

The chest, properly called the thorax, is the superior part of the trunk located between the neck and abdomen. It consists of several components:

- Thoracic wall
- Several cavities
- Neurovasculature and lymphatics
- Internal organs
- Breasts

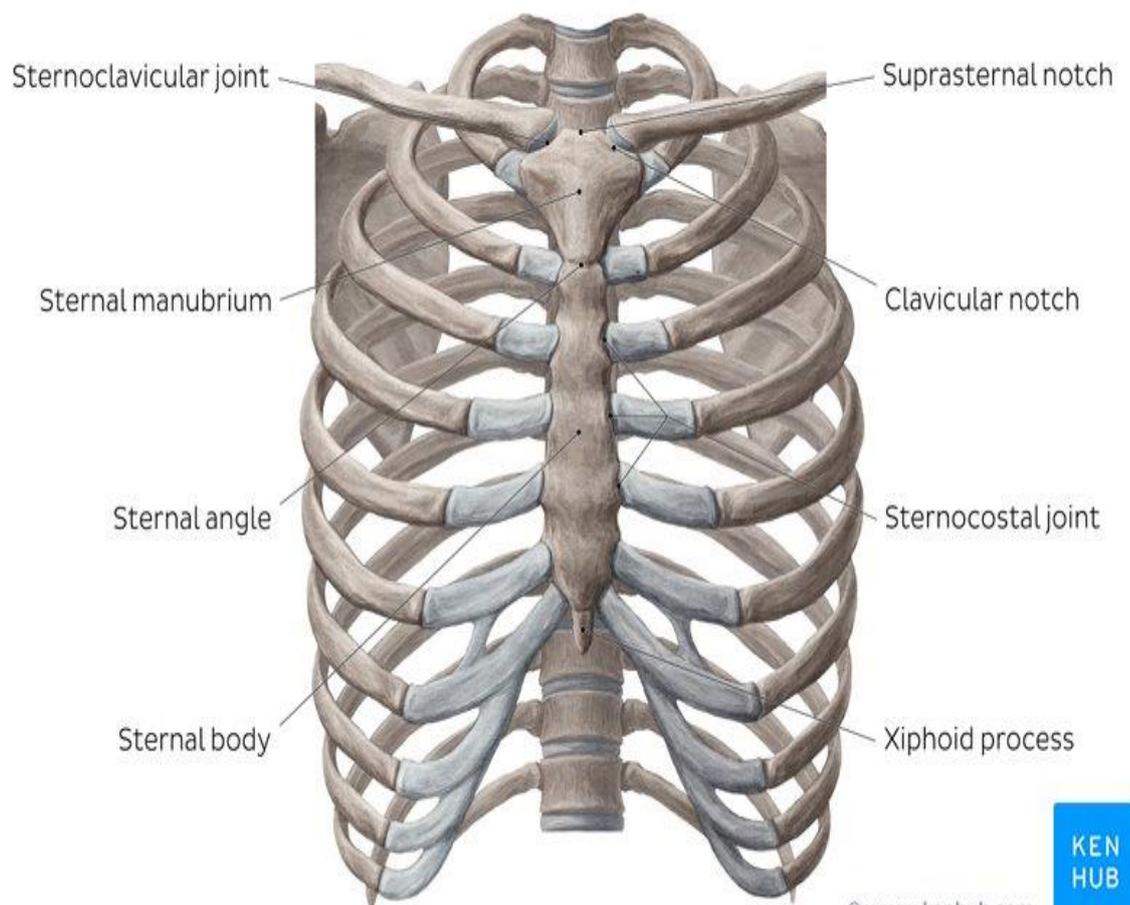
Key facts about the thorax	
Table quiz	
Thoracic wall	<p>Openings: superior and inferior thoracic apertures</p> <p>Skeleton: sternum, twelve pairs of ribs, twelve thoracic vertebrae</p> <p>Joints: intervertebral discs, costovertebral, joint of head of rib, sternocostal, sternoclavicular, costochondral, interchondral joints</p> <p>Intercostal spaces: intercostal vein, artery, nerve</p> <p>Muscles: intercostal muscles, (external, internal, innermost), transversus thoracis, subcostals, levatores costarum, serratus posterior superior, serratus posterior inferior muscles</p>
Thoracic cavity	<p>The mediastinum is located centrally and bordered by two pleural cavities laterally. The mediastinum consists of superior and inferior mediastinal cavities. The inferior mediastinal cavity is comprised of anterior, middle and posterior compartments.</p>
Neurovasculature	<p>Arterial: the three largest thoracic arteries (brachiocephalic trunk, left common carotid artery, left subclavian artery) originate from the thoracic aorta</p> <p>Venous: the major thoracic veins (superior vena cava, azygos venous system, accessory hemiazygos vein, pulmonary veins, esophageal veins, internal thoracic veins, cardiac veins, and superior intercostal veins) drain into the superior vena cava</p> <p>Nerves: esophageal, cardiac, and thoracic aortic nervous plexuses</p>
Organs	Heart, lungs, thymus, trachea, esophagus

