

INTRODUCTION TO THE ANATOMY OF THORAX

DR NAJMA ATTAULLAH
LECTURER ANATOMY KGMC

THORAX

- The thorax is the area of the body situated between the neck and the abdomen. The thorax itself can be split up into various areas that contain important structures.
- The thorax is bound by bony structures including the 12 pairs of ribs and thoracic vertebrae, also being supported by many ligaments and muscles.

THORAX

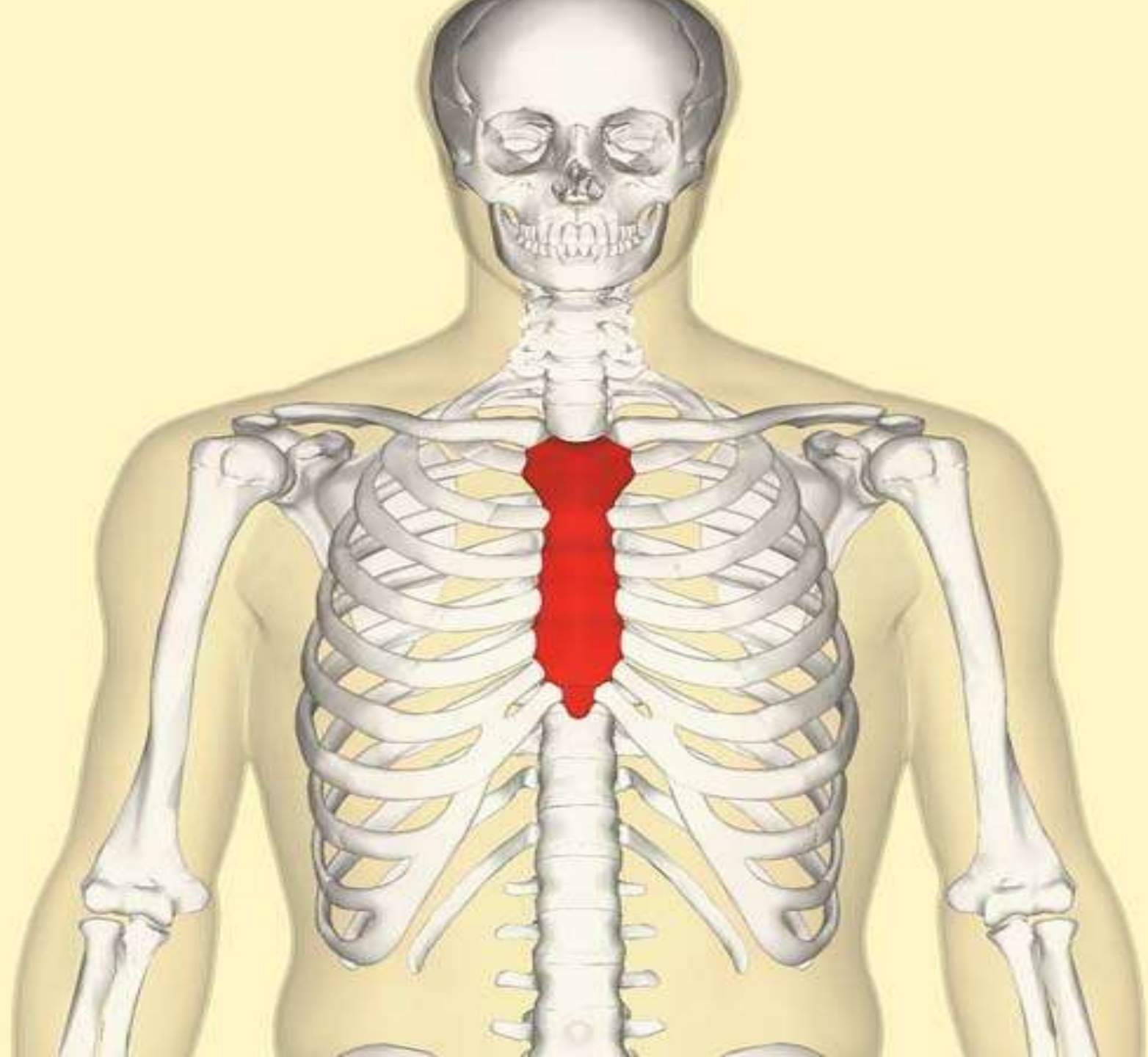
- The muscles of the thorax are also important for the vital actions of **breathing** and muscles that attach to the thoracic wall may also contribute to the general **movement** of the trunk, upper limbs and the neck.

THORAX

- The thoracic cavity is home to many vital organs, notably the lungs/pleurae and the heart, but also includes the thymus gland and the breasts.
- As the heart is found here, the great vessels associated with it are also found – including the pulmonary arteries/veins, the superior vena cava and the aorta (as well as some of its proximal branches).

