intercostal vessels in the subcostal groove of the corresponding rib, between the innermost intercostal and internal intercostal muscle.

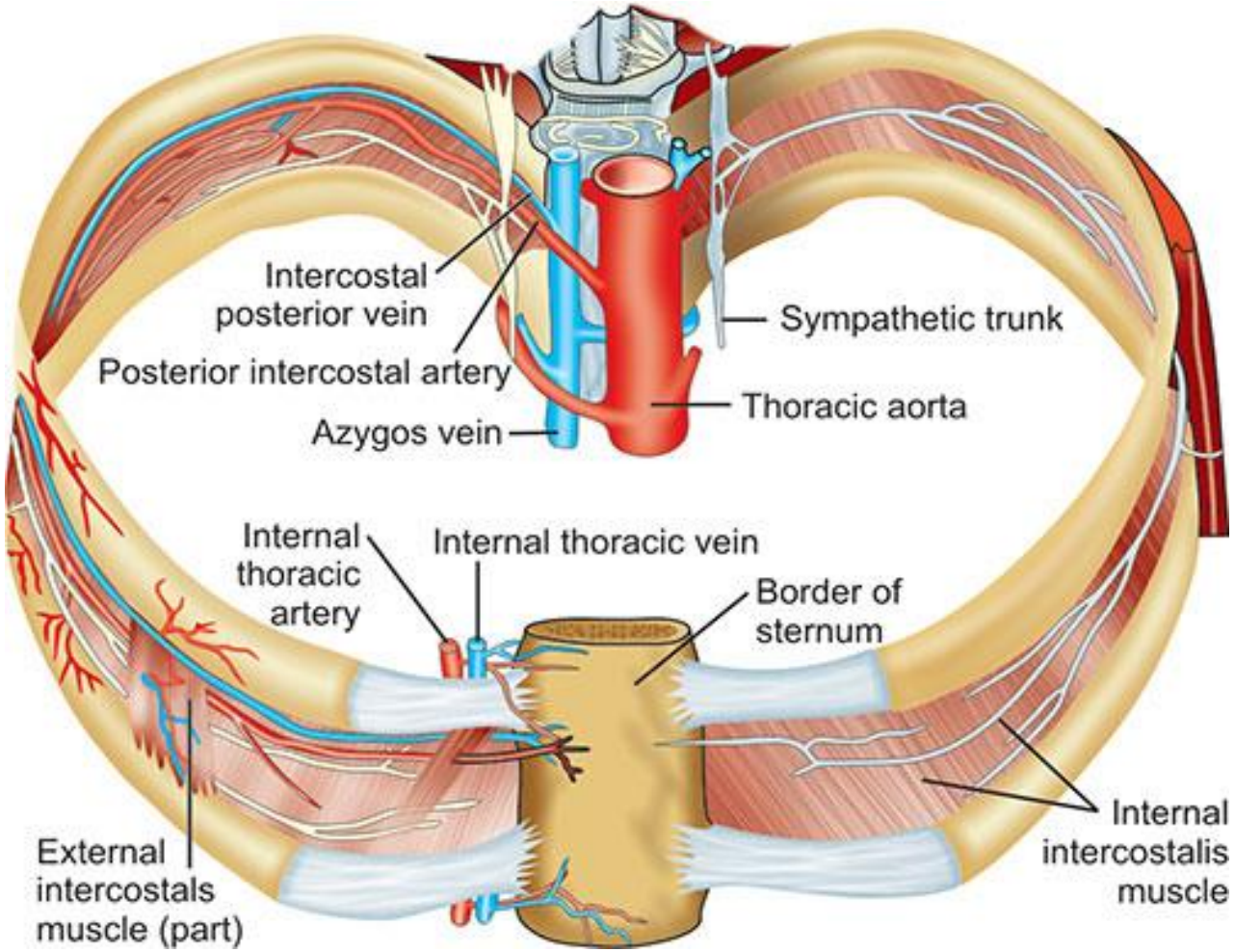
The Thorax L1

Intercostal Arteries and Veins

Each intercostal space contains a large single posterior intercostal artery and two small anterior intercostal arteries.

■■ The **posterior intercostal arteries** of the first two spaces are branches from the superior intercostal artery which is a branch of the costo cervical trunk of the subclavian artery. The posterior intercostal arteries of the lower nine spaces are branches of the **descending thoracic aorta**.