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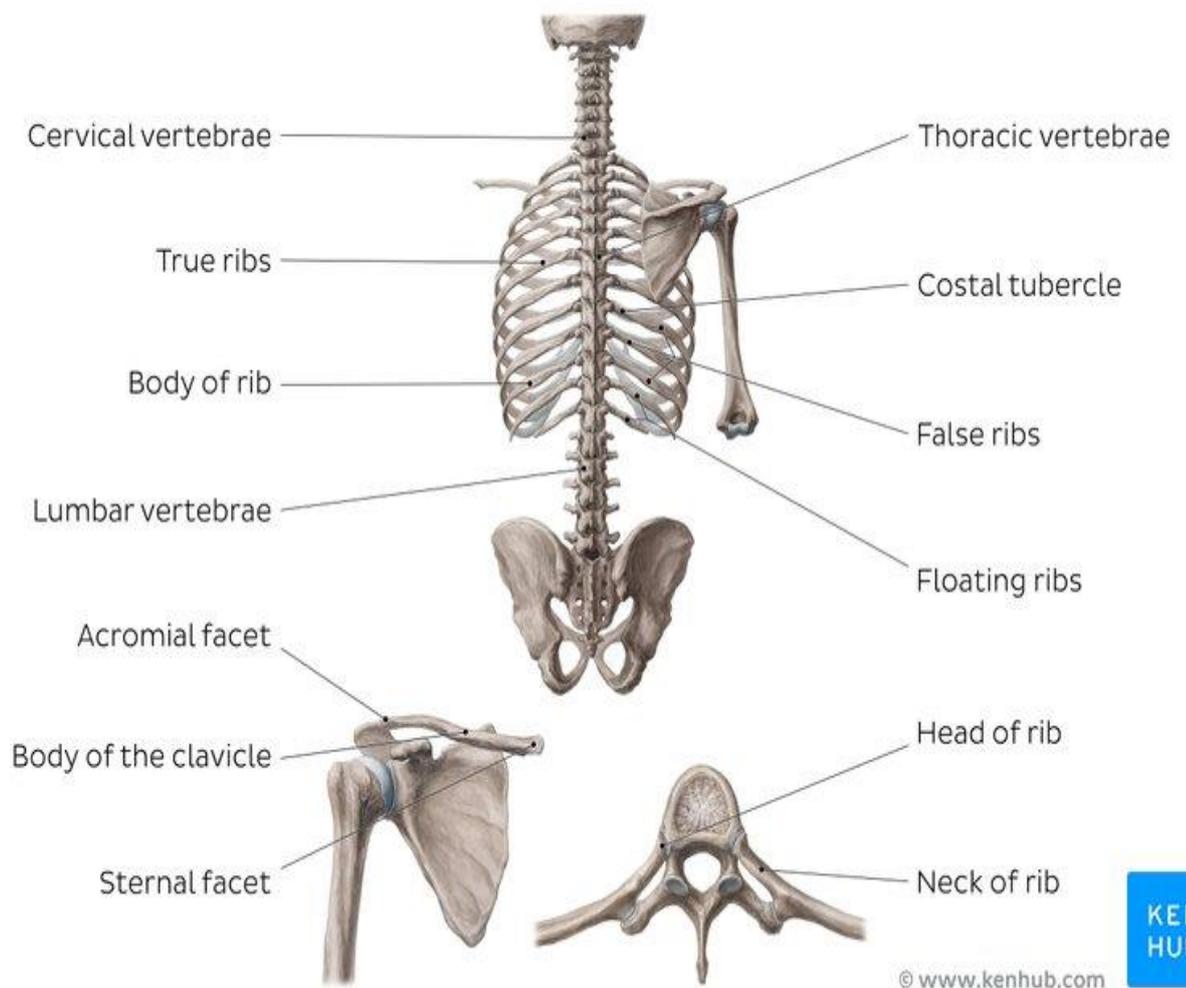
1. Thoracic wall
2. Thoracic cavity
3. Neurovasculature
4. Organs
5. Female breast anatomy

The thoracic, or chest wall, consists of a skeletal framework, fascia, muscles, and neurovasculature – all connected together to form a strong and protective yet flexible cage.

The thorax has two major openings: the superior thoracic aperture found superiorly and the inferior thoracic aperture located inferiorly. The superior thoracic aperture opens towards the neck. It is bounded by the bones of the upper thorax; manubrium of sternum, the first pair of ribs, and the body of the vertebra T1. The inferior thoracic aperture is almost completely covered by the diaphragm, separating it from the abdominal cavity.



6. Bones and joints of the ventral trunk (anterior view)



Bones of the dorsal trunk (posterior view)

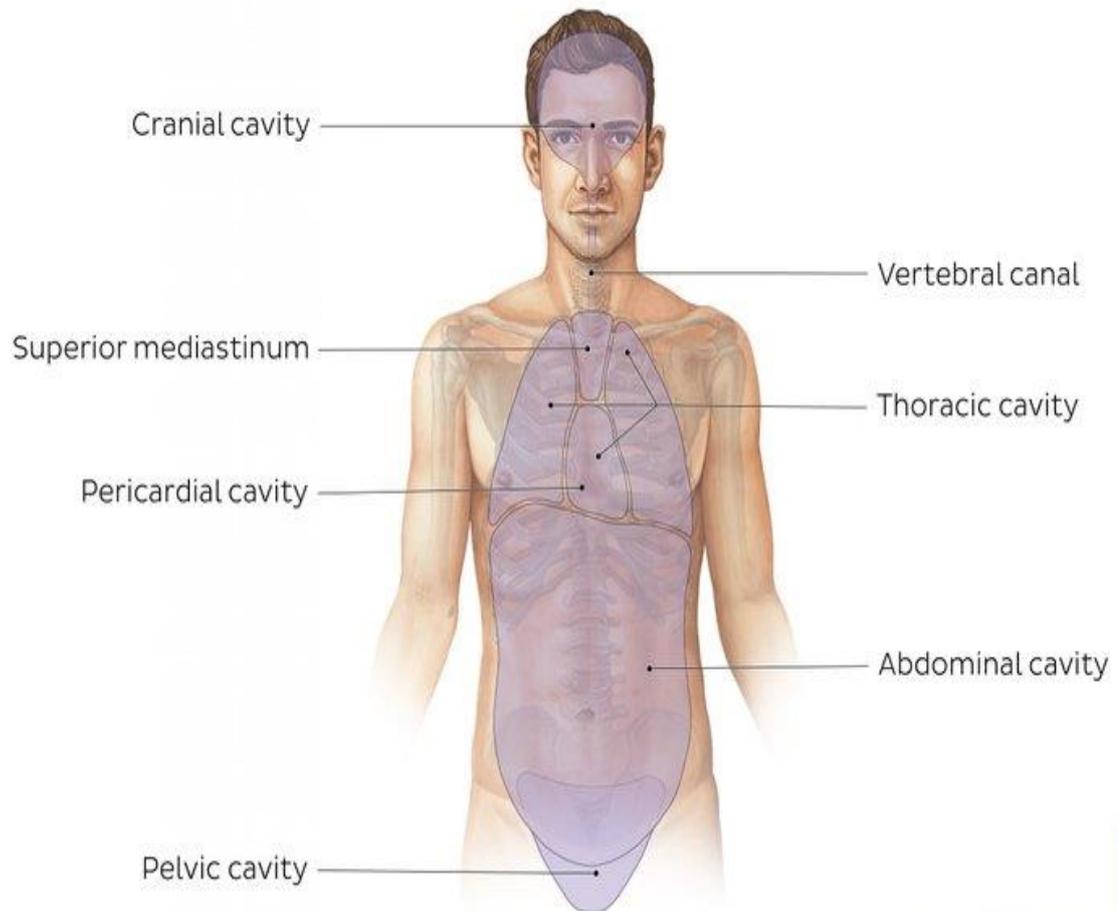
the thoracic skeleton. It is made up of the sternum, twelve pairs of ribs, twelve thoracic vertebrae, and interconnecting joints. The main thoracic joints include the intervertebral discs, costovertebral, sternocostal, sternoclavicular, costochondral, and interchondral joints.

