Heart Anatomy

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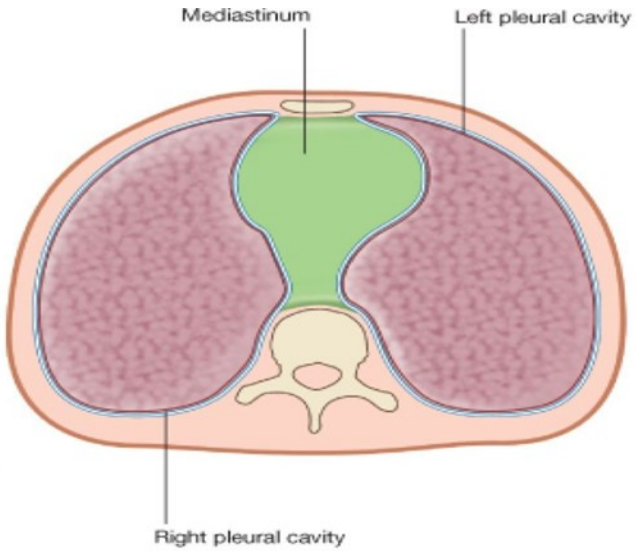
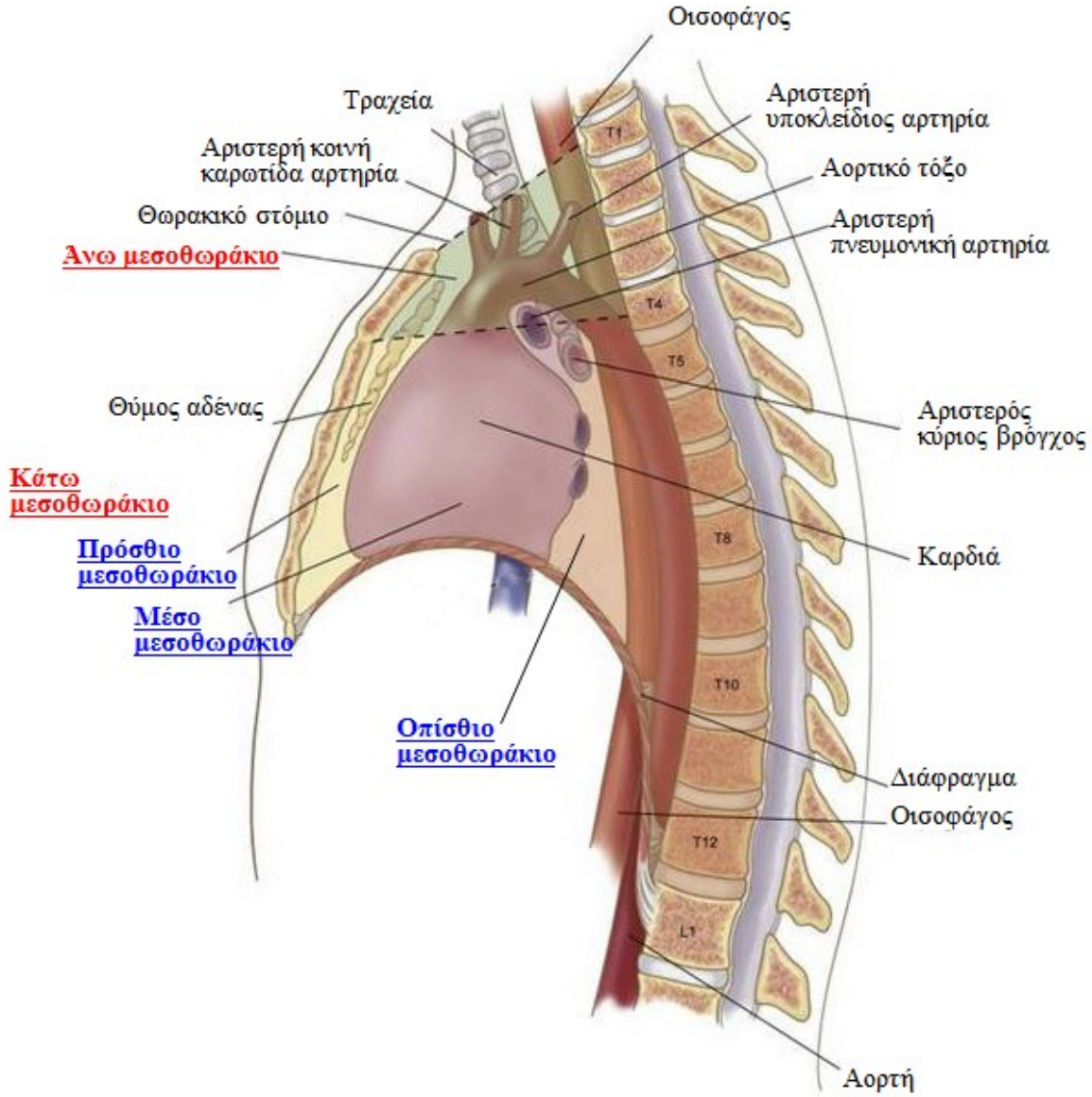
Mediastinum

Definition

It is a thick movable partition between the two pleural sacs & lungs.
It contains all the structures which lie in the intermediate compartment of the thoracic cavity.





Division of the Mediastinum

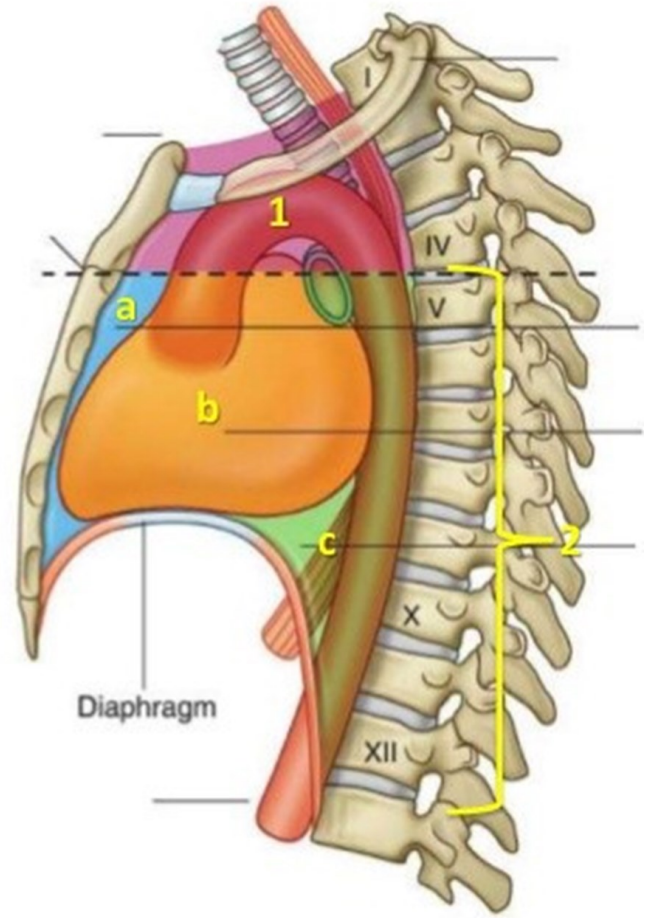
Division of the Mediastinum

The mediastinum

- For organizational purposes, the mediastinum is subdivided into several smaller regions.
- A transverse plane extending from the sternal angle (the junction between the manubrium and the body of the sternum) to the intervertebral disc between vertebrae TIV and TV separates the mediastinum into the:

  1- superior mediastinum

  2- inferior mediastinum
- Inferior mediastinum also divide into the anterior (a) , middle (b), and posterior (c) mediastinum by the pericardial sac.



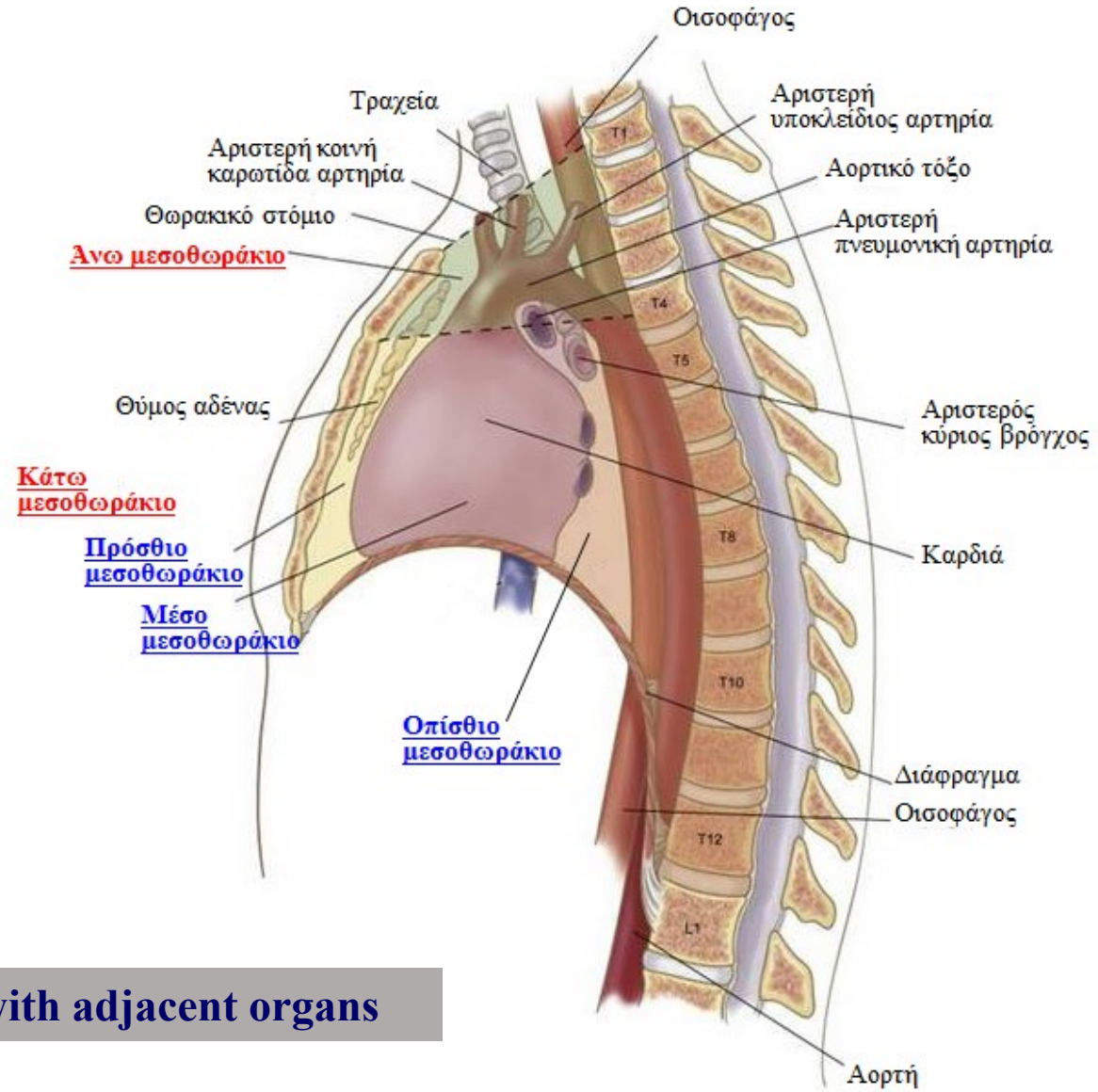
Mediastinum

Division of the Mediastinum

The ***Superior mediastinum*** contains the

- great arterial trunks of the heart
- the trachea
- part of the esophaguς

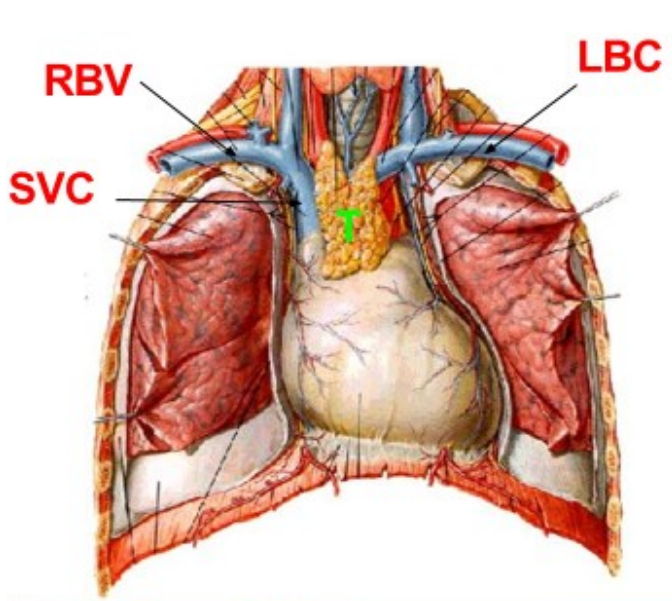
The ***Inferior mediastinum*** contains the heart

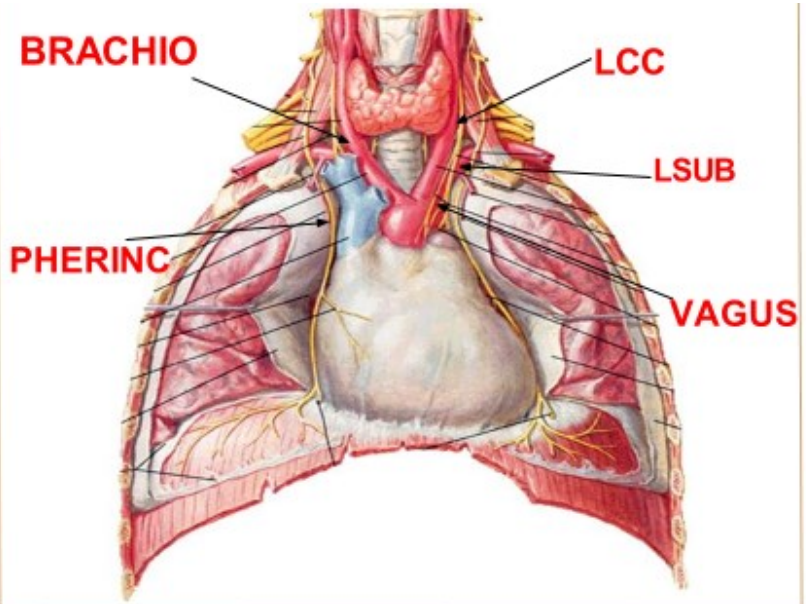


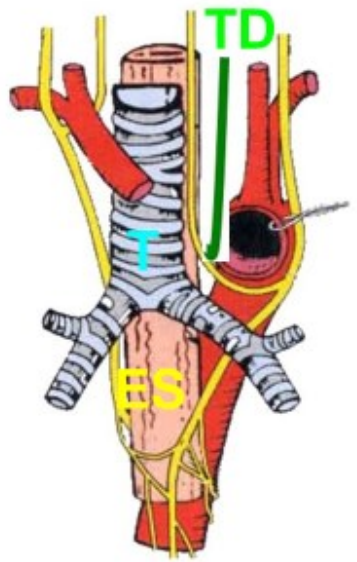
Position - relationships of the Heart with adjacent organs

Mediastinum

Contains of the superior Mediastinum







(A) Superficial:

Thymus Gland.