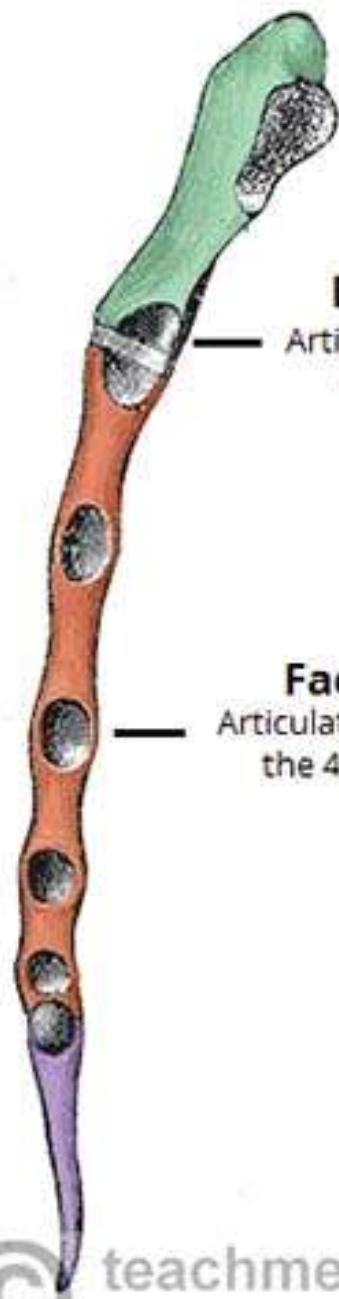
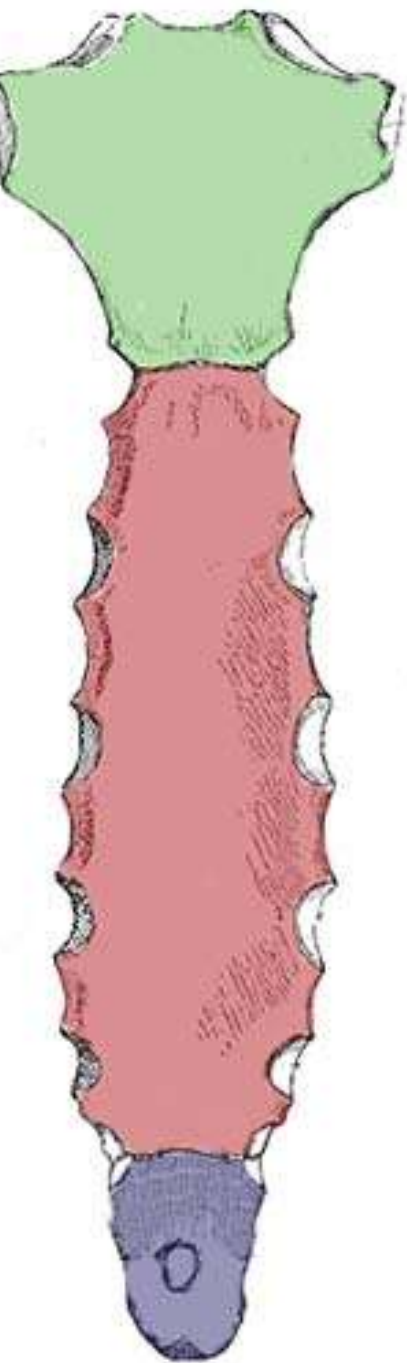
BONES OF THORAX

- The **sternum** (or breastbone) is a flat bone located at the anterior aspect of the thorax. It lies in the midline of the chest and has a 'T' shape.
- As part of the bony thoracic wall, the sternum helps **protect** the internal thoracic viscera – such as the heart, lungs and oesophagus.



STERNUM

- The sternum can be divided into three parts; the **manubrium**, **body** and **xiphoid process**.
- In children, these elements are joined by cartilage.
- The cartilage ossifies to bone during adulthood.



Demi facet

Articulates with part of the 2nd rib

Facet

Articulates with the 4th rib



Manubrium



Body



Xiphoid process



teachmeanatomy

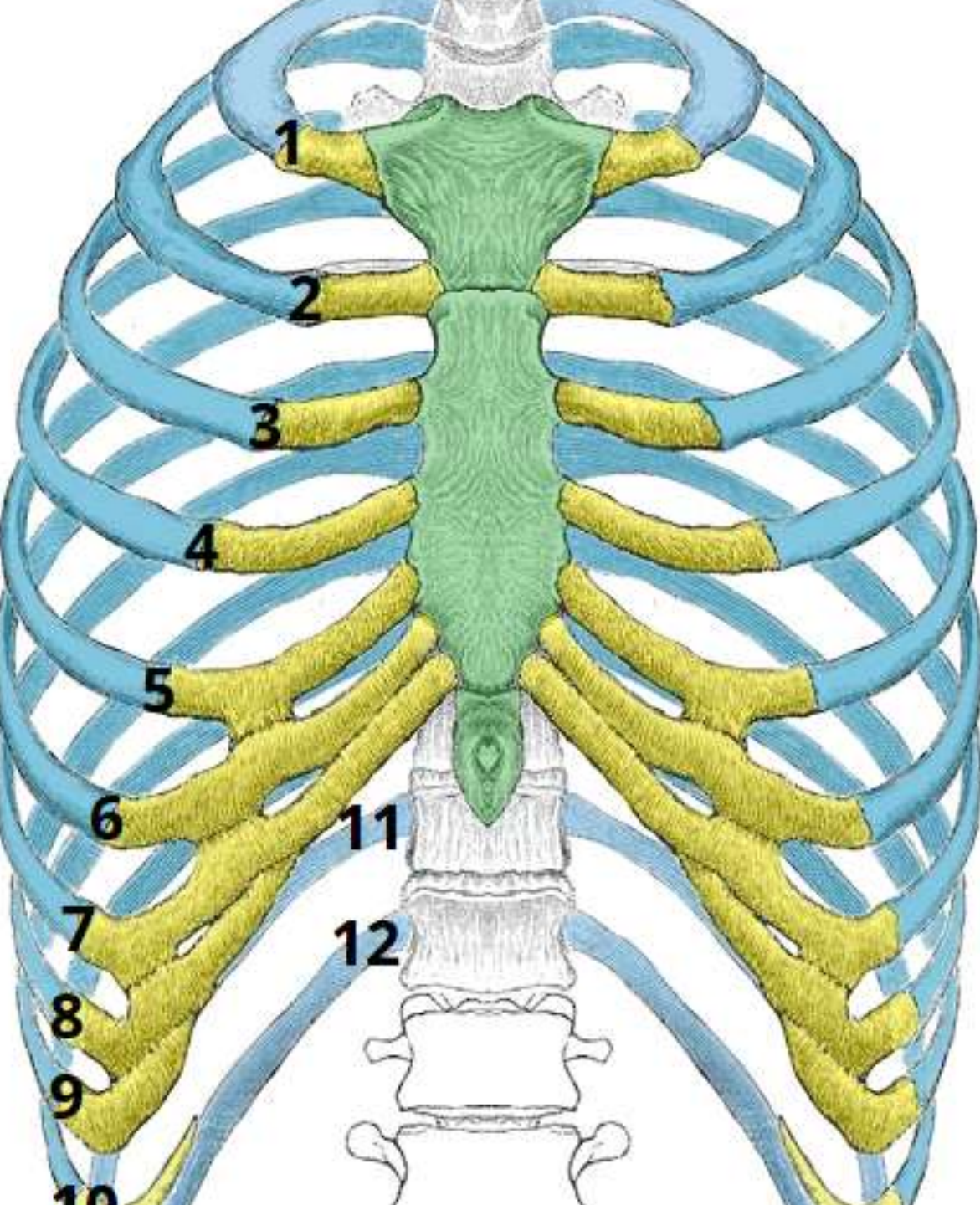
The #1 Applied Human Anatomy Site on the