Running between every two adjacent ribs are anatomical spaces called intercostal spaces. There are eleven in total, each one containing the intercostal muscles (external, internal, and innermost) together with the intercostal neurovascular bundle. This consists of the intercostal vein, artery, and nerve.

Apart from the intercostals and diaphragm, which are the most important thoracic muscles responsible for breathing, there are additional ones that are involved in forming the thoracic wall.

Broadly speaking, they attach to the ribs, their cartilages, or thoracic vertebrae—ultimately depressing or elevating the ribs. In addition, all of the thoracic muscles provide further support and strength for the thorax.

## Thoracic cavity



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### Cavities of the human body (anterior view)

The thoracic wall actually encloses a cavity, or space, that is filled with various anatomical structures. Since there are so many of them, the thoracic cavity is divided into several compartments to aid their localization. There is a mediastinum located centrally bordered by two pleural cavities laterally. The mediastinum is further divided into the superior and inferior mediastinal cavities. In turn, the latter is made up of an anterior, middle, and posterior compartment.

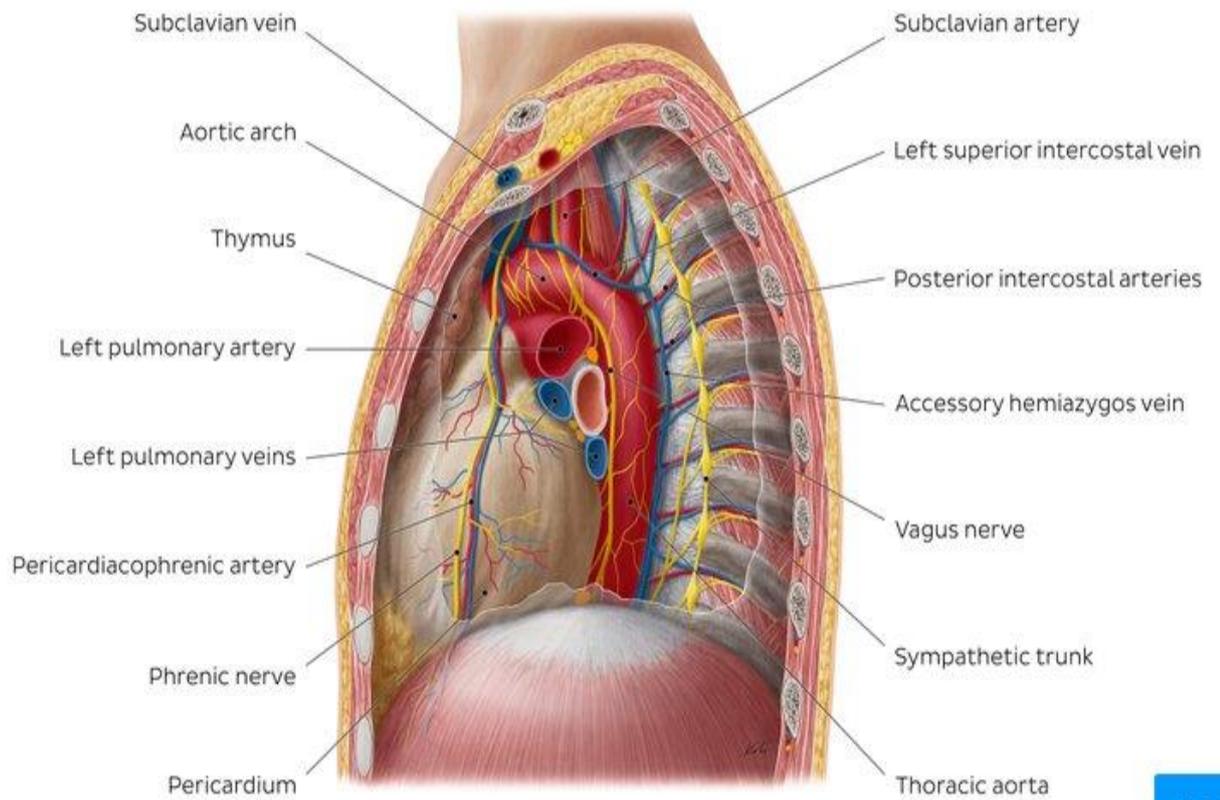
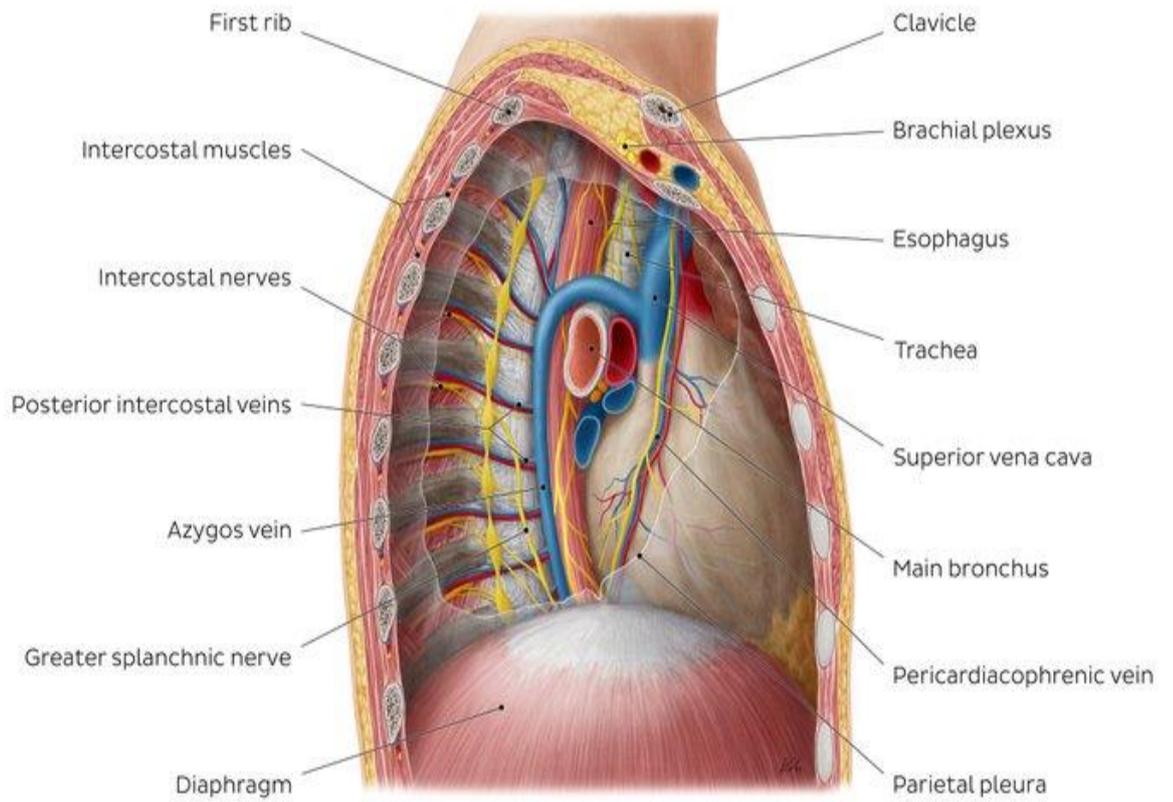