Three Veins:

Left brachiocephalic vein

Right brachiocephalic vein

Superior vena cava

Left brachiocephalic vein and Right brachiocephalic vein join together to give superior vena cava.

(B) Intermediate:

Arch of aorta & its 3 branches:

Brachiocephalic artery.

Left common carotid artery.

Left Subclavian artery

Nerves:

Left & Right Phrenic

Left & Right Vagus

(c) Deep:

Trachea

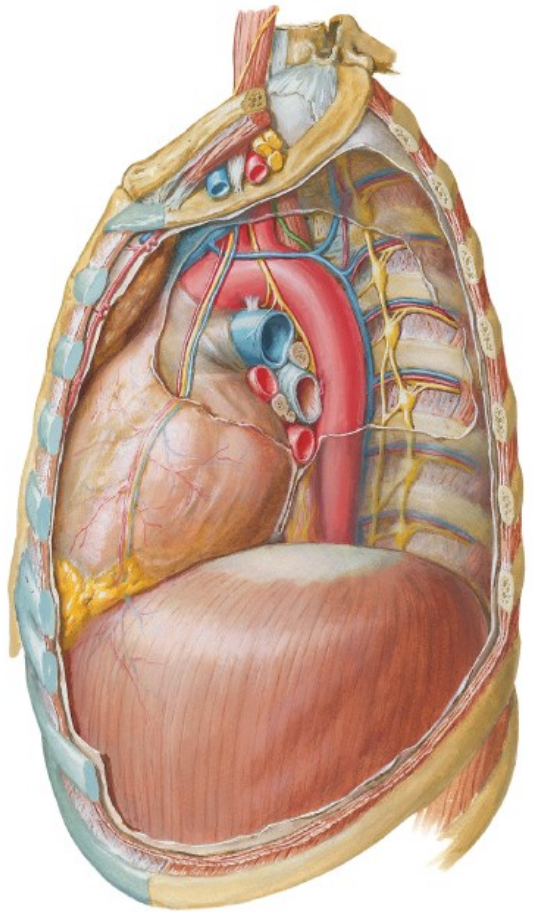
Esophagus

Thoracic Duct

Mediastinum

Division of the Mediastinum

Anatomists, surgeons, and clinical radiologists compartmentalize the mediastinum differently.
For instance, in the radiological scheme of Felson, there are only three compartments (anterior, middle, and posterior), and the ***heart*** is part of the ***middle (inferior) mediastinum.***



Position - relationships of the Heart with adjacent organs

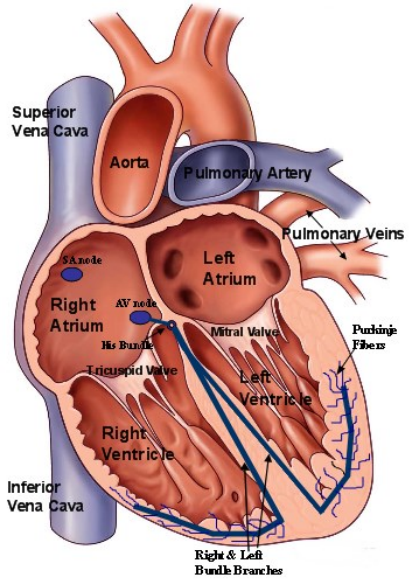
Introduction

The heart is a **muscular organ** that serves to collect deoxygenated blood from all parts of the body, carries it to the lungs to be oxygenated and release carbon dioxide.
Then, it transports the oxygenated blood from the lungs and distributes it to all the body parts.

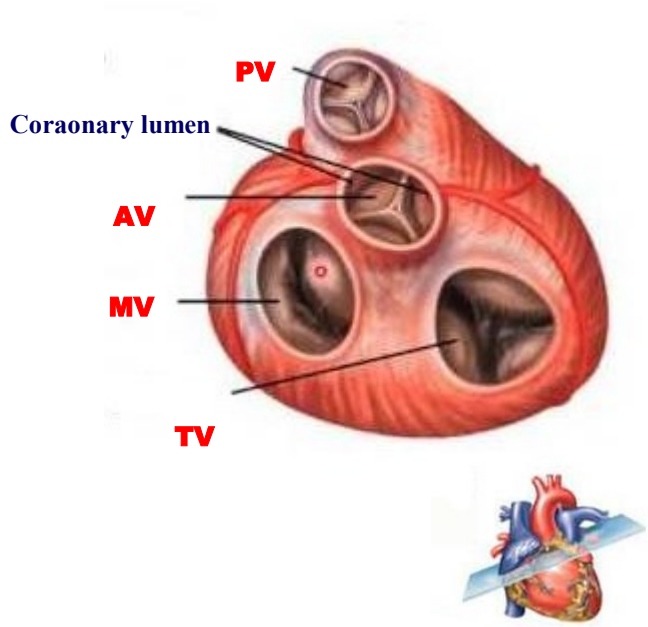
1. BASIC ANATOMICAL ELEMENTS OF THE HEART

BASIC ANATOMICAL ELEMENTS OF THE HEART

- conical hollow muscular organ situated in the middle mediastinum and is enclosed within the pericardium
- compound (depressor) pump - sucks & pushes blood
- fist size of the person it belongs to
- weight about 300 g.
- relatively larger in size in men than in women



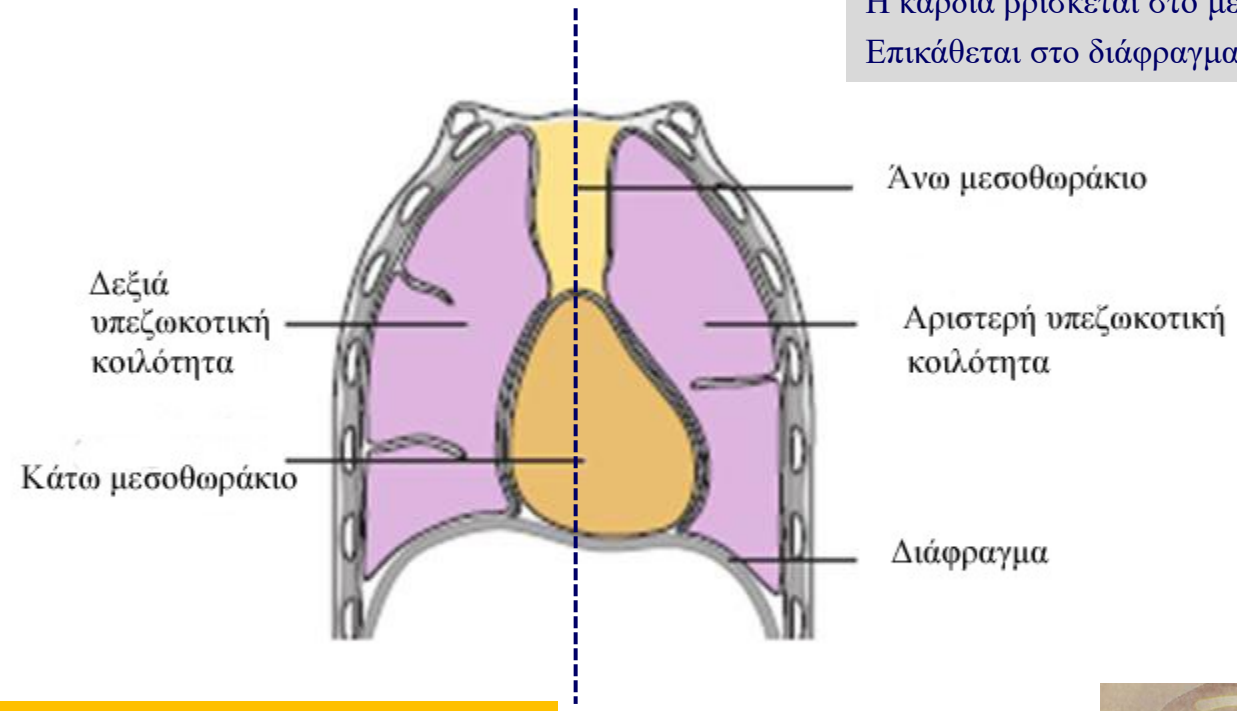
- 4 chambers (2 atrials - 2 ventricles)
- atrial & atrial septum
- 2 AV valves (tricuspid & bicuspid or mitral)
- 2 arterial valves (pulmonary & aortic)
- fibrous skeleton of the heart (in the form of fibrous rings around the orifices of the atrioventricular & arterial valves



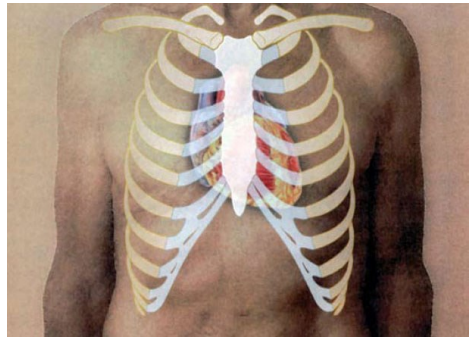
2. THE POSITION OF THE HEART
&
ITS RELATIONSHIP WITH ADJACENT ORGANS

Σχηματική απεικόνιση της θέσης της καρδιάς στον θώρακα

Η καρδιά βρίσκεται στο μέσο μεσοθωράκιο.
Επικάθεται στο διάφραγμα (τενόντιο κέντρο)

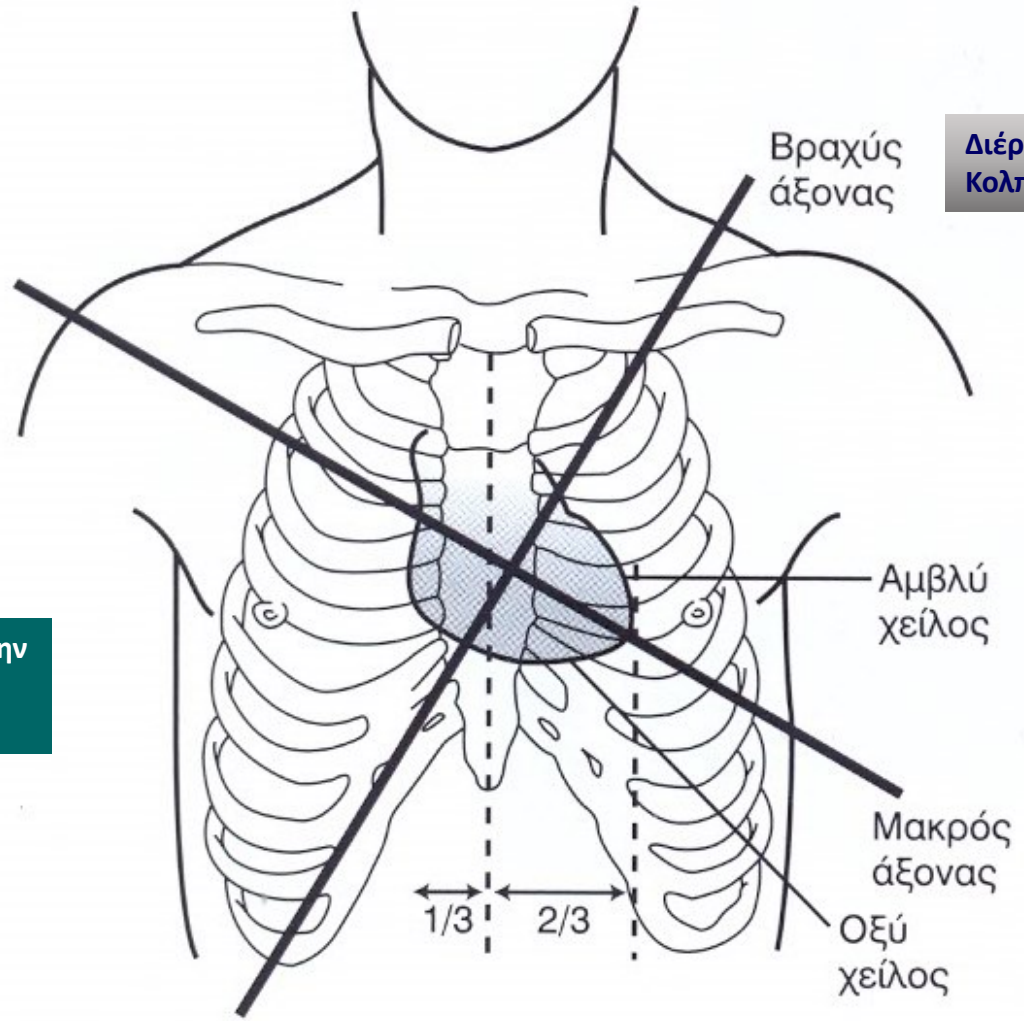


Ο δε πνεύμονας καλύπτει το δεξιό τμήμα της καρδιάς μέχρι τη μέση γραμμή κατά την εισπνοή



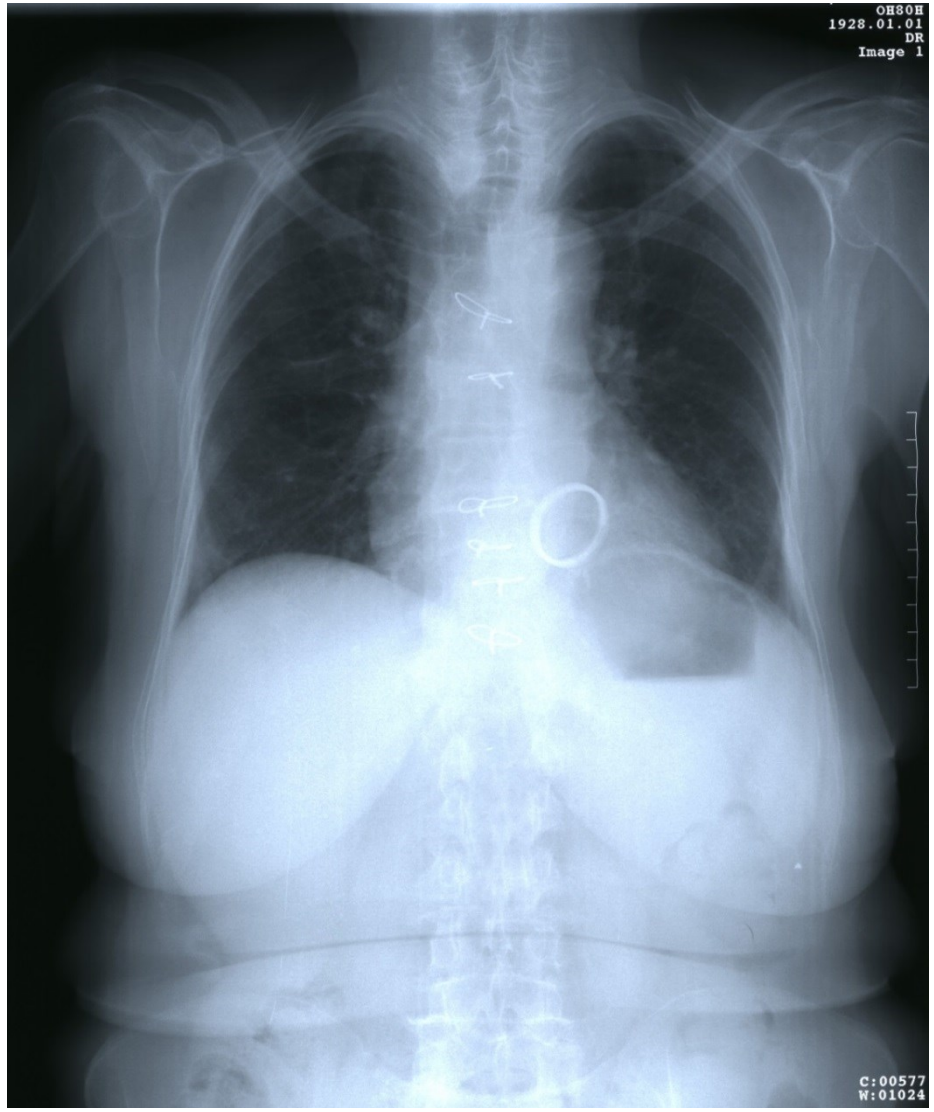
sos Αποδέσμευση ασθενούς από τεχνητό αερισμό κατά τη στερνοτομή με τον στερνοτόμο **sos**

