**Salah Boubnider University, Constantine 3.**
**Faculty of Medicine. Department of Medicine.**
**General Anatomy Laboratory.**
**Course intended for second-year medical students.**

# The Pericardium and Relations of the Heart

## I-Definition :

The pericardium is a fibroserous sac that encloses the heart and the root of the great vessels. It consists of two parts: a peripheral layer, the **fibrous pericardium**, and a deep layer, the **serous pericardium**.

The pericardium has two essential functions:

**Hemodynamic:** – Prevents excessive cardiac dilation – Optimizes intracavitary volume/pressure relationships

**-Anatomical and Mechanical:** – Protects the heart from infections and inflammation – Reduces friction between the heart and adjacent structures (especially the lungs)

– Anchors the heart within the thorax (during position changes)

– Serves as a passageway for neurovascular elements.

## II-Descriptive Anatomy :

### A- The Serous Pericardium :

The serous pericardium is a transparent membranous sac formed by two layers bounding a potential space, the **pericardial cavity**, which allows for cardiac movements.

**The visceral layer (epicardium):** It covers the heart and extends superiorly toward the vascular pedicles. It forms a sheath around the arterial pedicle (enclosing the pulmonary artery and its branches, as well as the aorta). Around the veins, it forms a sheath for the venous pedicle (enclosing the two venae cavae and the four pulmonary veins).

**The parietal layer:** It lines the inner surface of the visceral layer's outer border and coats the deep surface of the fibrous pericardium.

The two layers are continuous with each other along their line of reflection.

**Line of Reflection of the Serous Pericardium**:

**1-Anteriorly:** It originates at the root of the left pulmonary artery, ascends along the aorta to the origin of the brachiocephalic trunk, then descends along the superior vena cava, curving around toward its posterior surface.

**Posteriorly:** It begins at the posterior surface of the superior vena cava, descends to the right of the right pulmonary veins, loops around the inferior vena cava, and ascends along the left aspect of the right pulmonary veins. It then runs horizontally to the left to join the posterior surface of the left atrium. Finally, the line loops around the left pulmonary veins on the left,to reach the origin of the left pulmonary artery (the starting point of the line of reflection).

**Non-Pericardial Zone: The Posterior Mesocardium :**

There is an area devoid of pericardium at the level of the atria called the **posterior mesocardium**, which consists of three portions:

**Horizontal portion:** Located between the superior right and left pulmonary veins.

**Left vertical portion:** Enclosing the two left pulmonary veins.

**Right vertical portion:** Extending from the superior vena cava to the inferior vena cava, enclosing the right pulmonary veins.

- **The Transverse Pericardial Sinus (Sinus of Theile)**

It is an arcuate (curved) canal located between the arterial and venous pedicles, connecting the right and left regions of the pericardial cavity. It is bounded:

**Anteriorly:** By the ascending aorta and the pulmonary trunk.

**Posteriorly:** By the superior vena cava and the atria.

**The transverse sinus has two ostia (openings**):
The right ostium: Located between the superior vena cava and the ascending aorta.
The left ostium: Located between the pulmonary trunk and the left auricle.
These ostia allow a surgeon to easily slip a finger between the arterial pedicle and the anterior surface of the atria (surgical importance)

- **The Oblique Pericardial Sinus (Cul-de-sac of Haller)**

It is a recess (an extension of the pericardial cavity) located posterior to the left atrium, situated between the pulmonary veins.

**B- The Fibrous Pericardium** :It is a tough, fibrous sac that adheres firmly to the parietal layer of the serous pericardium. It is covered with fatty fringes. It is shaped like a cone, with its base anchored to the central tendon of the diaphragm by the **phrenicopericardial ligament**, and its truncated apex continuous with the adventitia of the great afferent and efferent blood vessels of the heart.

## C- Means of Fixation of the Heart

They anchor the heart within the thoracic cavity and include:

**Visceral Ligaments:** They fix the fibrous pericardium to surrounding organs: – **Tracheopericardial ligament** – **Bronchopericardial ligament** –--- **osophagopericardial ligament**

**Parietal Ligaments:** They attach to the walls of the thorax:
– **Phrenicopericardial ligaments:** Anchor it to the diaphragm (three in total: anterior, right, and left [inconstant/variable]).
– **Sternopericardial ligaments:** Two in total (superior and inferior).
– **Vertebropericardial ligaments:** Insert onto the prevertebral fascia from C6 to T4.

**Note:** The preferred site for pericardiocentesis via the thoracic approach is located at the medial end of the **left 5th intercostal space** (the pericardium can be reached without the risk of injuring the lung and/or pleura).