The thoracic cavity communicates with the neck via the superior thoracic

aperture and with the abdominal cavity via the inferior thoracic aperture through anatomical spaces piercing the diaphragm.

Located inside each cavity and compartment are various organs, thoracic blood vessels, nerves, and lymph nodes:

Superior <u>mediastinum</u>	Thymus, trachea, esophagus, aortic arch, brachiocephalic trunk, left common carotid artery, left subclavian artery, internal thoracic arteries, superior vena cava, left superior intercostal vein, <u>brachiocephalic veins</u> , phrenic nerves, vagus nerves, left recurrent laryngeal nerve, thoracic duct, lymph nodes and vessels
Anterior mediastinum	Portion of the thymus, adipose and connective tissue, lymph nodes, branches of internal thoracic vessels, sternopericardial ligaments
Middle mediastinum	<u>Pericardium</u> , heart, <u>pulmonary trunk</u> , ascending aorta, pulmonary veins, superior vena cava, inferior vena cava, tracheal bifurcation, main bronchi
Posterior mediastinum	Esophagus, esophageal plexus, thoracic aorta and its branches, azygos and hemiazygos venous systems, thoracic duct, sympathetic trunk, thoracic splanchnic nerves
Pleural cavities	Pleurae and lungs

Who would have thought that such a small space can contain so many structures? To simplify your learning, here's an overview of the most important ones:



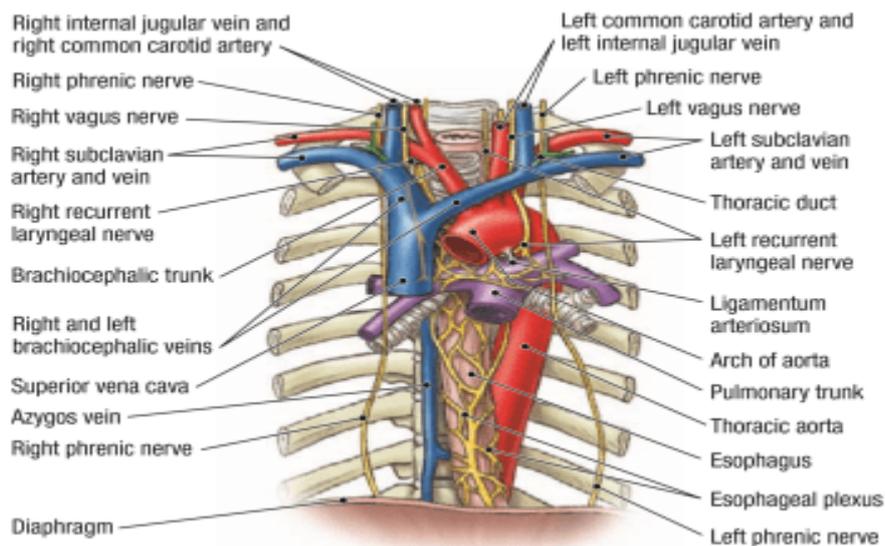
## Contents of the mediastinum (lateral view)