Οι άξονες της καρδιάς



Διέρχεται από το επίπεδο των Κολποκοιλιακών βαλβίδων

Οι άξονες έχουν εφαρμογή στην απεικόνιση της καρδιάς με τους υπερήχους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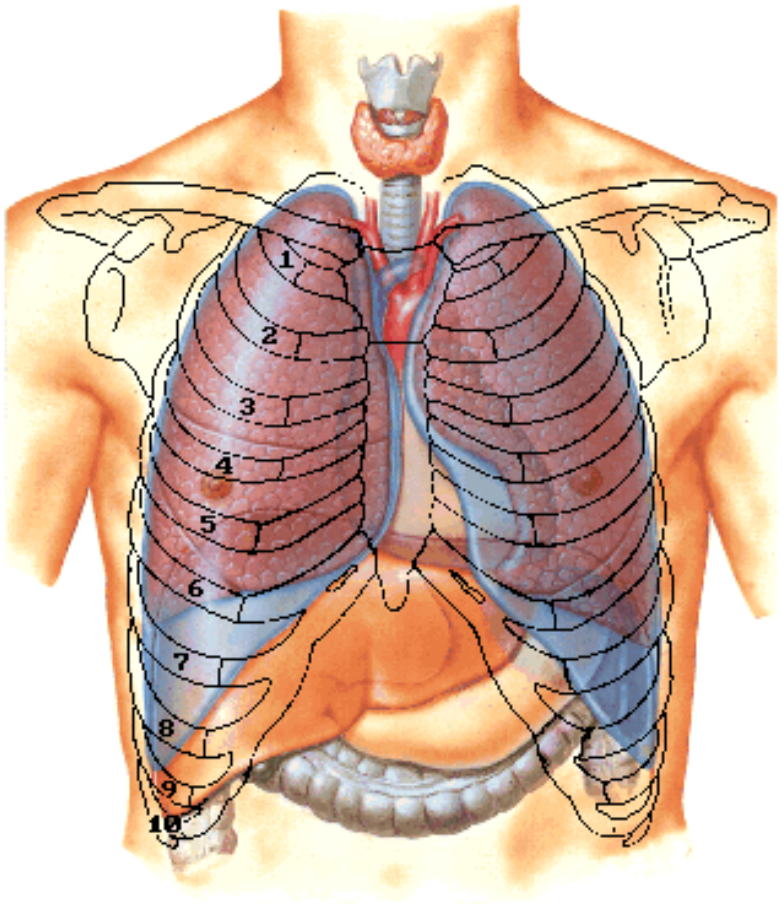
Projection of the heart on the chest wall



- **Anterior wall**

irregular quadrilateral, trapezoidal shape

- **Left borders**

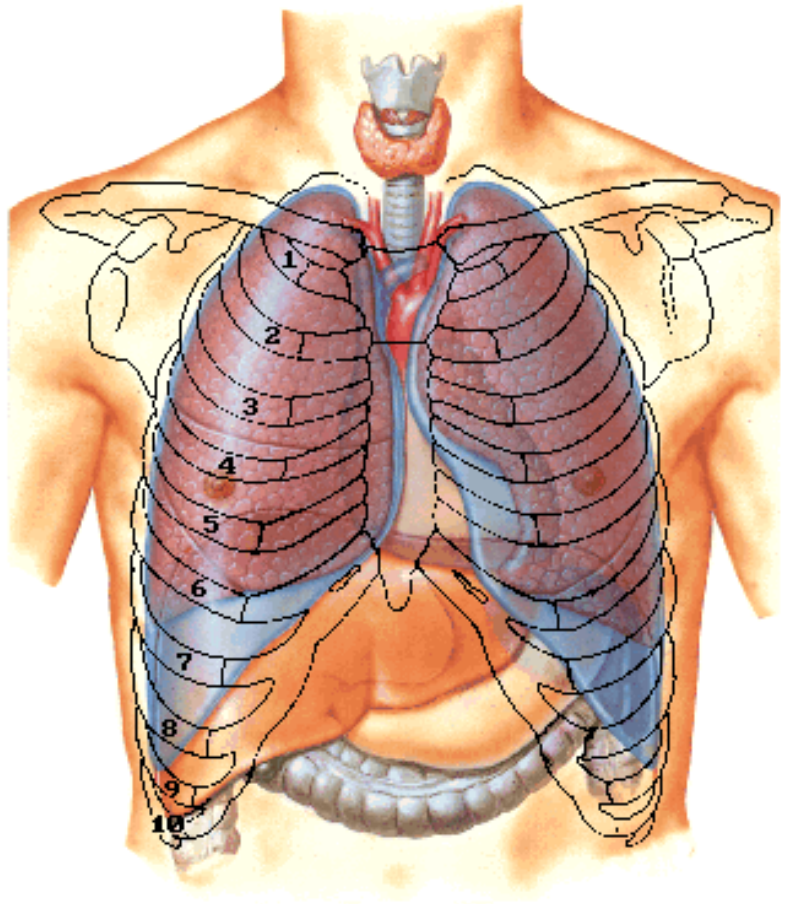
2nd costal cartilage to 5th intercostal space

1.5 and 8.5 cm from midline respectively.

- **Right borders**

3rd costal cartilage to 6th costal cartilage, 2.5 cm from midline, the most convex 2.5 cm.

Position of the heart



Behind the:

- the body of the sternum, the corresponding costal cartilages (3rd-6th) and the parts of the corresponding left ribs.
- 2/3 left
- The right 1/3 from mid-body level

3. Potential risks of median sternotomy

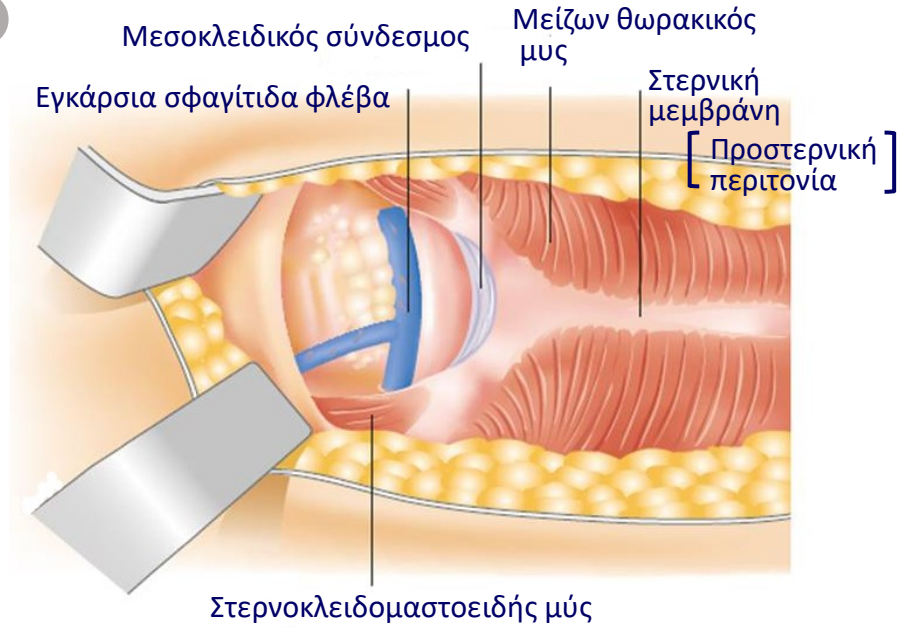
- the most frequent access to cardiac surgery

- anatomical elements we encounter

- potential risks

Potential risks of median sternotomy

1



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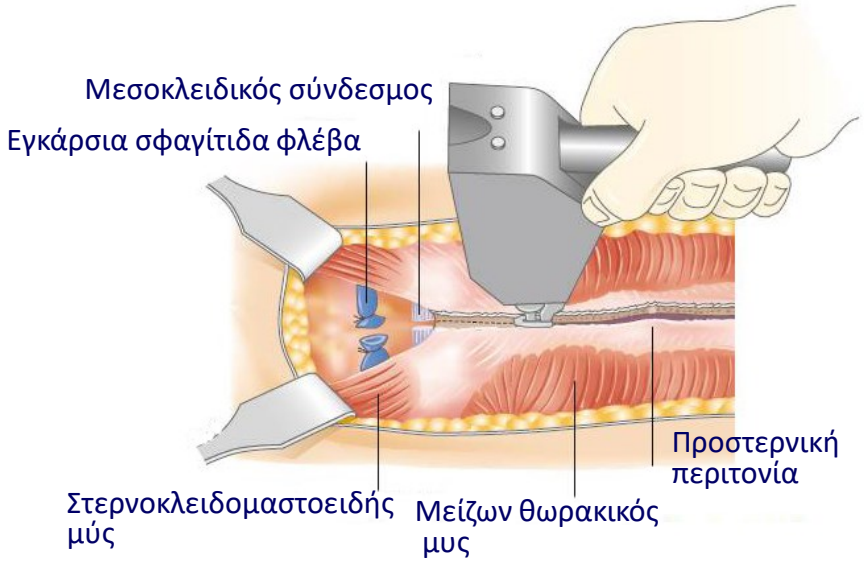
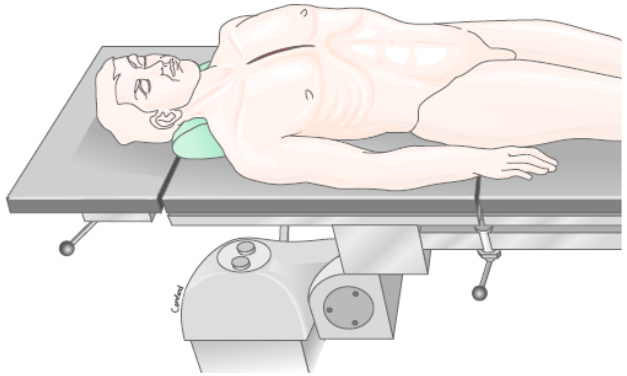


SOS

Causing the transverse jugular vein or deeper aortic arch with diathermy when attempting to transect the interclavicular ligament can lead to massive bleeding with sometimes fatal consequences.