Intercostal space
Figure 2.8



The Thorax L1

■■ The **anterior intercostal arteries** of the first six spaces are branches of the **internal thoracic artery,** which arises from the first part of the subclavian artery. The anterior intercostal arteries of the lower spaces are branches of the **musculophrenic artery**, one of the terminal branches of the internal thoracic artery.

Each intercostal artery gives off branches to the muscles, skin, and parietal pleura.

The Thorax L1

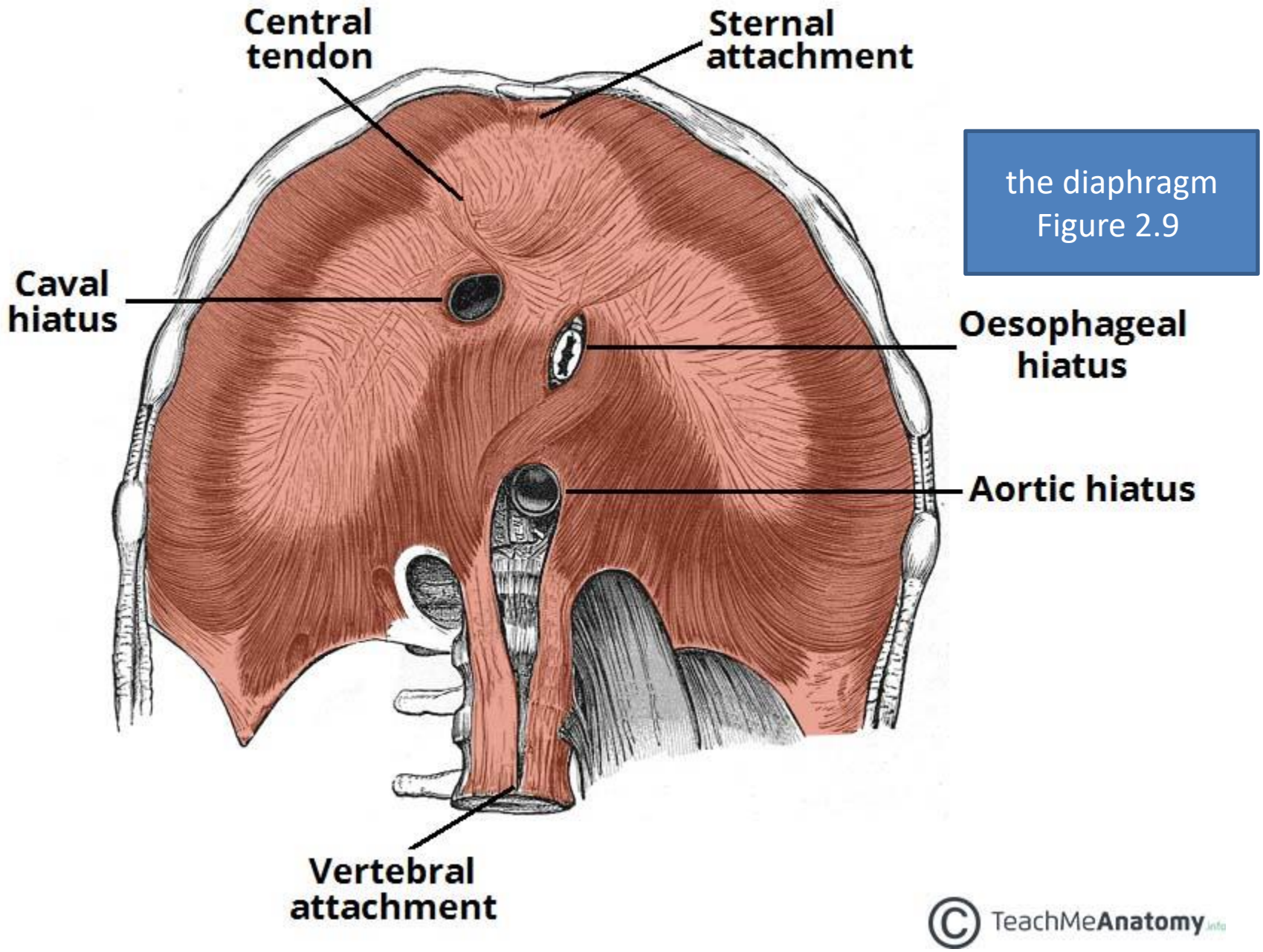
The corresponding **posterior intercostal veins** drain backward into the azygos or hemiazygos veins , and the **anterior intercostal veins** drain forward into the internal thoracic and the musculophrenic veins.