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### Neurovasculature

All the thoracic arteries originate from the aorta and the three largest ones are the brachiocephalic trunk, left common carotid artery, and left subclavian artery. Several visceral arteries also supply various thoracic organs including: bronchial, esophageal, pericardial, and several small mediastinal arteries. The thoracic aorta also gives off parietal branches for the thoracic muscles. These include the posterior intercostal, superior phrenic, and paired subcostal arteries. In terms of venous drainage, the major veins of the thorax are the: superior vena cava, azygos venous system, accessory hemiazygos vein, pulmonary veins, esophageal veins, internal thoracic veins, cardiac veins, and superior intercostal veins. These vessels collect all the deoxygenated blood from the muscles and organs of the thorax, ultimately bringing them into the superior vena cava.

Since the thorax houses several organs, the main innervation is autonomic and appears in the form of visceral plexuses located close to each respective organ. These include the esophageal, cardiac, and thoracic aortic plexuses. These are formed by contributions from the sympathetic trunk, thoracic splanchnic nerves, recurrent laryngeal nerve, and the vagus nerve.

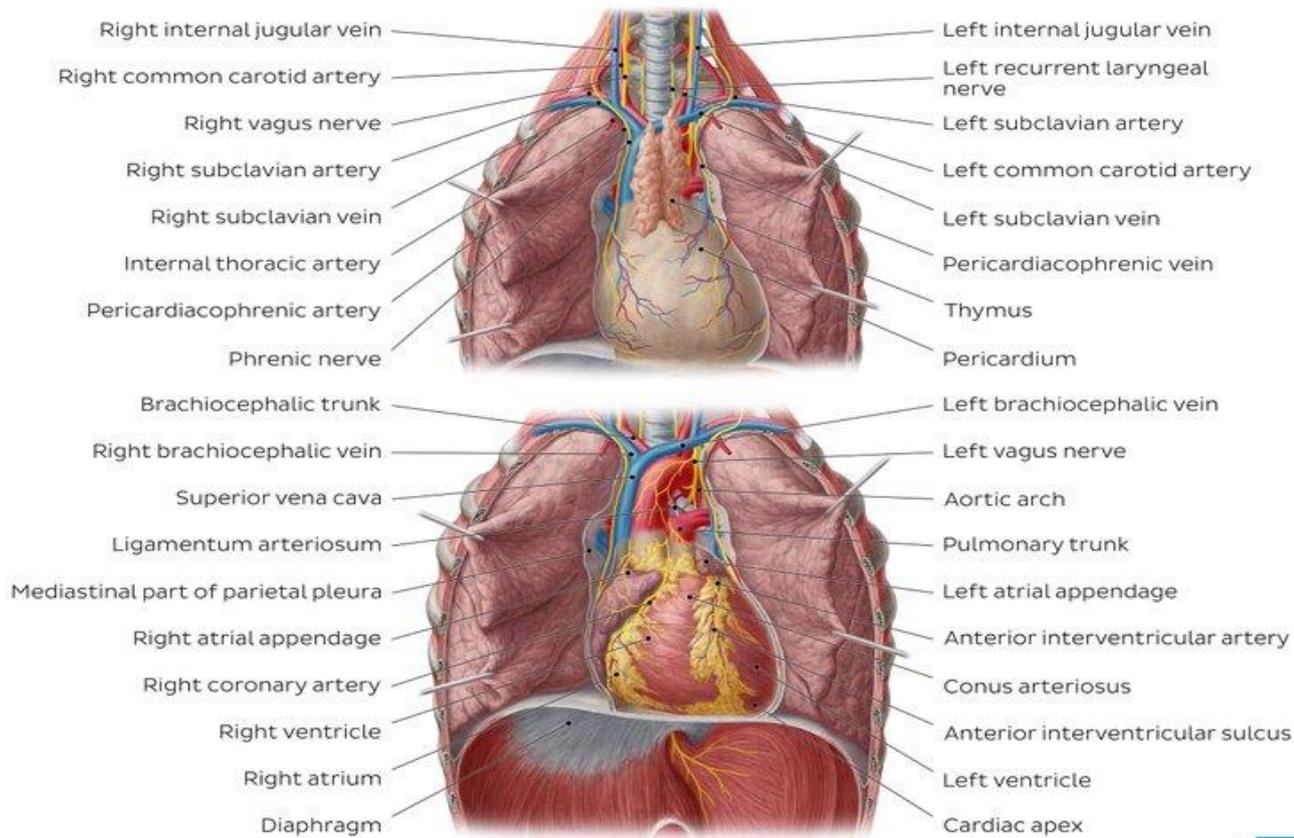


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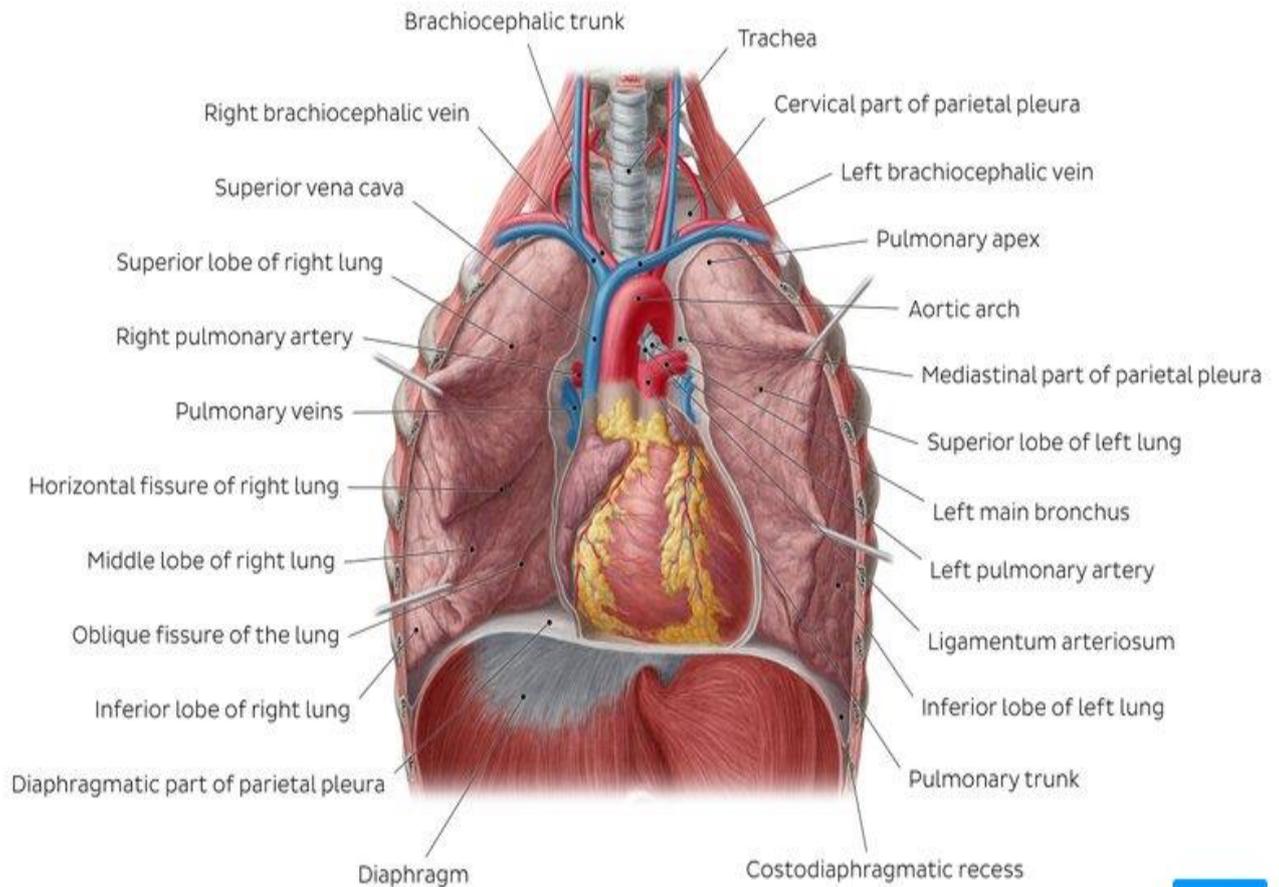
### Organs

As you've seen above, the thorax contains more than thoracic arteries, nerves, and lymphatics. It also contains vital organs and structures, such as the heart, lungs, thymus, trachea, and esophagus.