SOS

1

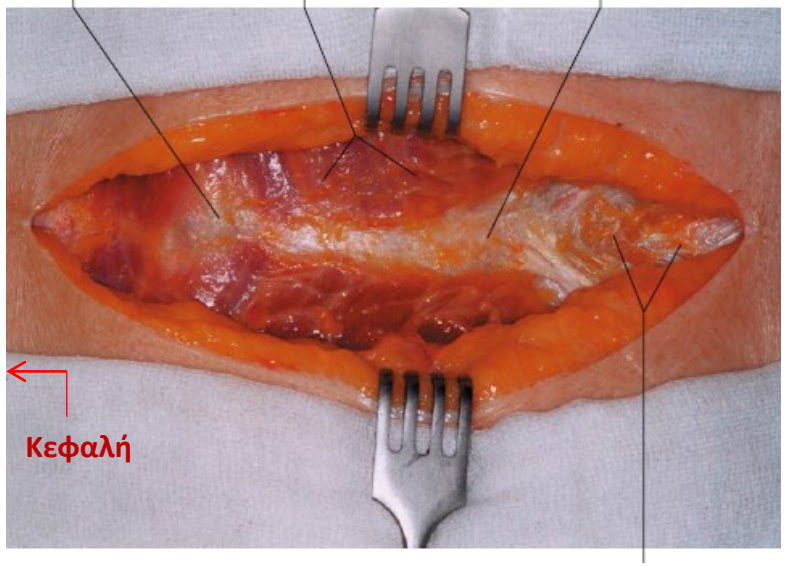


Θέση ασθενούς επι της χειρουργικής τραπέζης
για τη διενέργεια μέσης στερνοτομής

2

Η θέση της τομής του δέρματος για μέση στερνοτομή

3



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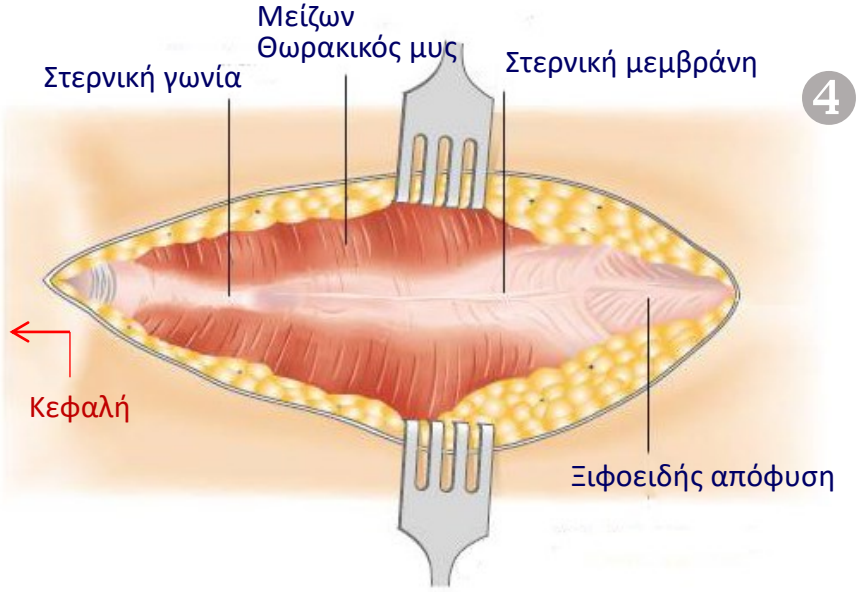
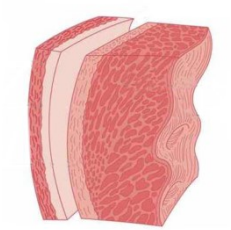
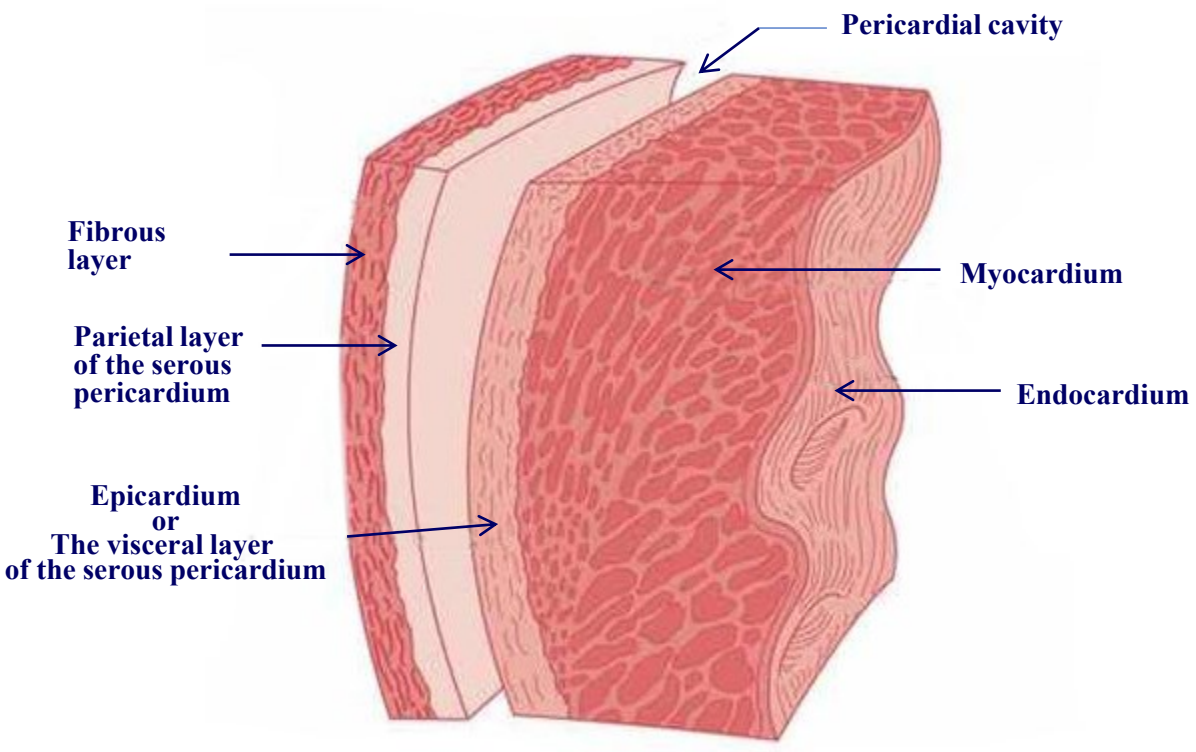




4. Pericardium

Pericardium

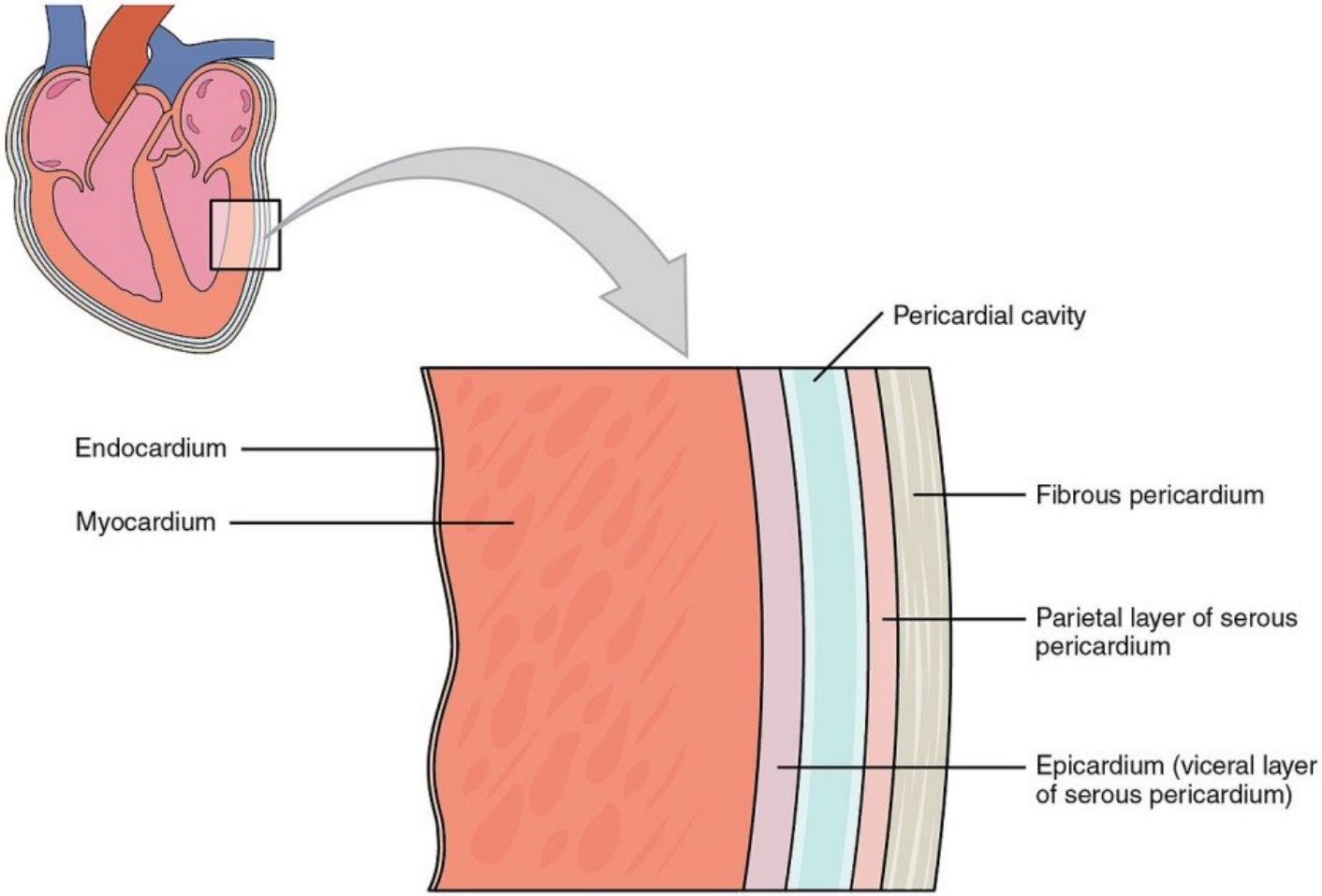


- *A serous membrane, with 2 layers*

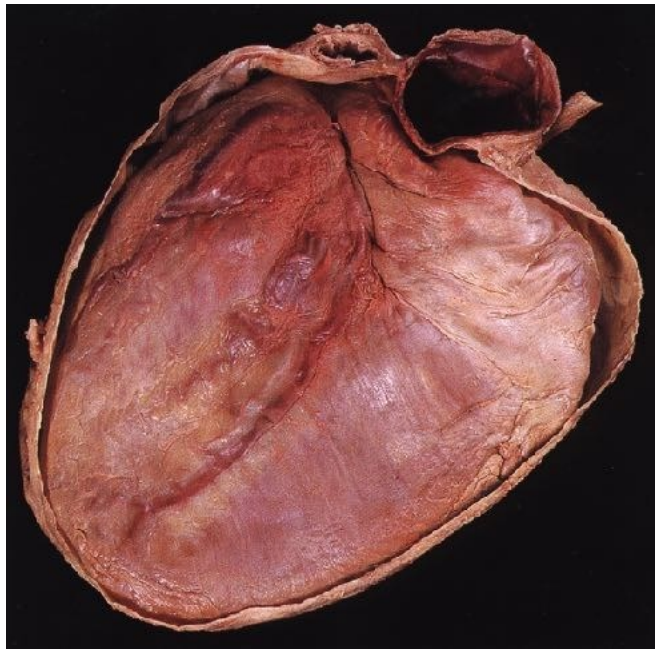
-Between the layers a small amount of pericardial fluid

-Pericardial sac - reflection of the pericardium

Layers of the pericardium

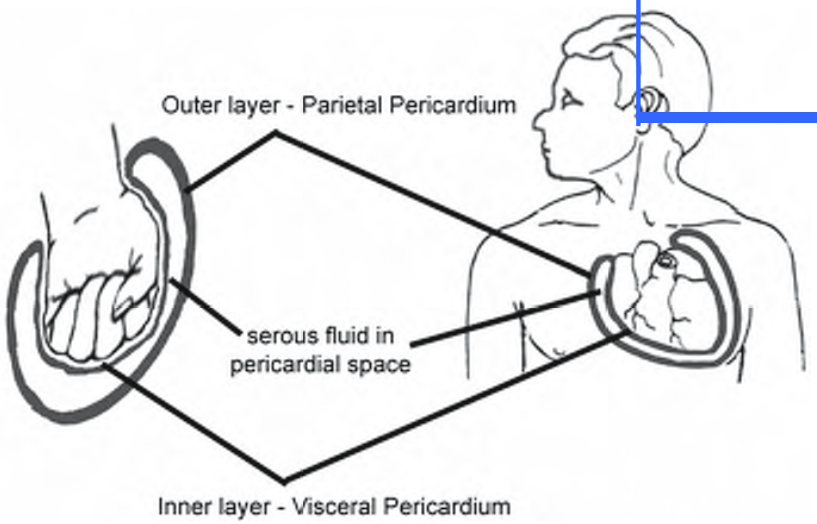


The pericardium

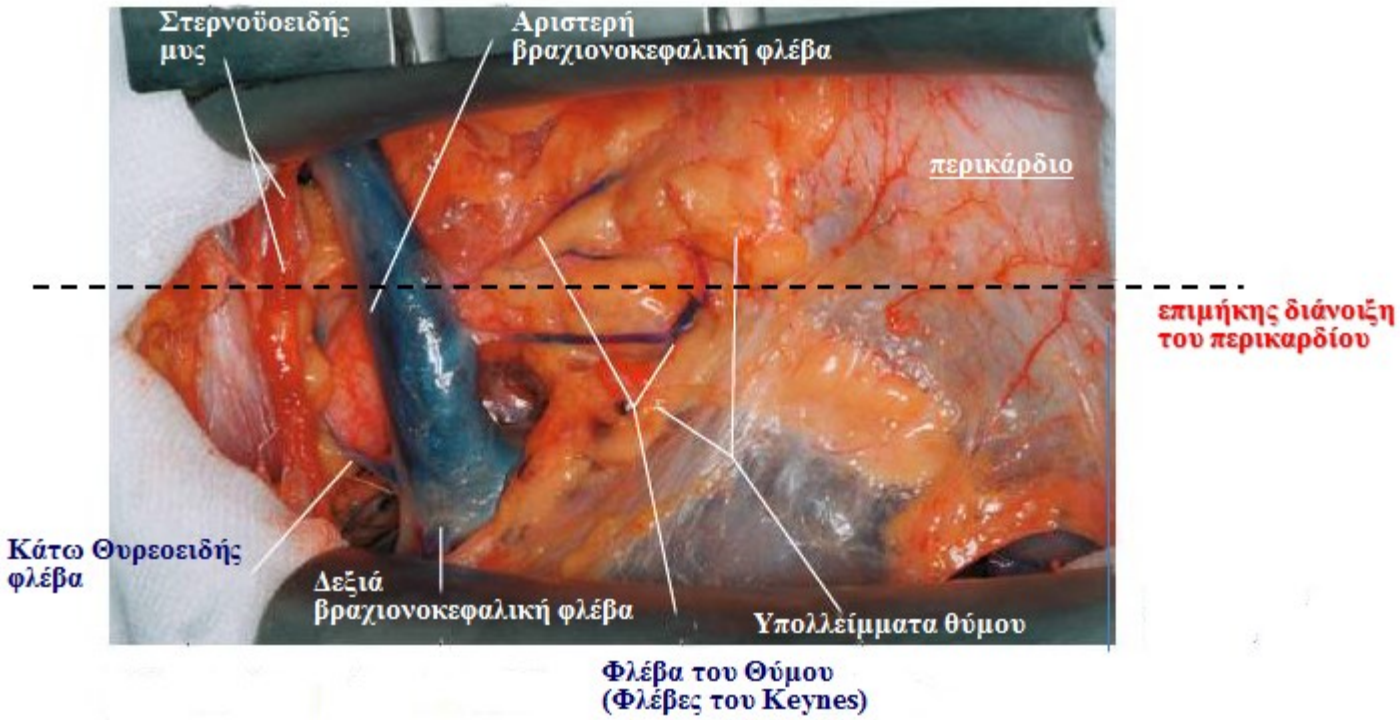


- fibrus: tough connective tissue
- serous:
  - the outer (parietal)
  - the inner (visceral) serosal layer