STERNUM FRACTURE

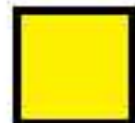
- Typically, the sternum will break into several pieces – this type of fracture is classified as a **comminuted fracture**. The most common site of fracture is the manubriosternal joint – Sternal fractures have a high mortality rate (25-45%). This is not due to the fracture itself, but usually as a result of heart and lung injuries, which are likely to occur simultaneously with the primary trauma.

RIBS

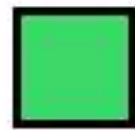
- The ribs are a set of twelve paired bones which form the protective 'cage' of the thorax.
- They articulate with the vertebral column posteriorly, and terminate anteriorly as cartilage (known as costal cartilage).
- As part of the bony thorax, the ribs protect the internal thoracic organs. They also have a role in ventilation; moving during chest expansion to enable lung inflation



RIBS



Costal Cartilage



Sternum

RIBS

- There are two classifications of ribs – **atypical** and **typical**.
- The typical ribs have a generalised structure, while the atypical ribs have variations on this structure.
- The typical rib consists of a head, neck and body

TYPICAL

- The head is wedge shaped, and has two articular facets separated by a wedge of bone. One facet articulates with the numerically corresponding vertebrae, and the other articulates with the vertebrae above.

Articular Facet

Articulates with the vertebrae above

Articular Facet

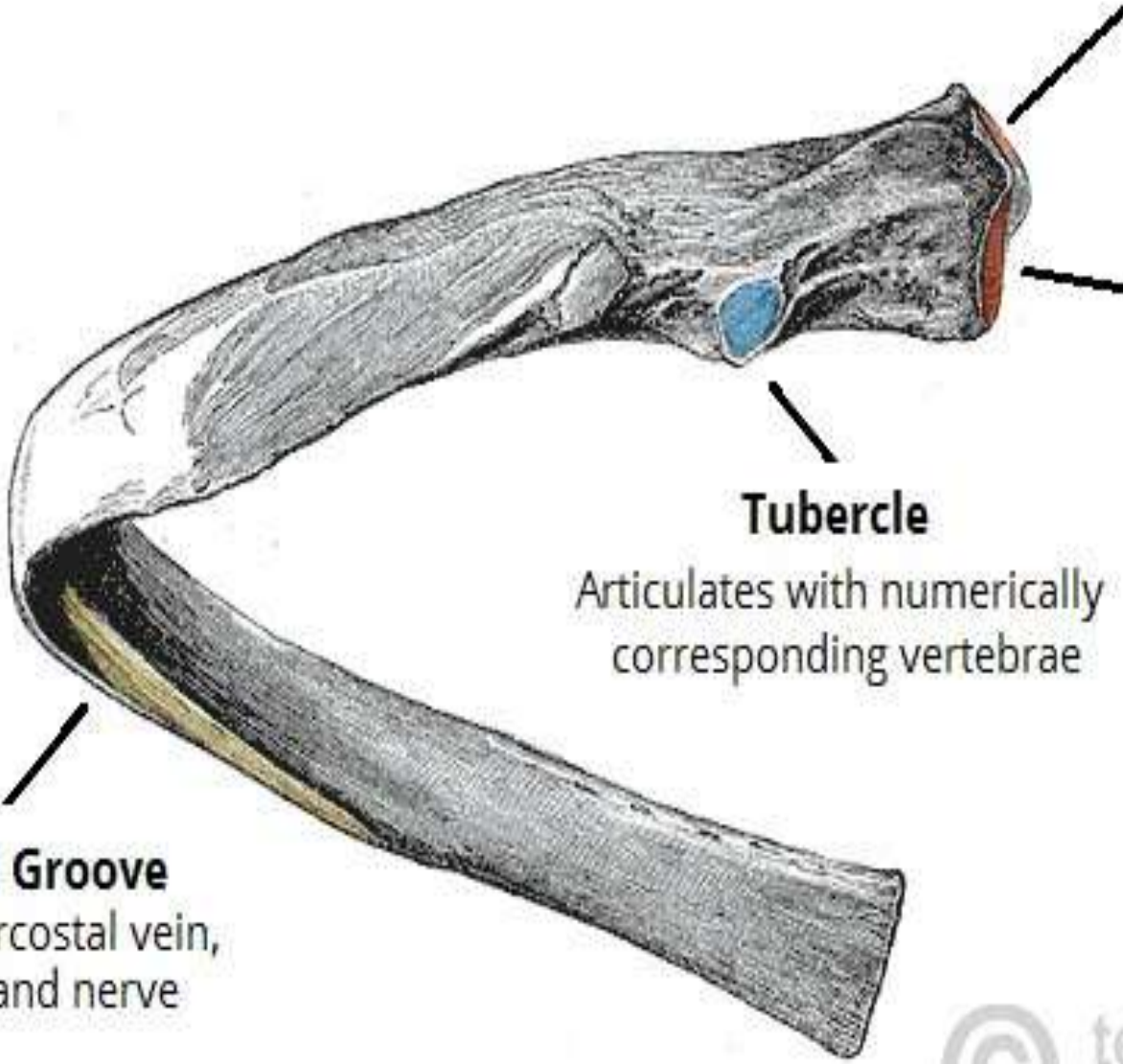
Articulates with numerically corresponding vertebrae

Tubercle

Articulates with numerically corresponding vertebrae

Costal Groove

For intercostal vein, artery and nerve



TYPICAL

- The neck contains no bony prominences, but simply connects the head with the body.
- Where the neck meets the body there is a roughened tubercle, with a facet for articulation with the transverse process of the corresponding vertebrae.