One of the most important organs situated in the thorax is the heart. It is the size of a clenched fist located in the middle mediastinum within the pericardial sac. This muscular pump receives direct blood via the coronary circulation and consists of four chambers: two atria and two ventricles. The right side of the heart handles deoxygenated blood while the left hand side deals with oxygenated blood. Several major blood vessels enter and leave the heart carrying blood to and from pulmonary and systemic circulations. They are the: superior and inferior vena cavae, pulmonary arteries, aorta, and pulmonary veins. Blood flow between the atria and ventricles is regulated by the heart valves (left atrioventricular (mitral), right atrioventricular (tricuspid), aortic, and pulmonary). In order for the heart to beat and complete its functions, it has an autonomic nervous control facilitated by the sinuatrial node, atrioventricular node, bundle of His, and Purkinje fibers.



The lungs are part of the respiratory system and they are the site of gas exchange and respiration. These bilateral structures occupy the pleural cavities and consist of lobes and bronchopulmonary segments separated by fissures. Air enters and leaves the lungs via a network of passageways consisting of the trachea, bronchi, bronchioles, and alveoli. Several structures enter each lung via a hilum: principal bronchus, pulmonary artery, two pulmonary veins, bronchial vessels, pulmonary autonomic plexus, lymph nodes and vessels, and connective tissue. Each lung is surrounded by two layers of pleura (parietal and visceral). The lung parenchyma is supplied by the bronchial arteries and veins, as well as the pulmonary nervous plexus.