## III- Anatomical Relations of the Heart :

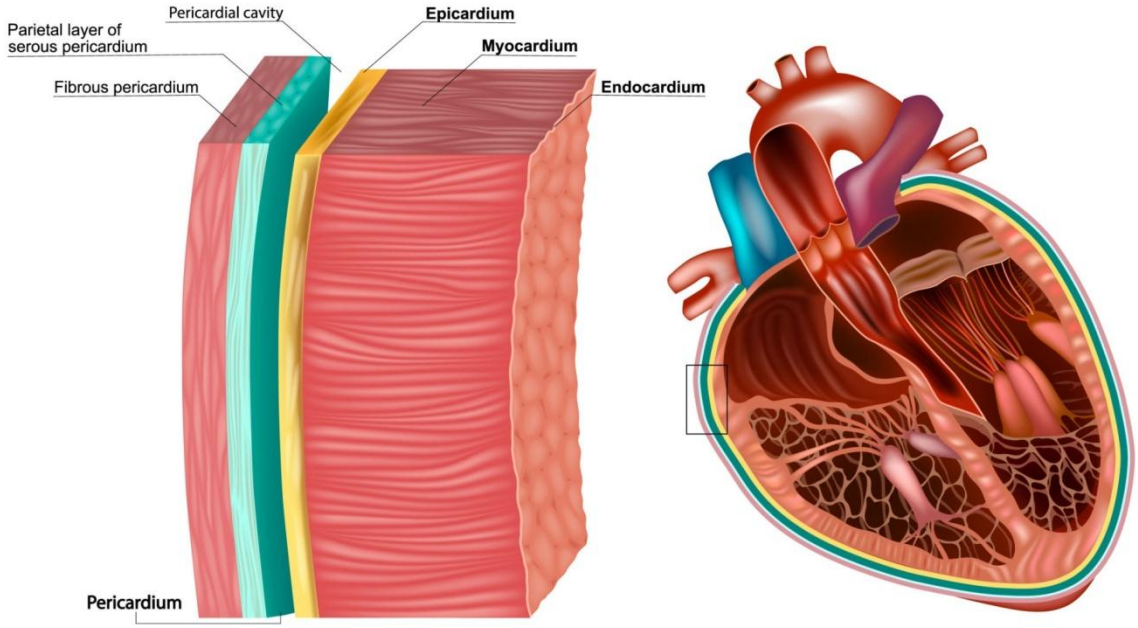
Most relations of the heart occur through the pericardium.
**1-Anterior (or Sternocostal) Surface:** It relates to:
– The pleurae and lungs – The thymus or its remnants – The internal thoracic vessels – The transversus thoracis muscle
**2-Inferior (or Diaphragmatic) Surface:** It rests on the central tendon of the diaphragm.
**3-Left (or Pulmonary) Surface:** It relates to the left pleura and left lung, and is run along by the left phrenic nerve.
**4-Base of the Heart:** The relationships differ for the two atria:
– **Right atrium:** Faces posteriorly and to the right, relating to the right pleura, right lung, and the right phrenic nerve.
– **Left atrium:** Faces posteriorly and relates to: • *Posteriorly:* The esophagus. • *Further posteriorly:* It projects onto the inferior border of the 5th thoracic vertebra (T5) and spans the entire height of the 6th, 7th, and 8th thoracic vertebrae (T6, T7, T8).
Apex:Relates to the lung, pleura, and the 5th/6th intercostal space.
**V/ Vascularization :**
**Arteries:** The arteries supplying the fibrous pericardium and the parietal layer of the serous pericardium derive from the superior phrenic, bronchial, and esophageal arteries.
The visceral layer of the serous pericardium is supplied by the coronary arteries.
**Veins:** They accompany the corresponding arteries (satellite veins) and drain into the azygos veins and the superior phrenic veins.

**Lymphatics:** They drain into the pre-pericardial, lateral pericardial, superior phrenic, and intertracheobronchial lymph nodes.

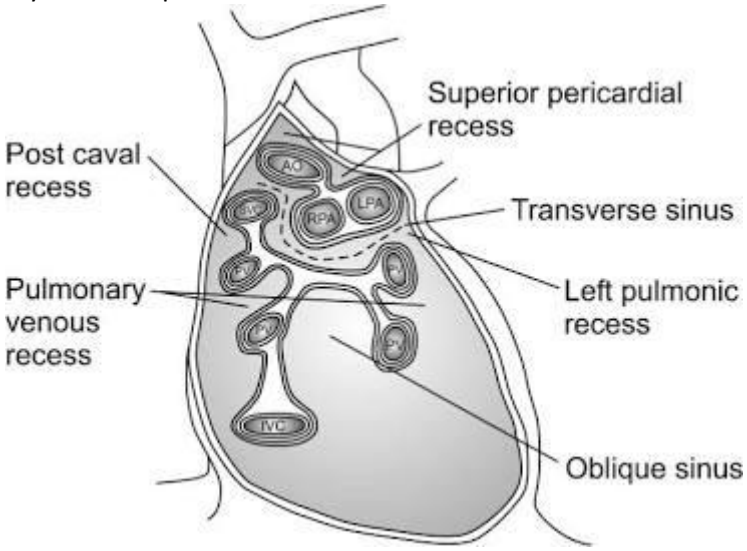
**VI/ Innervation** The nerves supplying the pericardium arise from the vagus nerve, the sympathetic trunks, and the phrenic nerves.

## Bibliography


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2. P. Kamina. *Fascicule 11 : Dos et thorax*. Ed. Maloine, 1997.
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Layers of the pericardium and heart wall.




Pericardial reflection lines and sinuses.