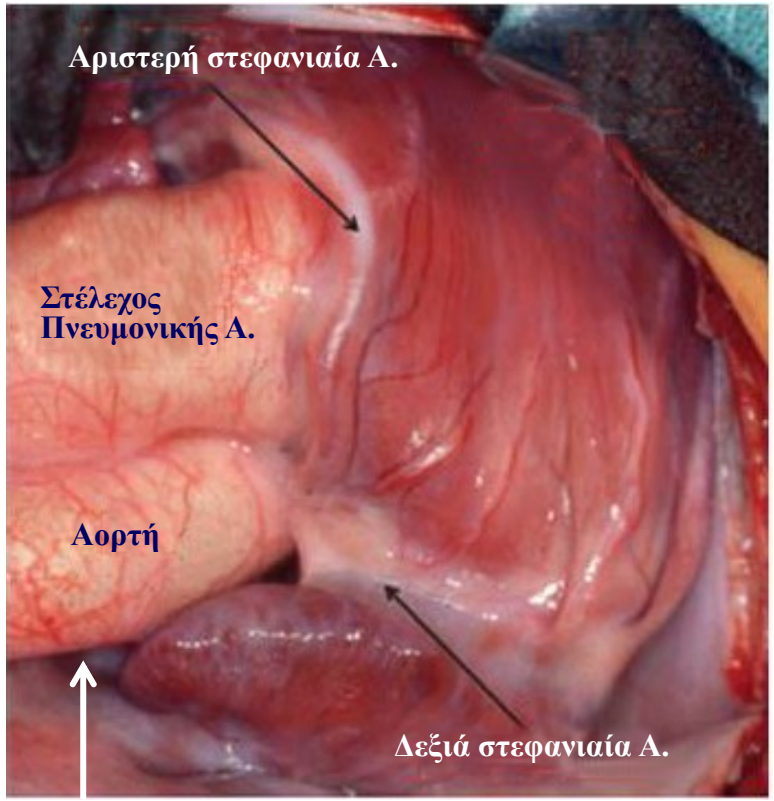
pericardial fluid: 15-20ml



The pericardium

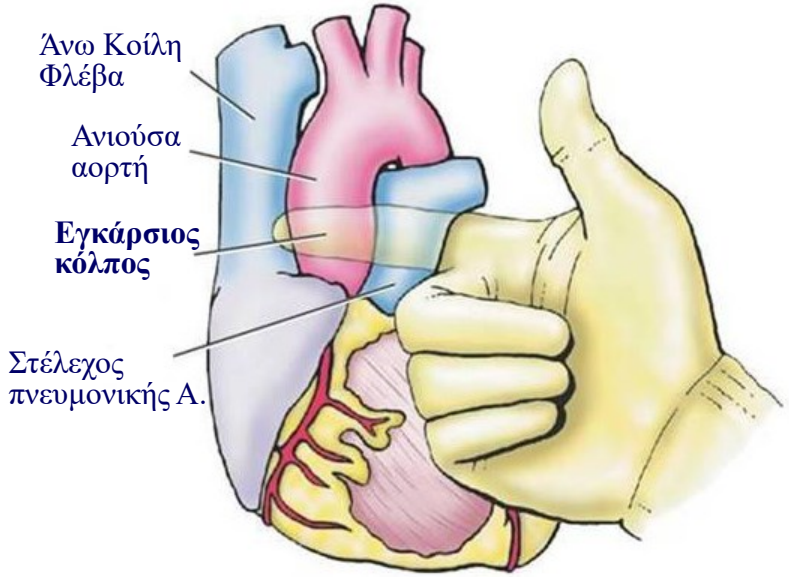


Reflections of the Pericardium



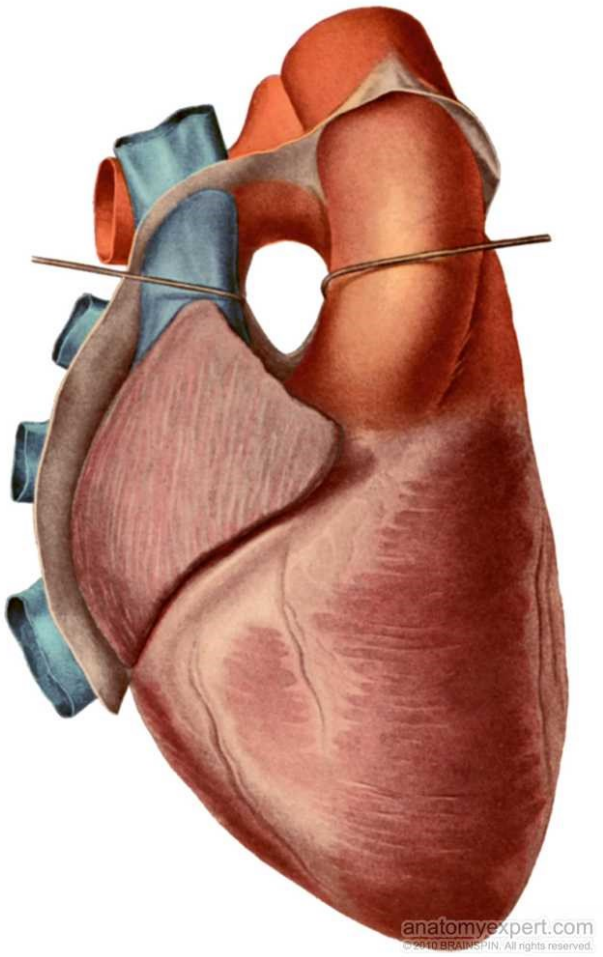
The transverse pericardial sinus
allows communication between right & left side of the pericardium cavity above the left atrium

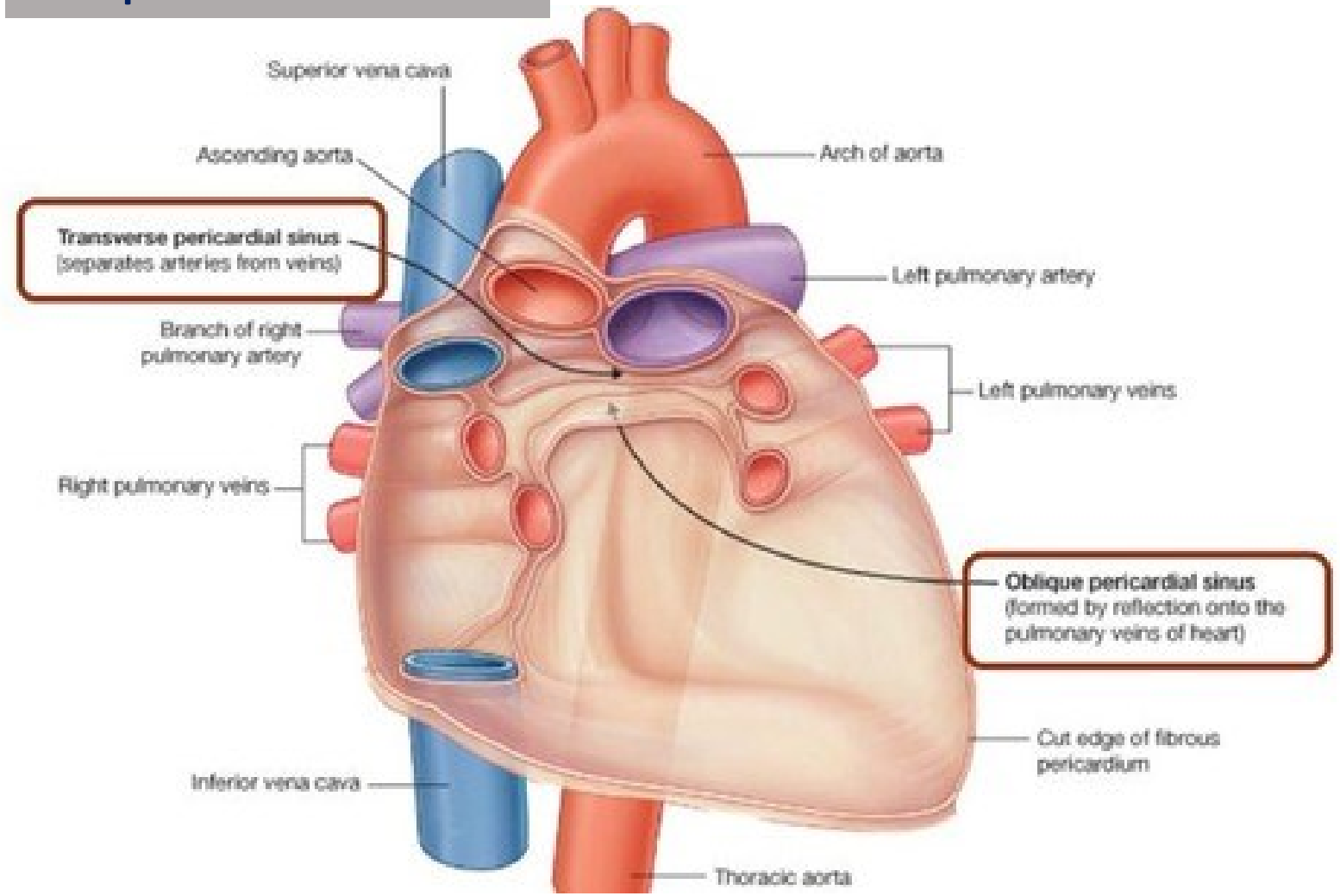
1. The transverse pericardial sinus



Διεκβολή δεξιάς ΕΘΑ για αναστόμωσή της σε κλάδους της Περισπώμενης Α.

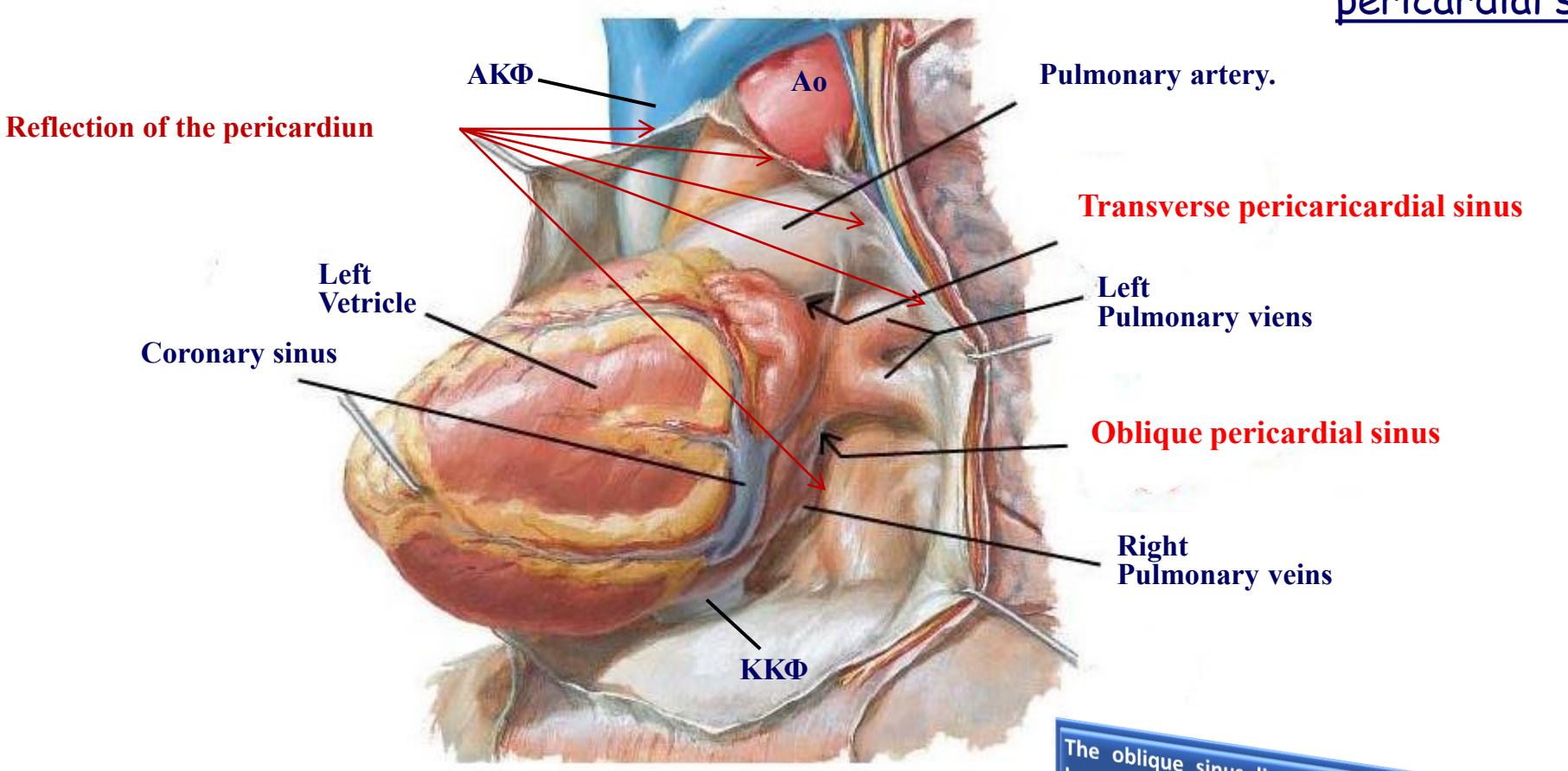
The transverse pericardial sinus





The reflection of the pericardium

2. The oblique pericardial sinus



The oblique sinus lies below the left atrium, between the reflection of the pericardium to the pulmonary veins and the Inferior vena cava

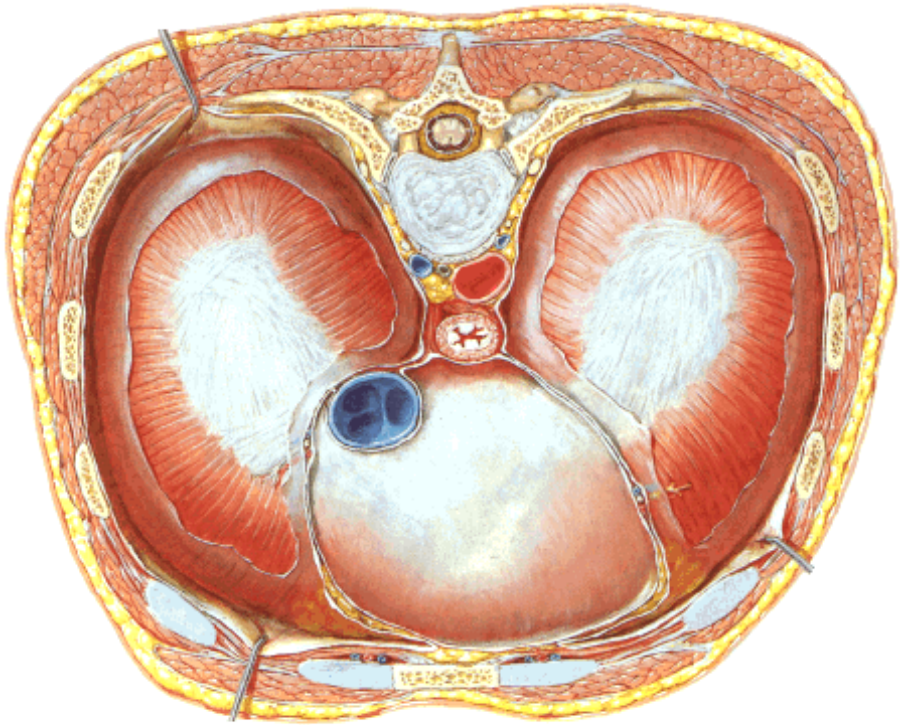
Manipulations for searching of the two sinuses of the pericardium