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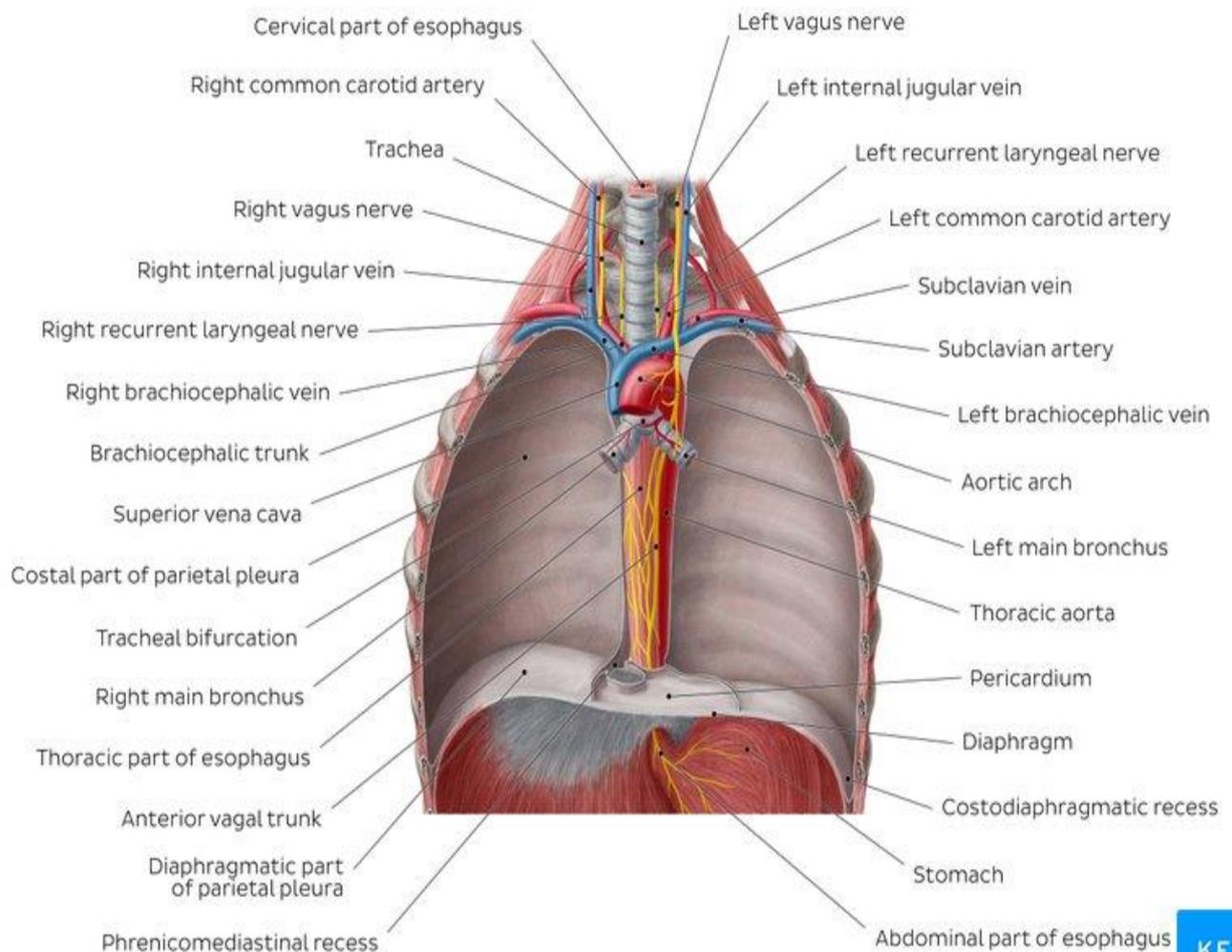
### Lungs in situ (anterior view)



Intimately linked to the lungs is the trachea – a tubular organ. It is located anterior to the esophagus and extends into the superior mediastinum. The trachea is part of the respiratory system and provides a passage for air to enter and exit the lungs. It is surrounded by rings of cartilage and divides into the left and right bronchi at the sternal angle. Those bronchi continue towards the lungs, dividing further and further, until reaching the alveoli. The trachea receives its arterial supply from the inferior thyroid and bronchial arteries. Deoxygenated blood is drained from the trachea via the brachiocephalic, azygos, and accessory hemiazygos veins. Innervation arrives via the recurrent laryngeal nerve and sympathetic trunk

In addition to the trachea, we have another tubular organ. The esophagus is a fibromuscular tube extending from the pharynx to the stomach. It is divided into three parts: cervical, thoracic, and abdominal. The esophagus is part of the digestive system

and its role is to transport saliva, liquids, and solids all the way to the stomach using peristaltic contractions. Two sphincters (upper and lower) prevent the reflux of food particles or gastric acid. Arterial supply of the esophagus originates from the inferior thyroid artery, thoracic aorta, and left gastric artery. Deoxygenated blood is drained by several vessels: inferior thyroid veins, azygos and hemiazygos venous systems, intercostal veins, bronchial veins, and short gastric veins. Innervation is provided by the recurrent laryngeal nerve, sympathetic trunk, and esophageal nervous plexus.



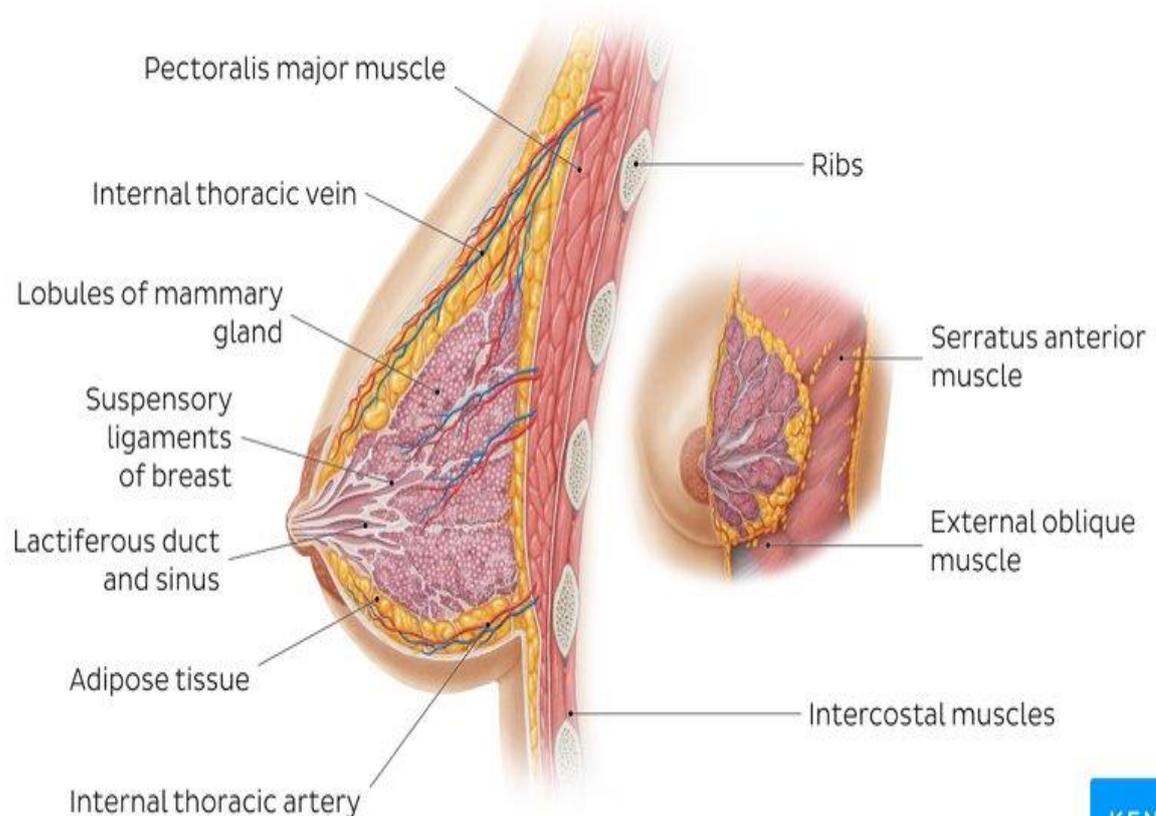
### Esophagus in situ (anterior view)