TYPICAL

- The body, or shaft of the rib is flat and curved. The internal surface of the shaft has a groove for the neurovascular supply of the thorax, protecting the vessels and nerves from damage

ATYPICAL

- Ribs 1, 2, 10 11 and 12 can be described as 'atypical' – they have features that are not common to all the ribs.

RIB 1

- Rib 1 is shorter and wider than the other ribs.
- It only has one facet on its head for articulation with its corresponding vertebrae (there isn't a thoracic vertebra above it).
- The superior surface is marked by two grooves, which make way for the subclavian vessels.

RIB 2

- Rib 2 is thinner and longer than rib 1, and has two articular facets on the head as normal.
- It has a roughened area on its upper surface, from which the serratus anterior muscle originates.

ATYPICAL

- Rib 10 only has one facet – for articulation with its numerically corresponding vertebrae.
- Ribs 11 and 12 have no neck, and only contain one facet, which is for articulation with their corresponding vertebrae.

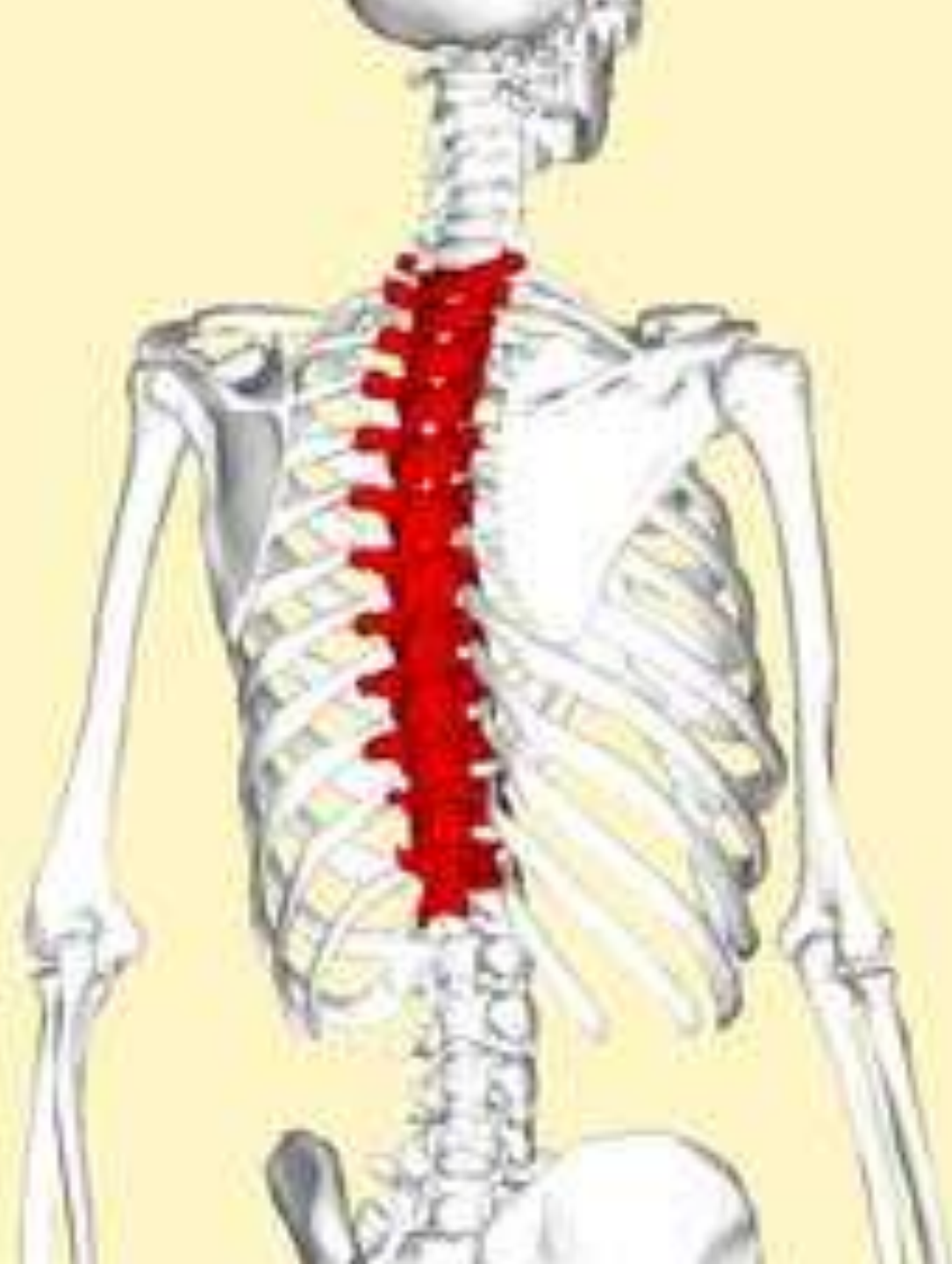
RIB FRACTURES

- Rib fractures most commonly occur in the middle ribs, as a consequence of crushing injuries or direct trauma.
- A common complication of a rib fracture is further soft tissue injury from the broken fragments. Structures most at risk of damage are the lungs, spleen or diaphragm.