Transverse sinuous

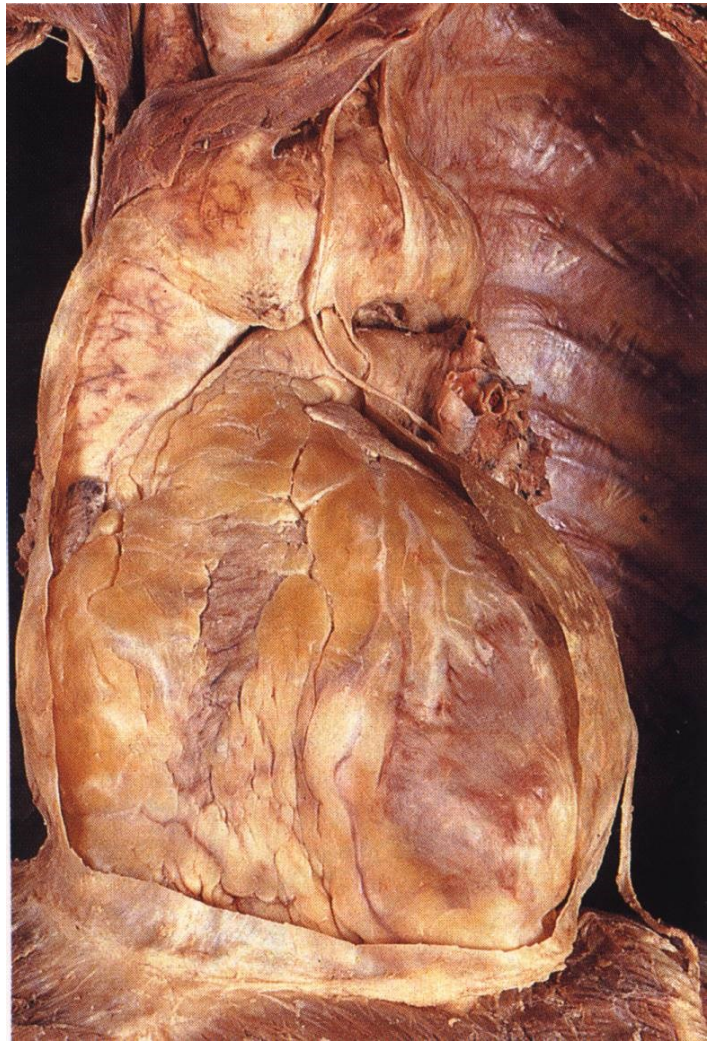
Oblique sinuous

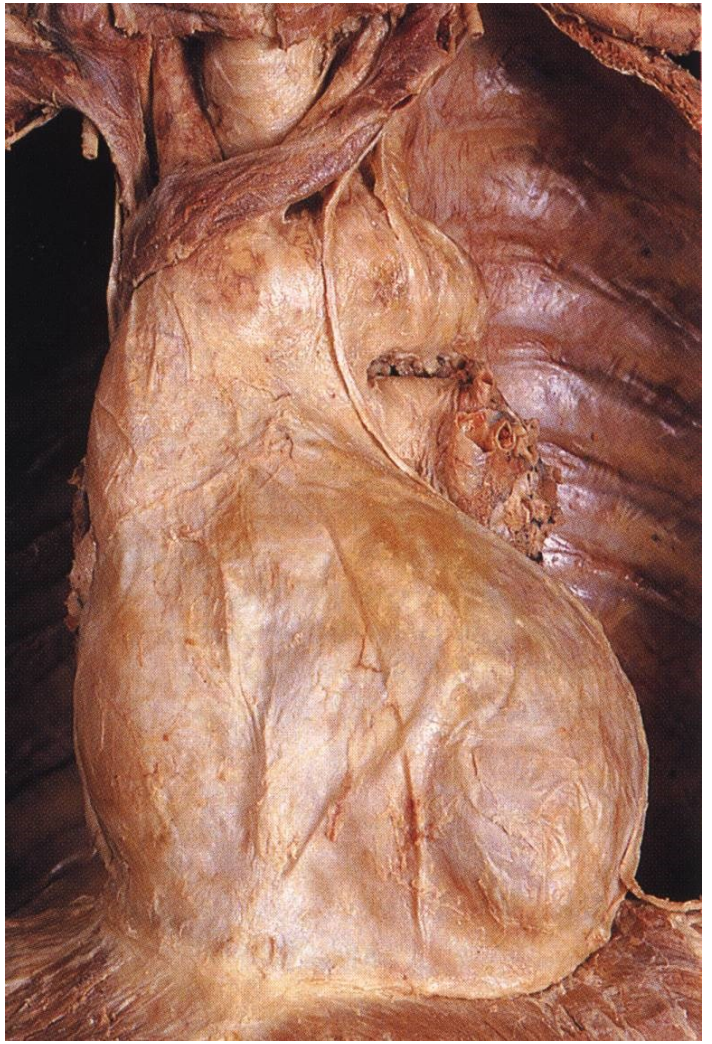
(cadaver dissection)

Fibrous pericardium base

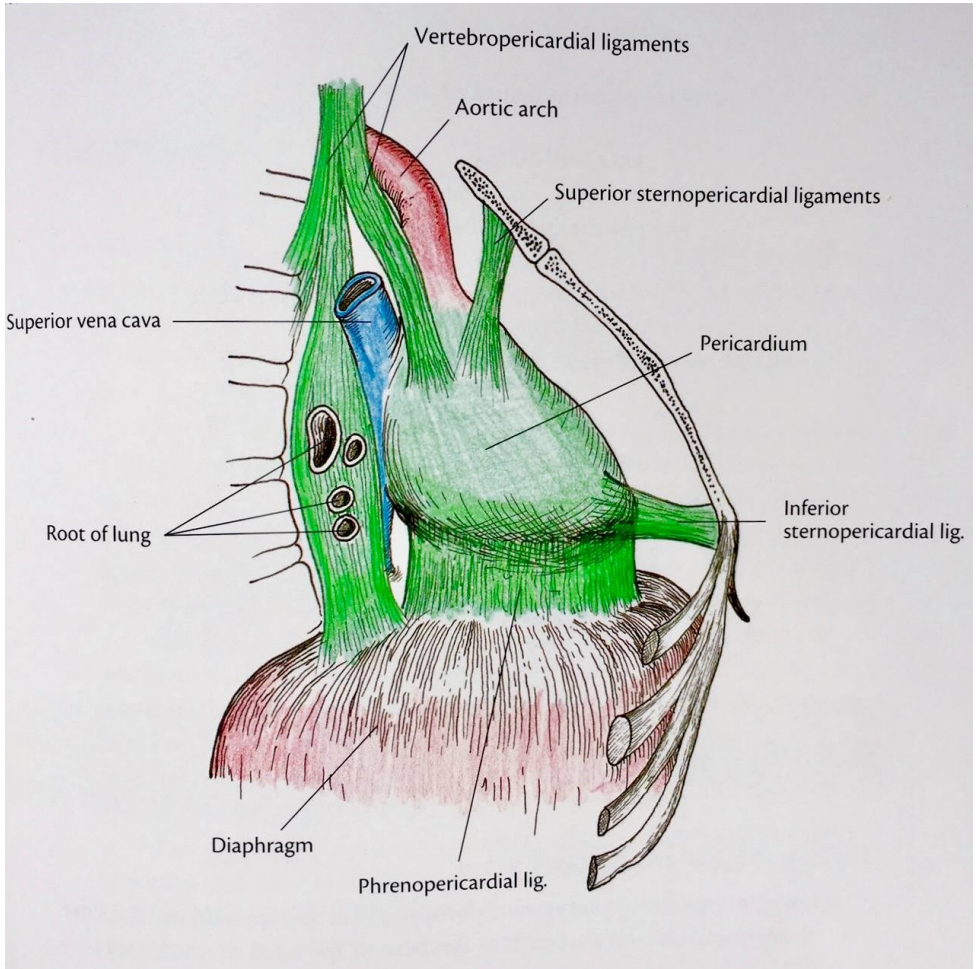


Its **base** lays over the diaphragm and is attached to the central tendon of the diaphragm by the phrenopericardial ligament.



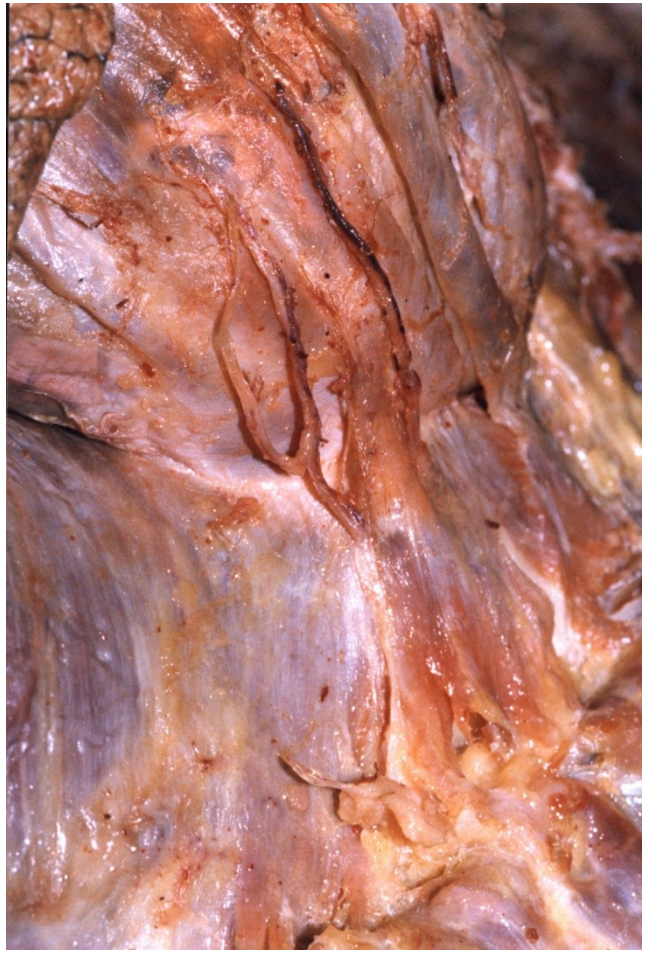


Ligaments of the pericardium

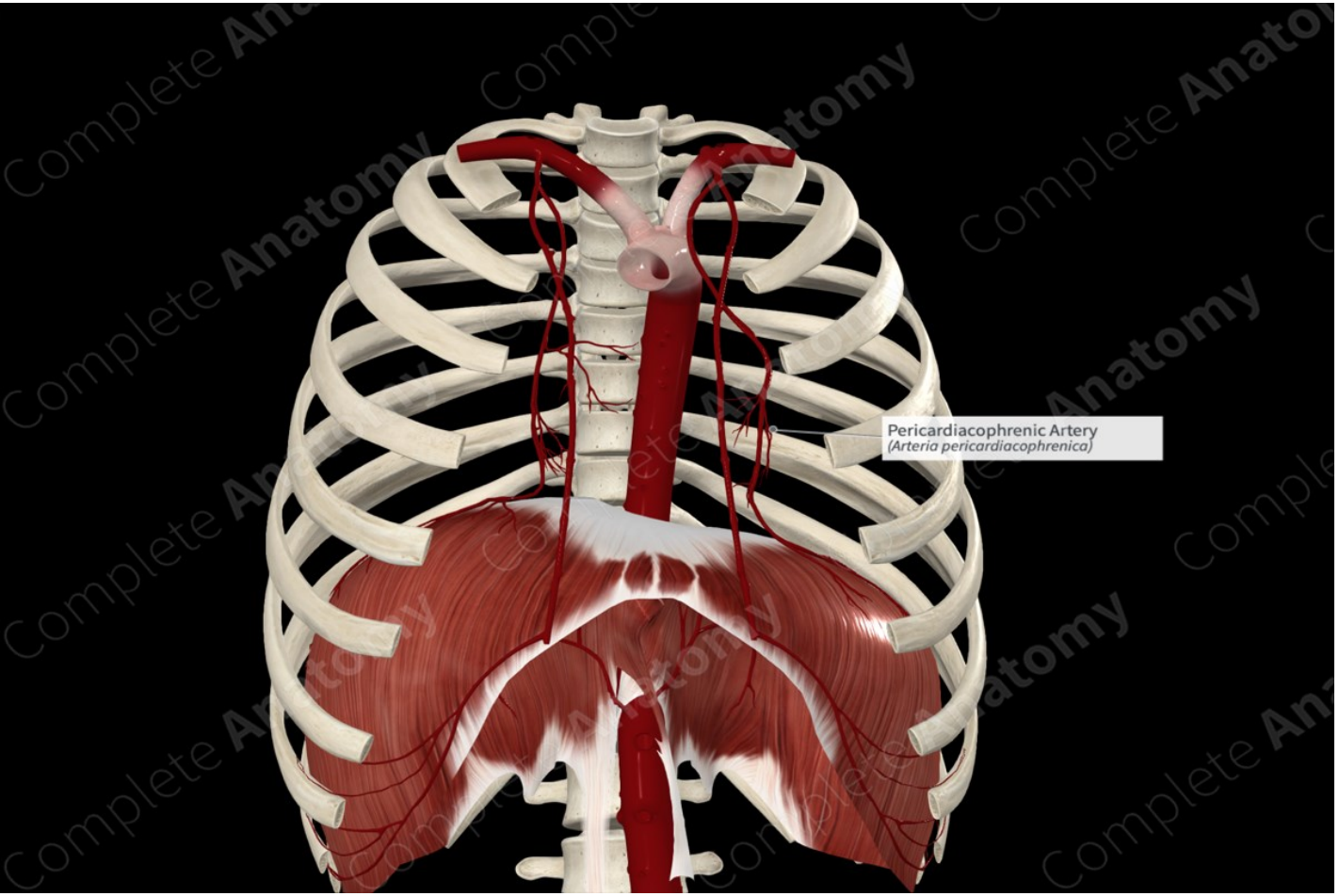


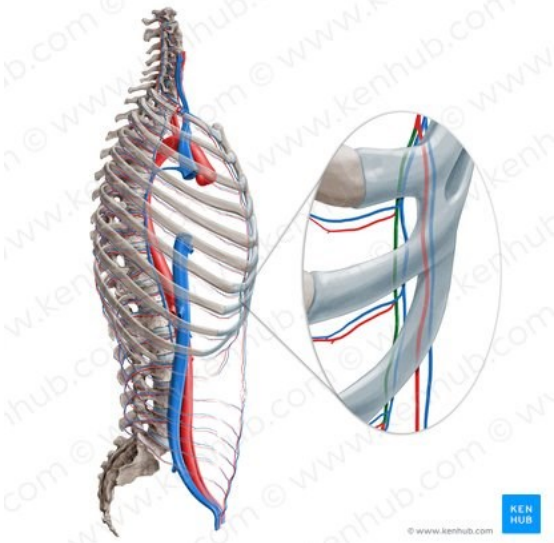
These attachments of the pericardium to surrounding structures fixes the position of the heart, prevents its excessive distension, and provides protection.