The Thorax L1

Diaphragm

The diaphragm is a thin muscular and tendinous septum that separates the chest cavity above from the abdominal cavity below .

The diaphragm is the most important muscle of espiration. It is dome shaped and consists of **a peripheral muscular part and a centrally placed tendon** figure 2.9). The muscular part arises from the margins of the thoracic opening. The diaphragm is inserted into a **central tendon,** which is shaped like three leaves


Central tendon
Sternal attachment
Caval hiatus
Oesophageal hiatus
Aortic hiatus
Vertebral attachment
the diaphragm
Figure 2.9
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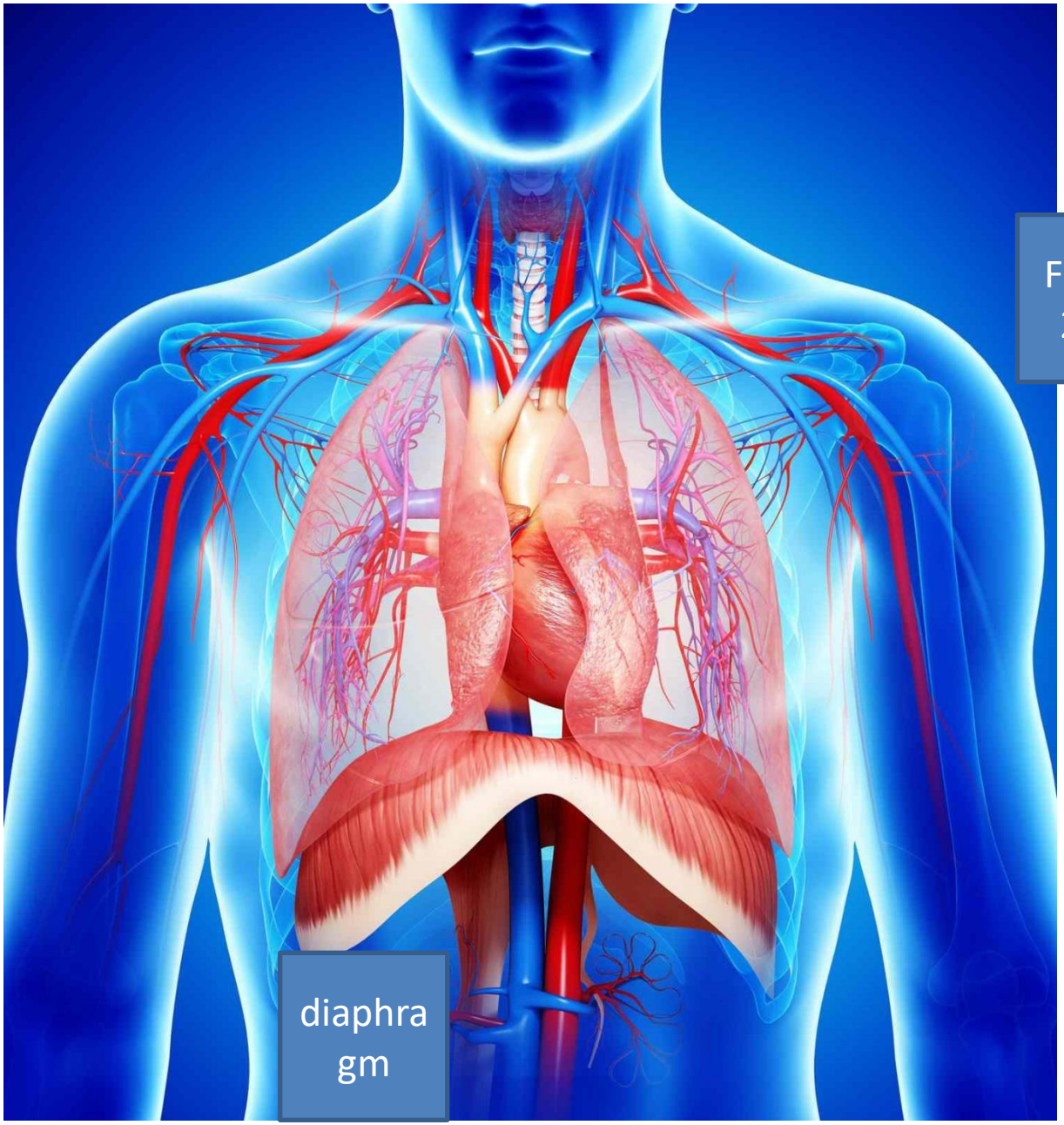


Figure 2.10

The Thorax L1

The origin of the diaphragm can be divided into three parts:

A **sternal part** arising from the posterior surface of the

xiphoid process .