THORACIC SPINE

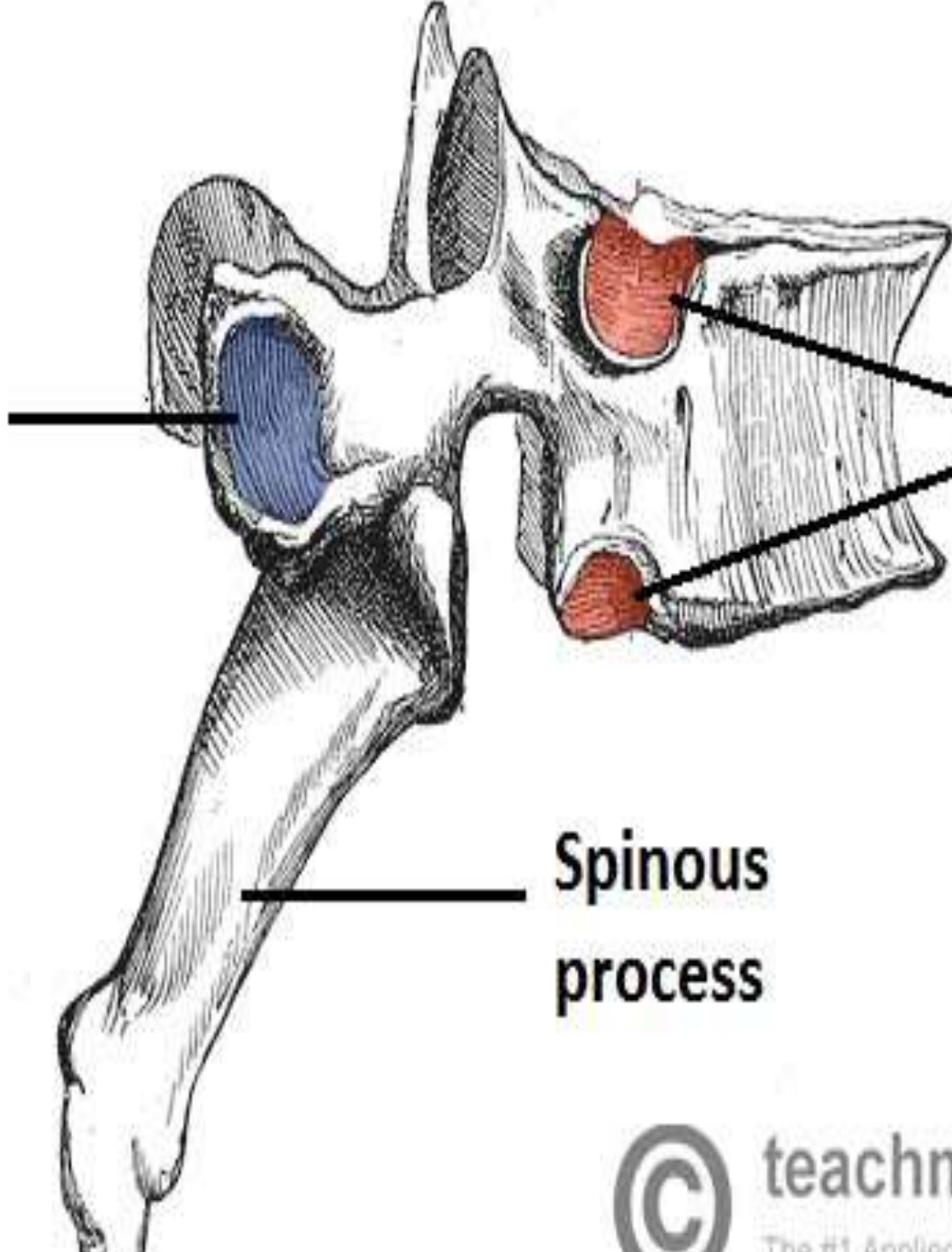
- The thoracic spine is the second segment of the vertebral column, located between the cervical and lumbar vertebral segments.
- It consists of twelve vertebrae, which are separated by intervertebral discs.



THORACIC VERTEBRAE

- The thoracic vertebrae have four features which distinguish them from other vertebrae:
- Vertebral body is heart shaped.
- Presence of demi-facets on the sides of each vertebral body – these articulate with the heads of the ribs.
- Presence of costal facets on the transverse processes – these articulate with the tubercles of the ribs. They are present on T1-T10 only.
- The spinous processes are long and slant inferiorly. This offers increased protection to the spinal cord, preventing an object such as a knife entering the spinal canal.

Costal facet



Demi-facets

Spinous
process



teachmeanatomy

The #1 Applied Human Anatomy Site on the Web

CLINICAL RELEVANCE

- Kyphosis is an excessive curvature of the thoracic spine, causing the back to appear “hunched”.
- It may occur for a number of reasons early in life. These include poor posture, abnormally wedge-shaped shaped vertebrae, and fusing of vertebrae during development.



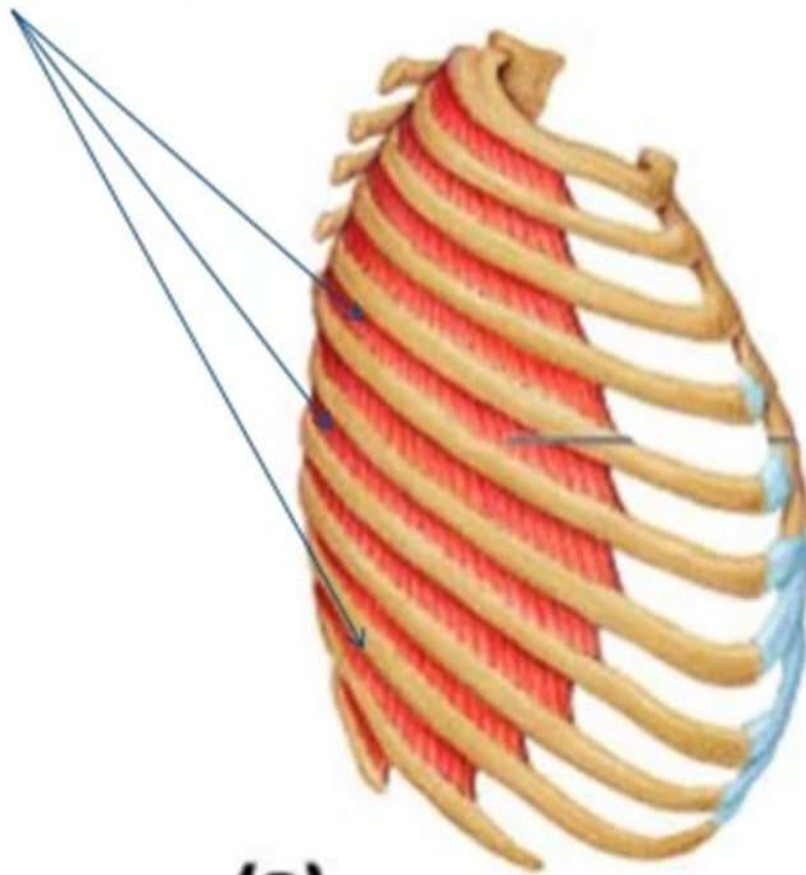
MUSCLES OF THORAX

- There are five muscles that make up the thoracic cage; the intercostals (external, internal and innermost), subcostals, and transversus thoracis.
- These muscles act to change the volume of the thoracic cavity during respiration.