Ligaments of the pericardium



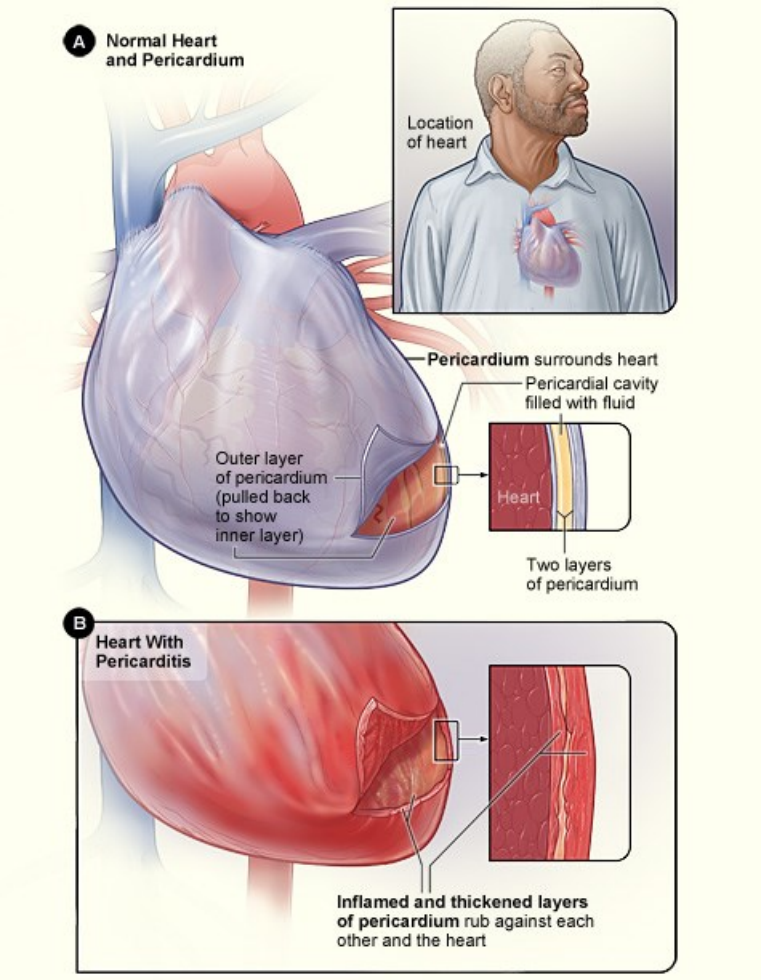
Arterial supply of the pericardium





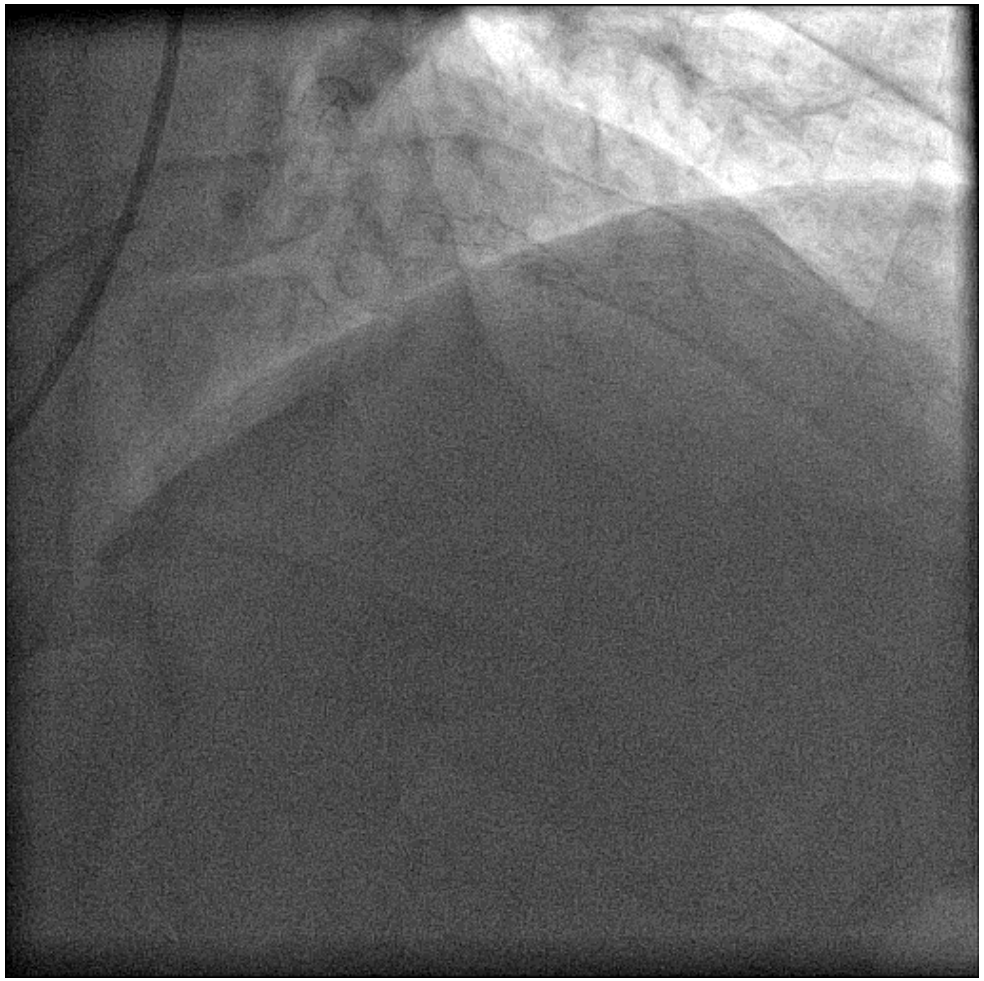
*It receives blood from the **pericardiophrenic vessels** (branches of the internal mammary artery and is sensory innervated by the **phrenic nerve**¨reflex pain in the ipsilateral supraclavicular region*

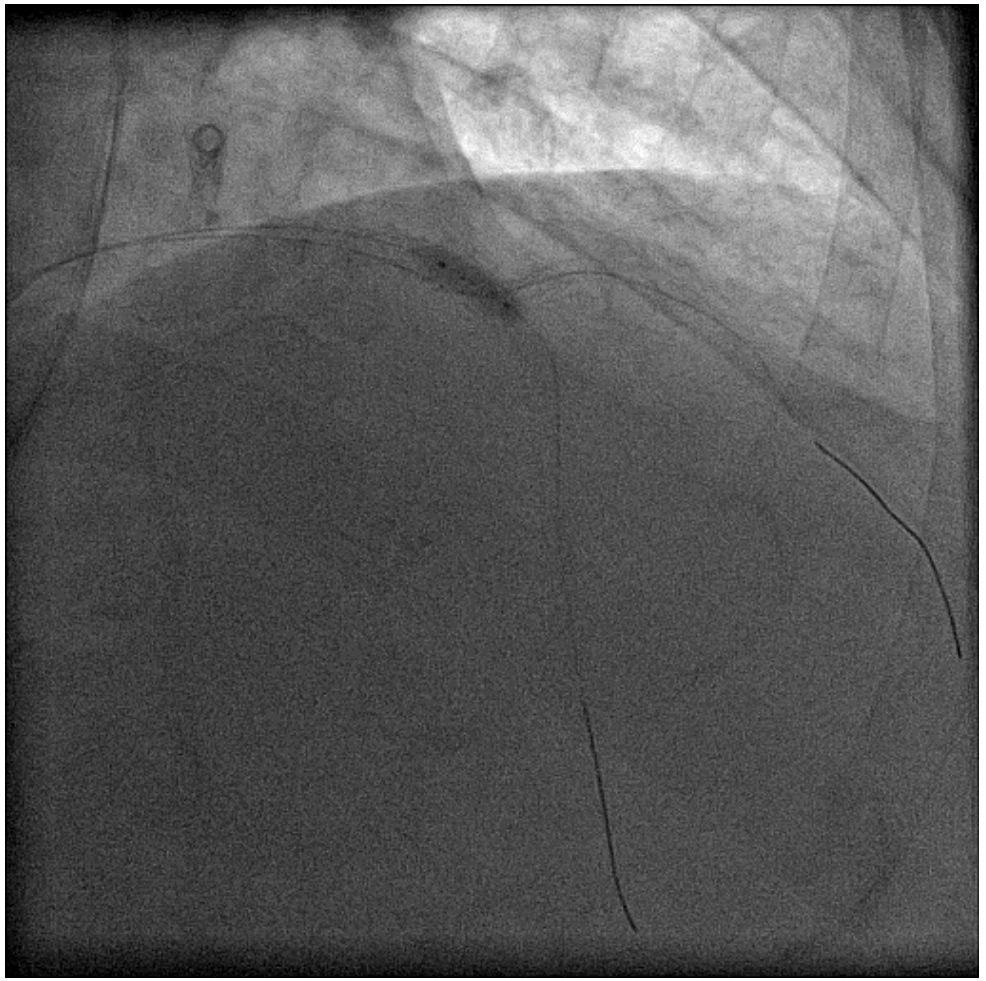
Clinical significance



Inflammation of the pericardium is called **pericarditis**.

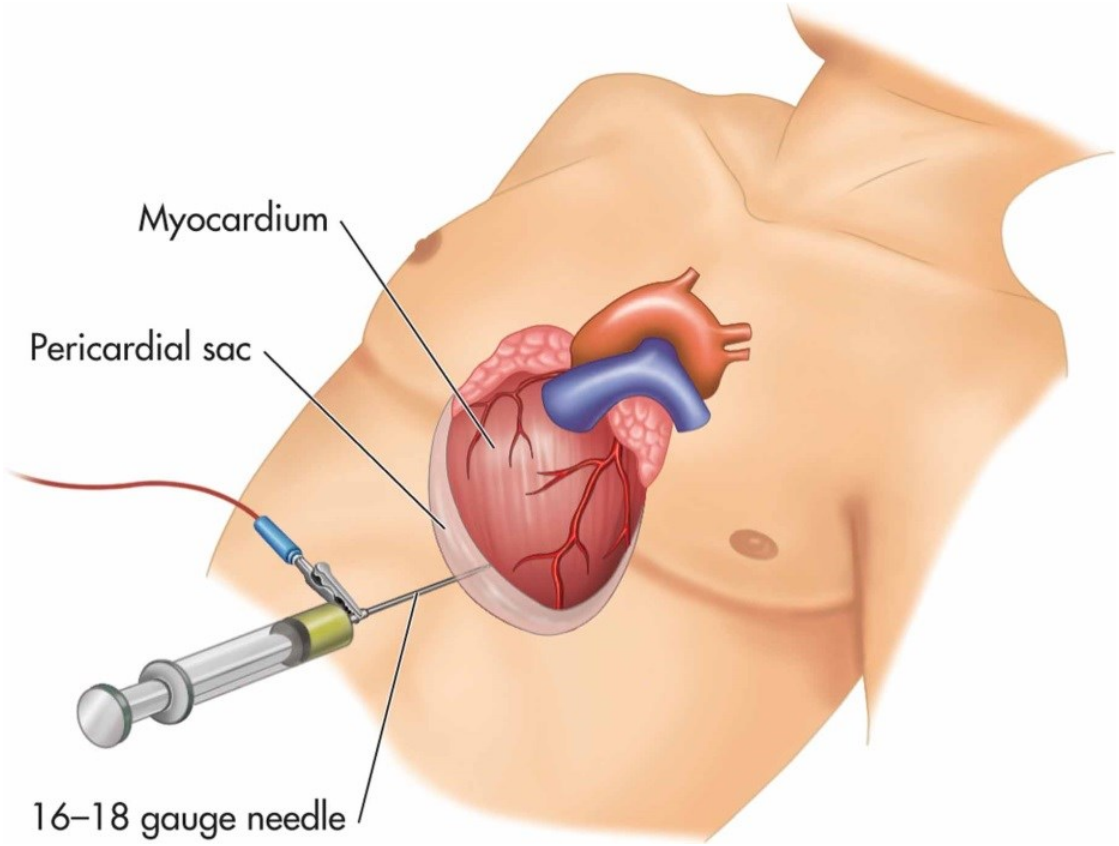
Wire perforation





Wire perforation

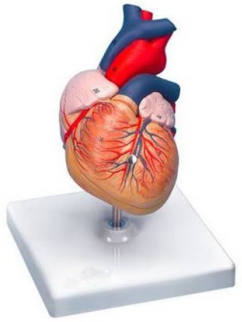
Pericardiocentesis



Pericardiocentesis position

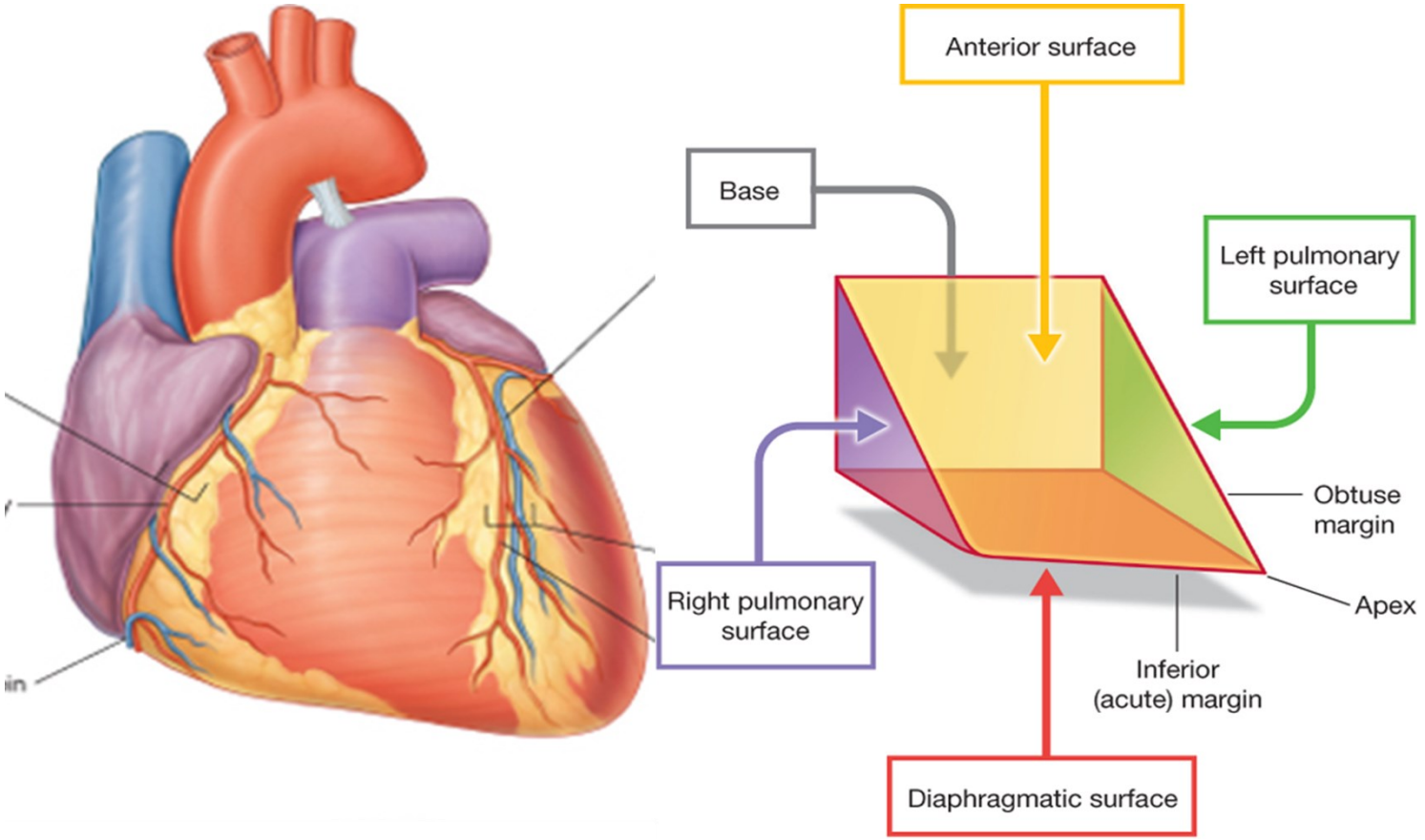
4o-5o intercostal space parasternal, or

subxiphoidally directed at the upper-outer corner of the scapula and inclined 45 from the horizontal plane.