A **costal part** arising from the deep surfaces of the lower six ribs and their costal cartilages.

A **vertebral part** arising by vertical columns or crura and from the arcuate ligaments

The Thorax L1

As seen from in front, the diaphragm curves up into **right and left domes,** or cupulae. The right dome reaches higher than the left because the right lobe of the liver The central tendon lies at the level of the xiphisternal joint. **The domes support the right and left lungs, whereas the central tendon supports the heart**.figure 2.10)

The Thorax L1

Action of the Diaphragm

On contraction, the diaphragm pulls down its central tendon and increases the vertical diameter of the thorax.

The Thorax L1

Openings in the Diaphragm

The diaphragm has three main openings:

■■ **The aortic opening** lies anterior to the body of the 12th

thoracic vertebra between the crura (see Fig. 2.16). It

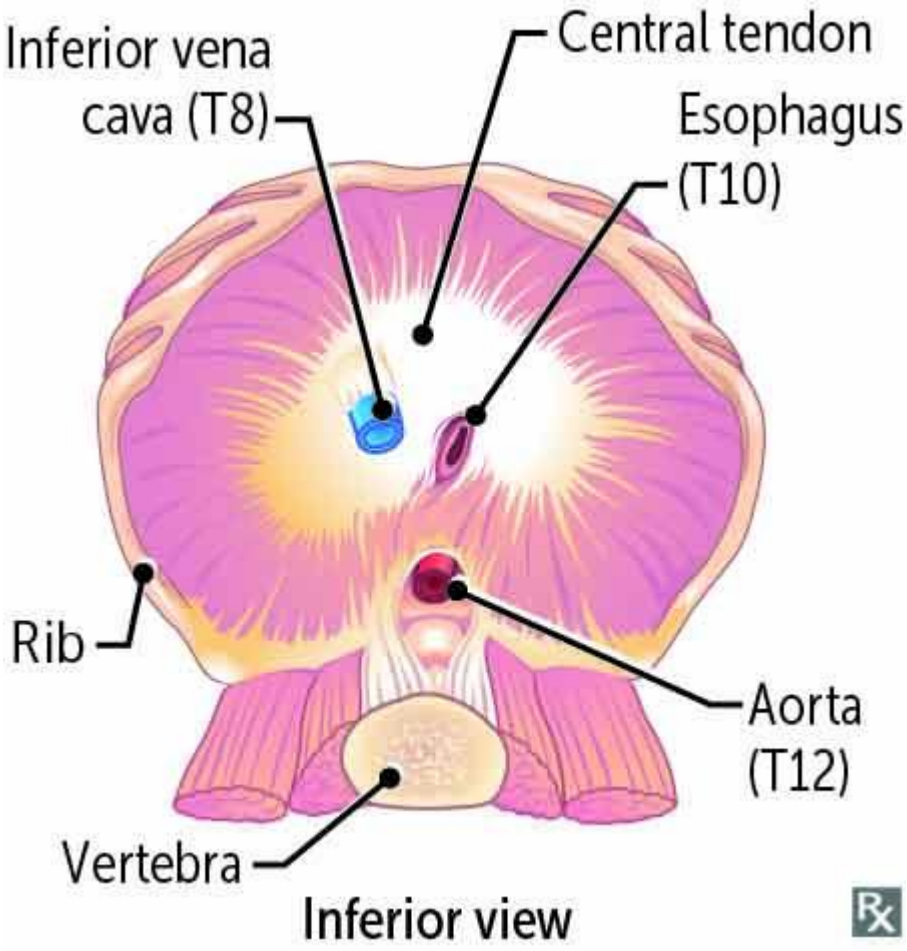
transmits the aorta, the thoracic duct, and the azygos vein.

■■ **The esophageal opening** lies at the level of the 10th thoracic vertebra in a sling of muscle fibers derived from the right crus.

The Thorax L1

It transmits the esophagus, the right and left vagus nerves, the esophageal branches of the left gastric vessels.

■■ The **caval opening** lies at the level of the 8th thoracic vertebra in the central tendon. It transmits the inferior vena cava and terminal branches of the right phrenic nerve.


Inferior vena cava (T8)
Central tendon
Esophagus (T10)
Rib
Aorta (T12)
Vertebra
Inferior view


THANK YOU
FOR YOUR
ATTENTION