INTERCOSTAL MS

- The intercostal muscles lie in the intercostal spaces between ribs. They are organised into three layers.
- There are 11 pairs of external intercostal muscles. They run inferoanteriorly from the rib above to the rib below, and are continuous with the external oblique of the abdomen.

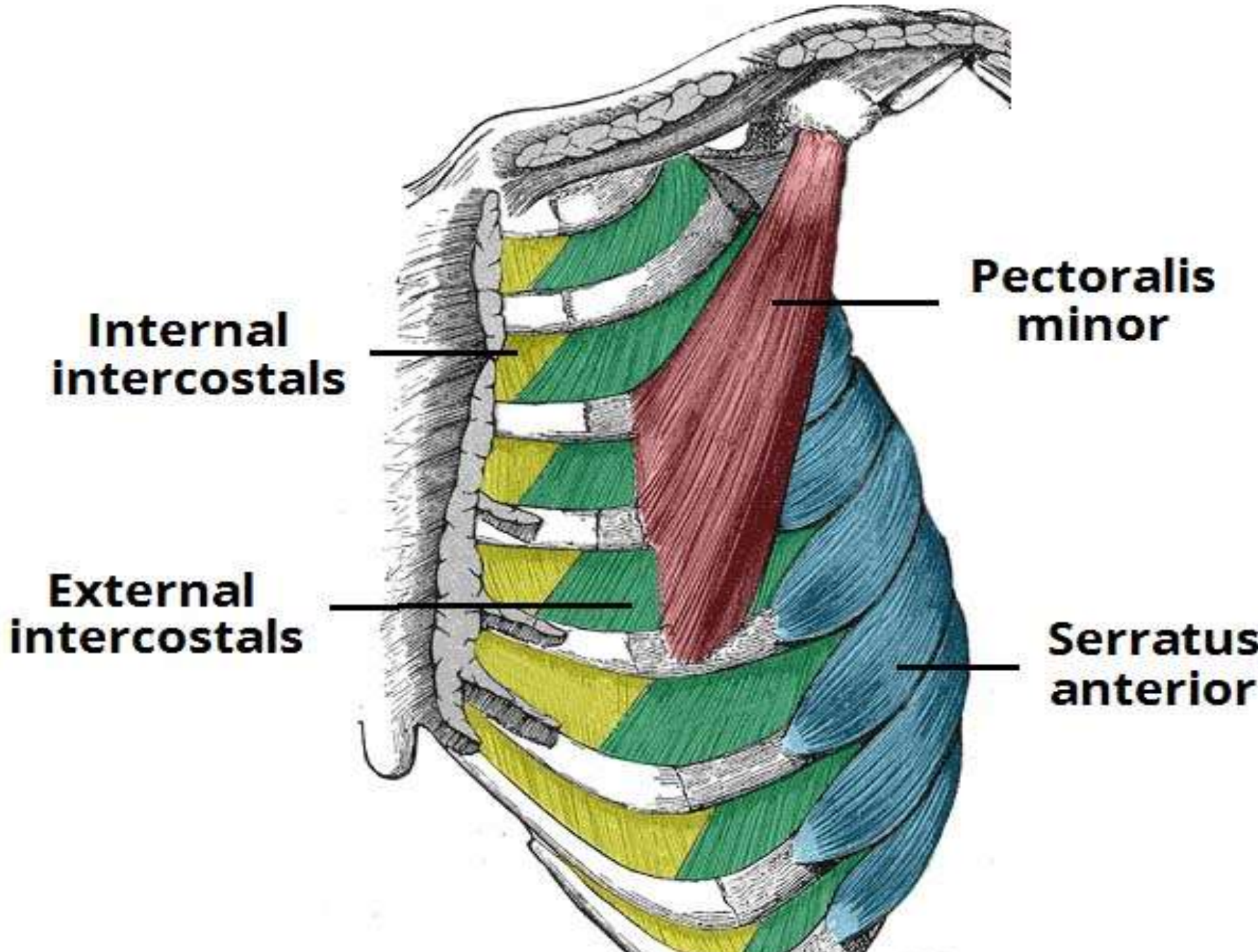
External intercostal muscle



(a)