Now we'll move to a small organ called the thymus. It is actually a lymphoid organ spanning the superior and anterior mediastinal cavities. Its main role is to facilitate the

maturation of a specific subset of immune cells (T-lymphocytes) and starts to shrink after puberty. As a result, adults typically don't have a thymus anymore.

## Female breast anatomy

The breasts are secondary sex characteristics in females and the most prominent features of the anterior thoracic wall. The primary function of the female breast is milk production following birth. This function is facilitated by the mammary glands which produce and squeeze the milk into the lactiferous ducts. The breast is attached to the skin of the thorax by suspensory ligaments (of Cooper) overlying two major muscles called pectoralis major and serratus anterior.



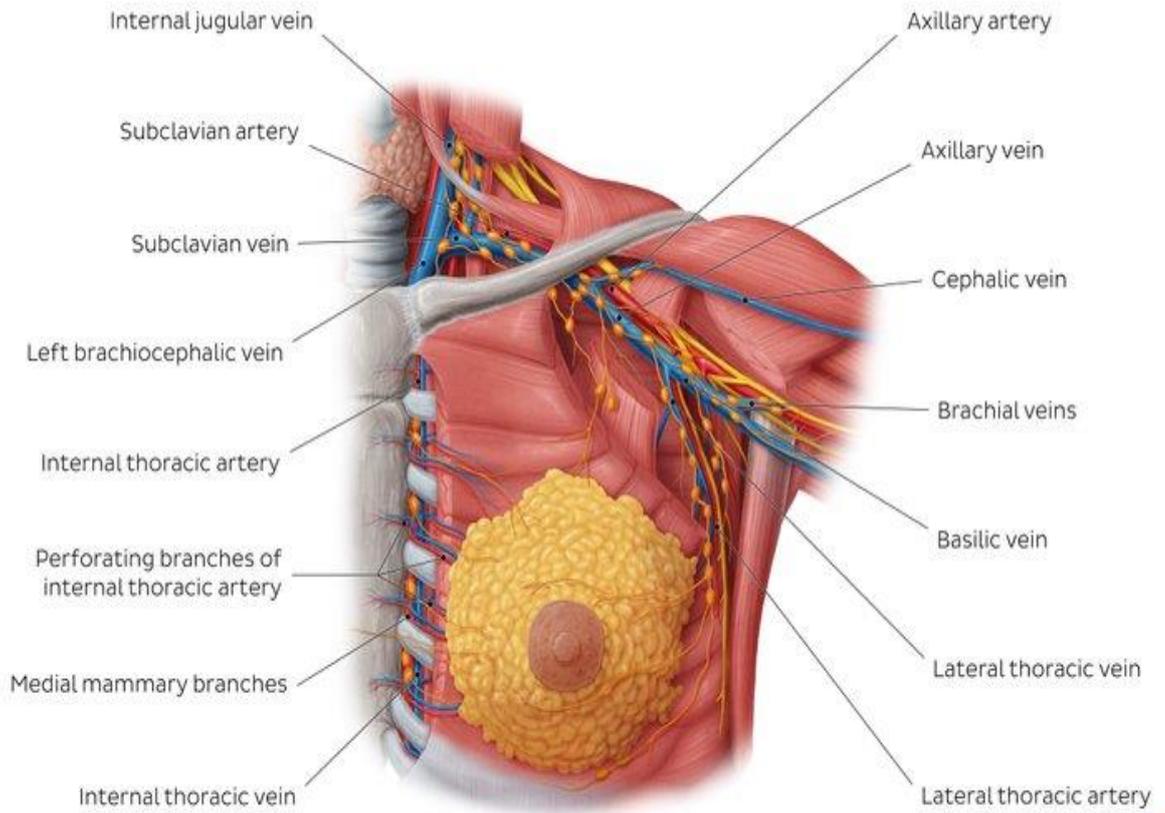
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### Anatomy of the female breast (lateral view)

They are supplied by several arteries of the thoracic wall, namely branches of the internal thoracic, axillary, lateral thoracic, thoracoacromial, and posterior intercostal arteries. The axillary and internal thoracic veins are responsible for

venous drainage, while nervous supply is carried out by branches from the intercostal nerves.



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Arteries and veins of the female breast (anterior view)