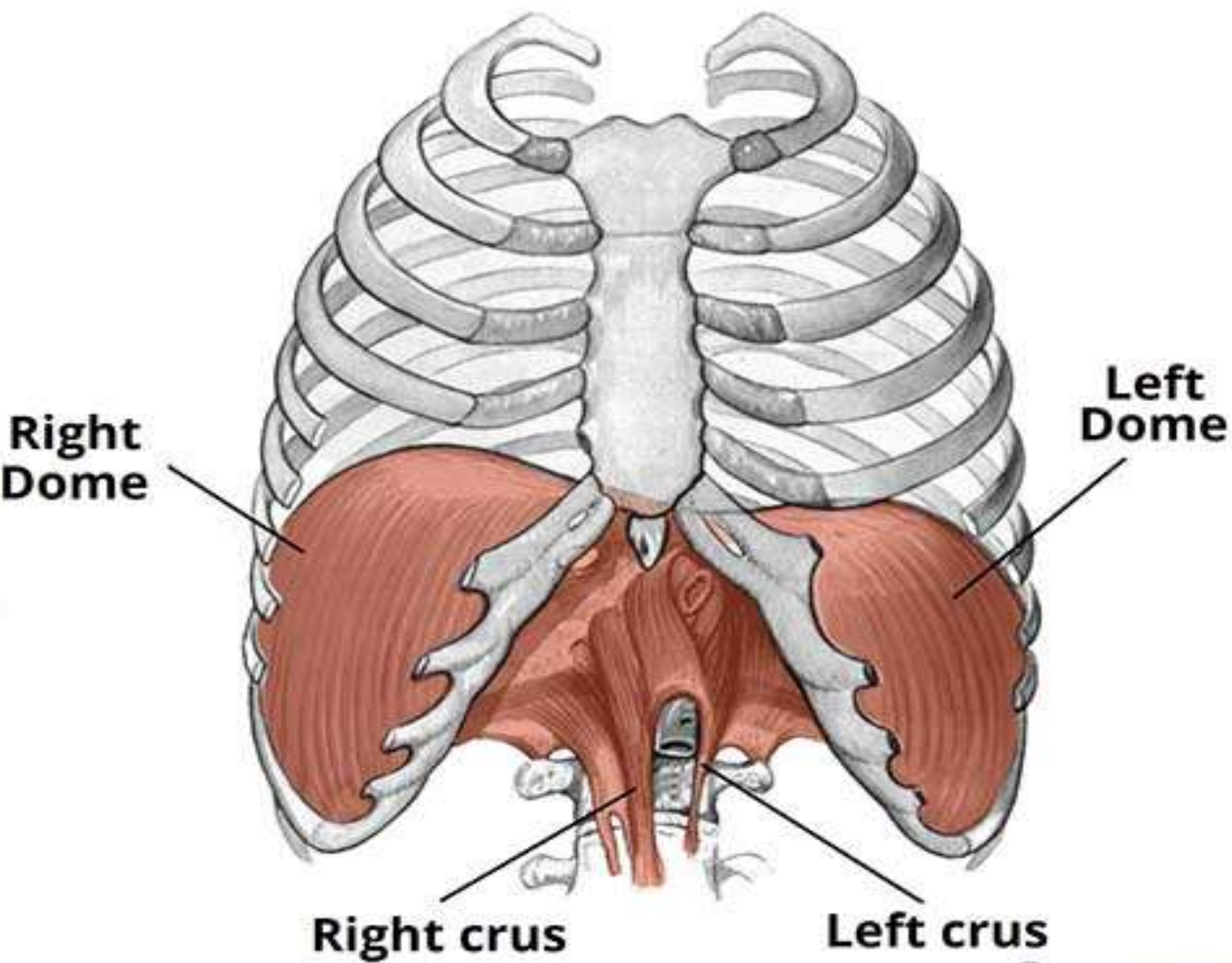
INTERNAL INTERCOSTAL MUSCLES

- These flat muscles lie deep to the external intercostals. Like the external intercostals, they run from the rib above to the one below, but in an opposite direction (inferoposteriorly). They are continuous with the internal oblique muscle of the abdominal wall



DIAPHRAGM

- The diaphragm is a double-domed musculotendinous sheet, located at the inferior-most aspect of the rib cage. It serves two main functions:
- Separates the thoracic cavity from the abdominal cavity

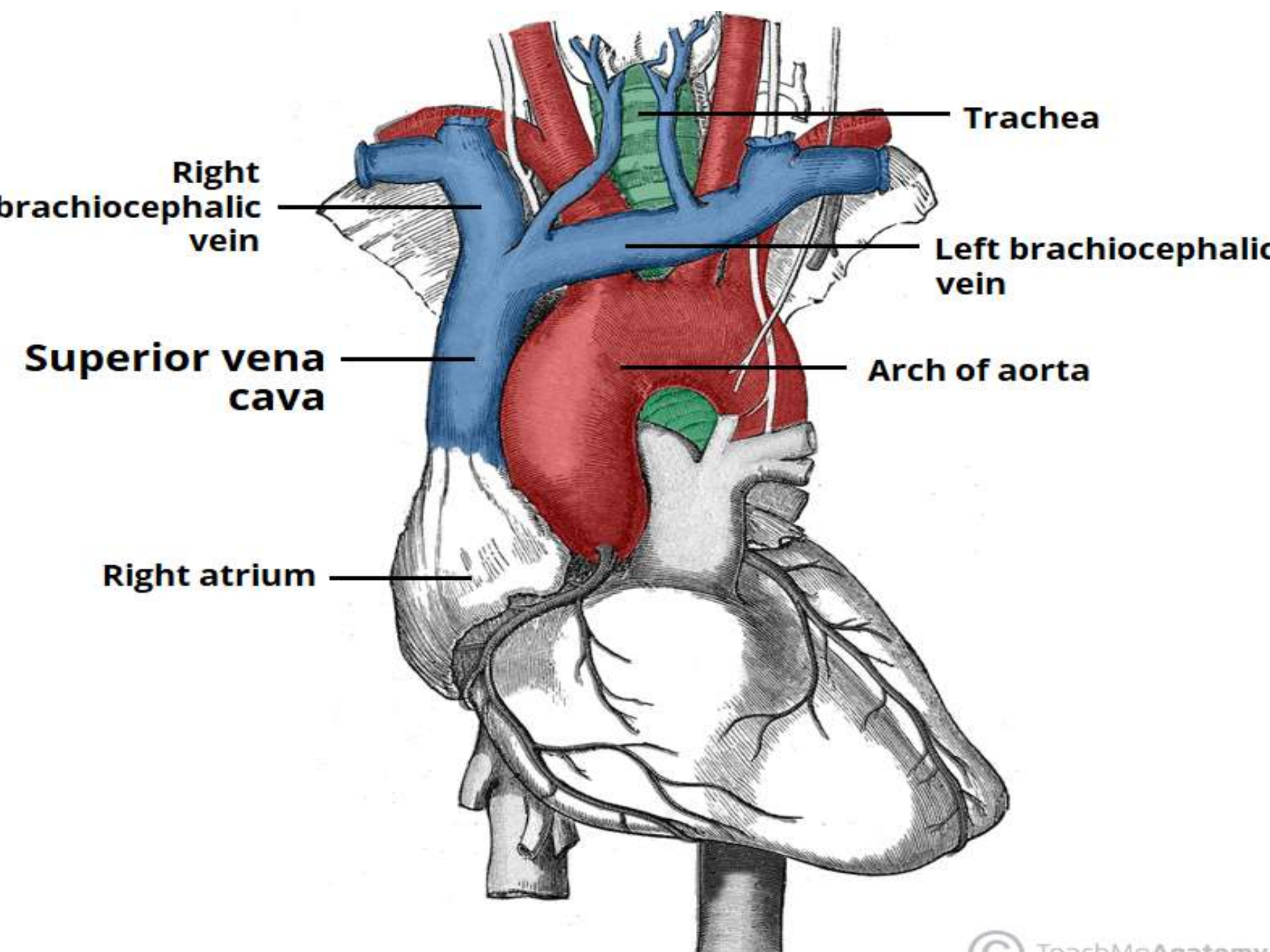


ORGANS OF THORAX

- HEART
- LUNGS
- PLEURAE
- THYMUS GLAND
- BREAST
- TRACHEOBRONCHIAL TREE

VASCULATURE OF THORAX

- **The superior vena cava (SVC)** is a large, valveless vein that conveys venous blood from the upper half of the body and returns it to the right atrium.
- The three major branches of the **aortic arch** arise within the superior mediastinum:
 - **Brachiocephalic artery** – supplying the right side of the head & neck and the right upper limb.
 - **Left Common carotid artery** – to the left side of the head & neck.
 - **Left Subclavian artery** – to the left upper limb.



AREAS OF THORAX..MEDIASTINUM

- The mediastinum is the central compartment of the thoracic cavity, located between the two pleural sacs.
- It contains most of the thoracic organs, and acts as a conduit for structures traversing the thorax on their way into the abdomen.

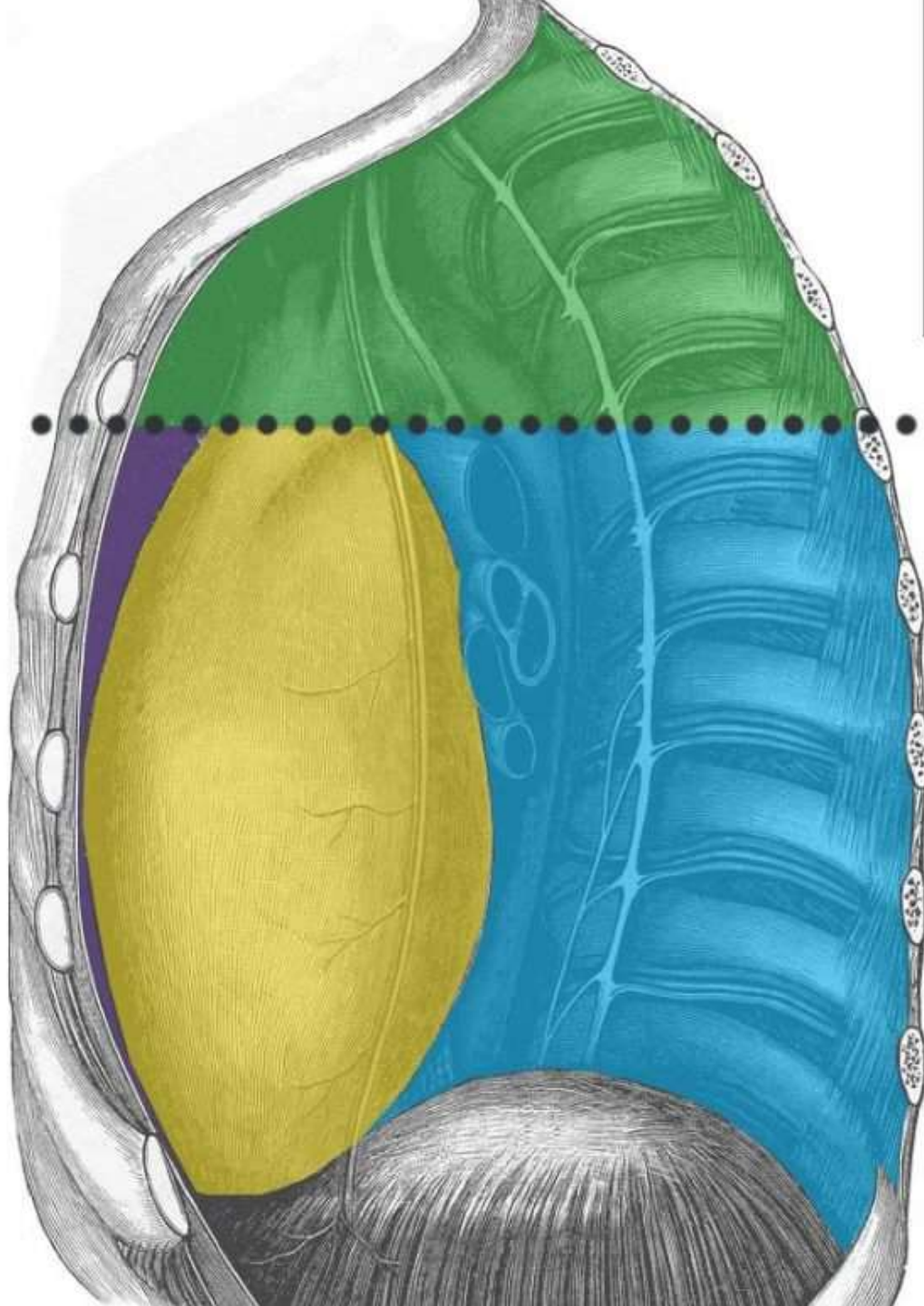
AREAS OF THORAX

- Anatomically, the mediastinum is divided into two parts by an imaginary line that runs from the sternal angle (the angle formed by the junction of the sternal body and manubrium) to the T4 vertebrae

AREAS OF THORAX

- **Superior mediastinum** – extends upwards, terminating at the superior thoracic aperture.
- **Inferior mediastinum** – extends downwards, terminating at the diaphragm. It is further subdivided into the anterior mediastinum, middle mediastinum and posterior mediastinum

**Sternal
angle**



-  Superior mediastinum
-  Anterior mediastinum
-  Middle mediastinum
-  Posterior mediastinum

Thank You