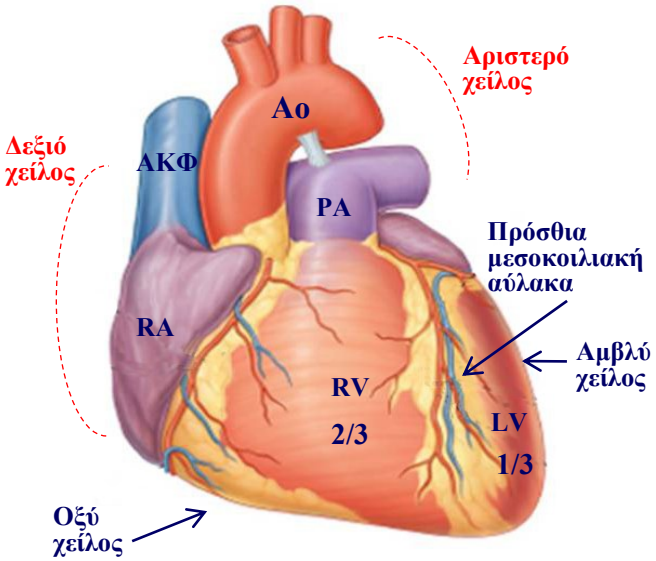


5. SURFACES – ORIENTATION - EXTERNAL GROOVES OF THE HEART

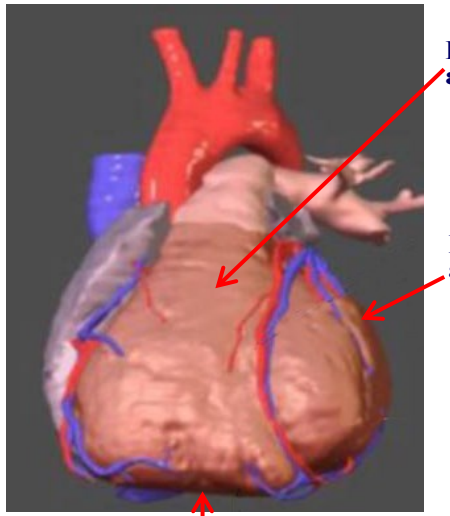
Surfaces & margins of the heart

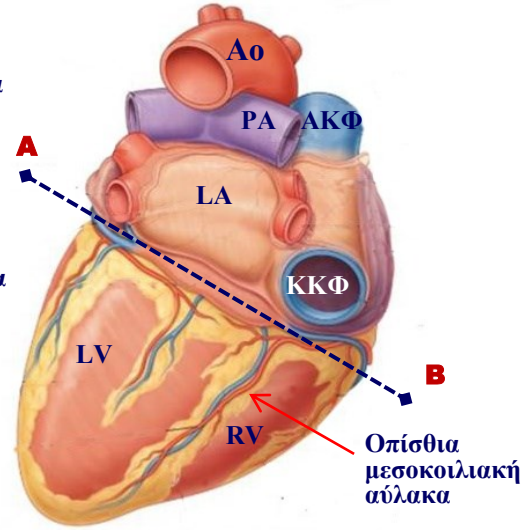


Surfaces & margins of the heart



Anterior surface of the heart





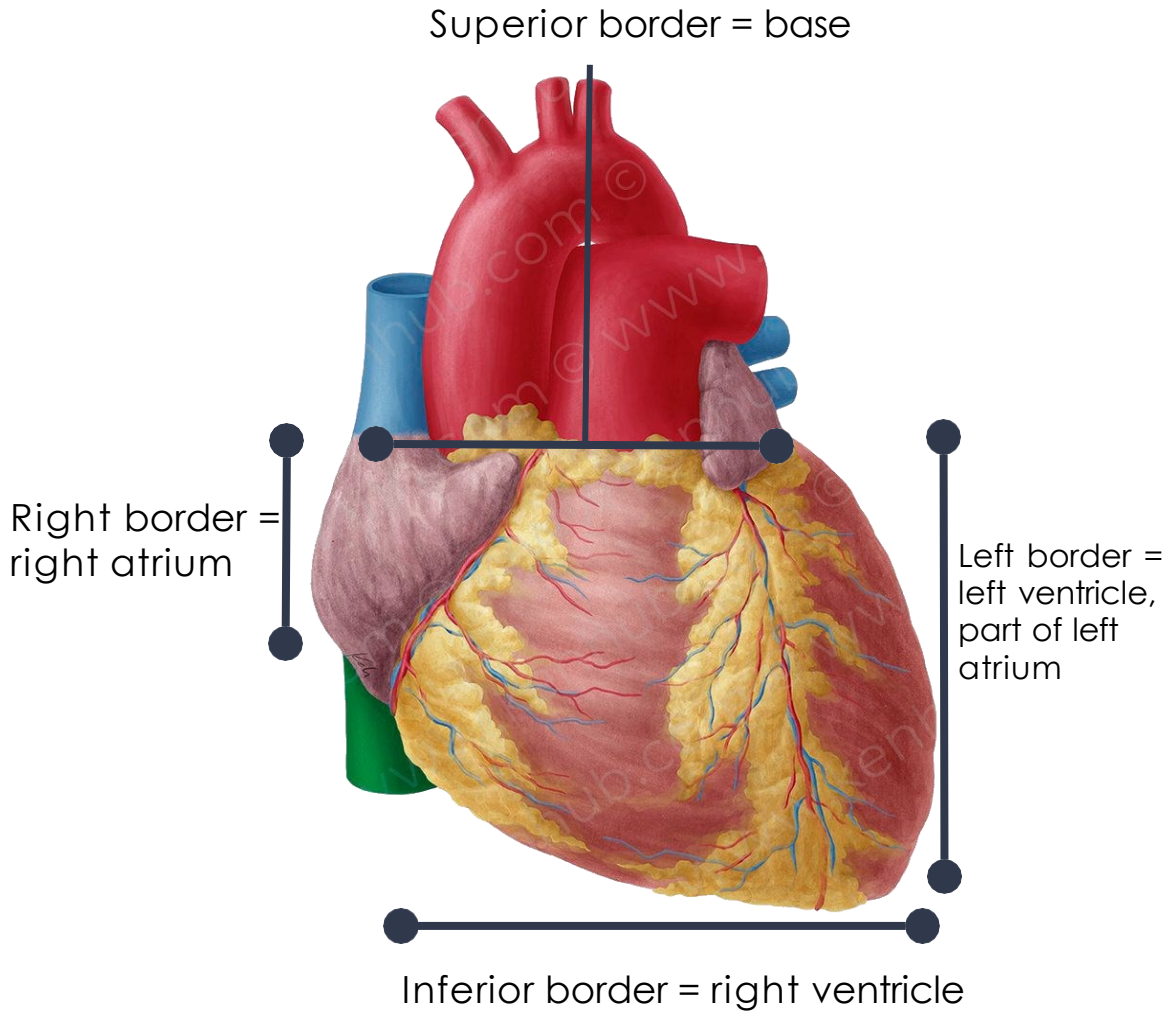
Diaphragmatic (or inferior) surface of the heart

Three-sided pyramid

- Base: the two atrium
- Apex: the two ventricles

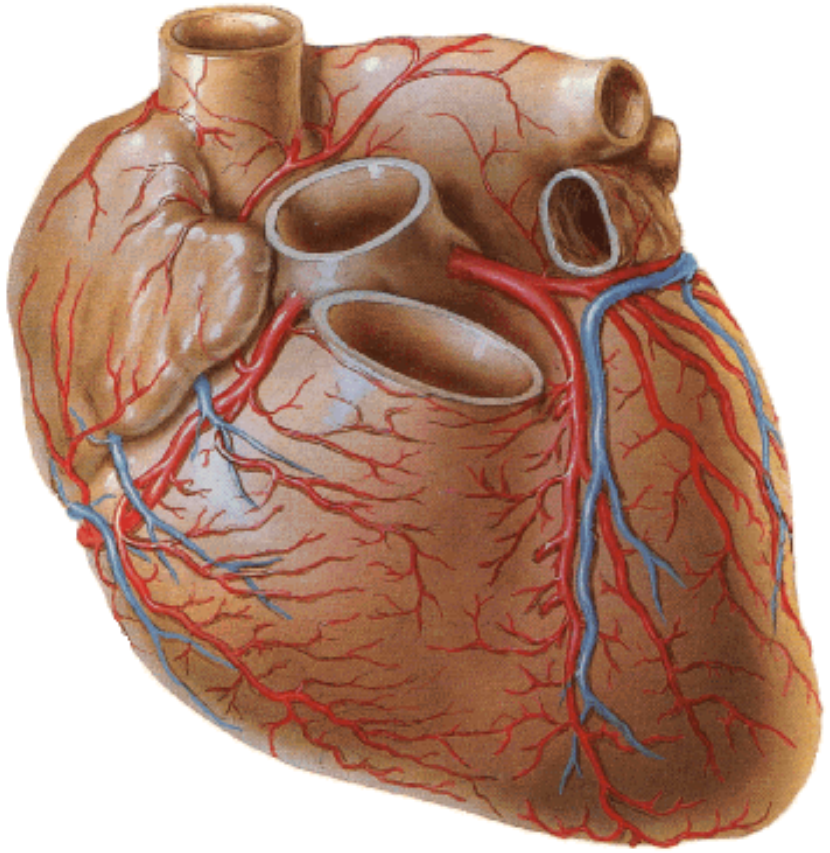
Borders of the heart

Borders	Formed by :
Upper border	**the 2 atria. & It is concealed by ascending aorta & pulmonary trunk.**
Right border	**right atrium**
Lower border	**mainly by right ventricle + apical part of left ventricle.**
Left border	**mainly by left ventricle + left auricle.**



6. EXTERNAL MORPHOLOGY OF THE HEART

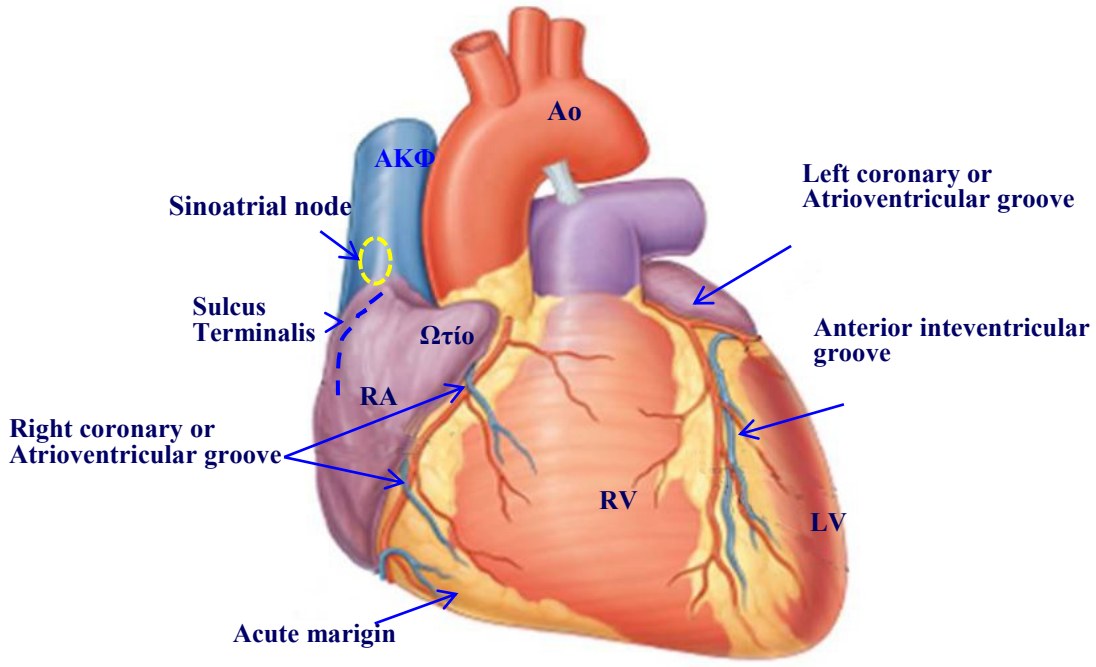
External morphology of the heart
Sternocostal surface (anterior aspect)

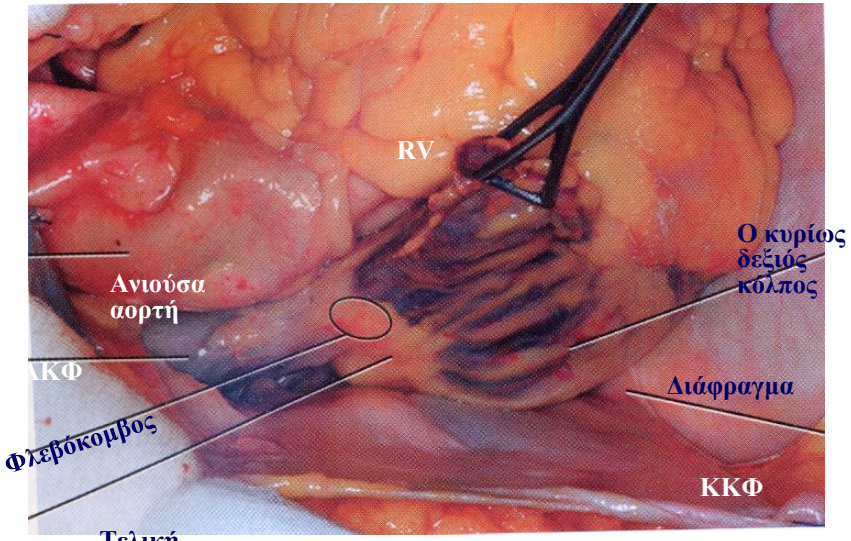


- This surface is formed mainly by the ***right atrium*** and ***the right ventricle***
- Divided by coronary (atrioventricular) groove into :
  - ***Atrial part***, formed mainly by right atrium.
  - ***Ventricular part*** , the right 2/3 is formed by right ventricle
- The 2 ventricles are separated by ***anterior interventricular groove***, which lodges :
  - ***Anterior interventricular artery*** (branch of left coronary).
  - ***Great cardiac vein***.

The ***coronary groove*** lodges : the right coronary artery.

External morphology of the heart





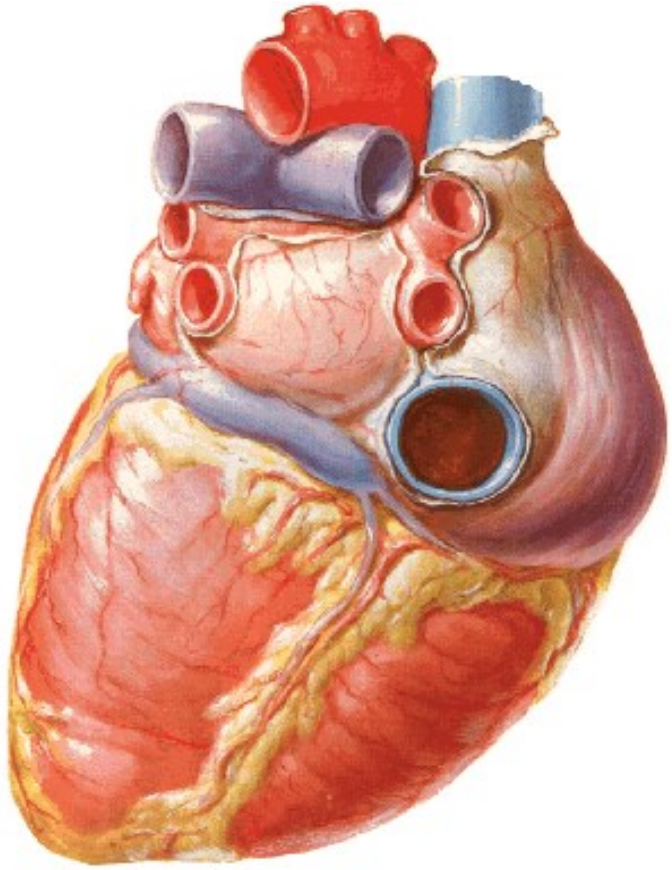
[από Berdajs D., Turina M.I. (eds), 2011]

Anatomical landmarks in cardio surgery

- **Interventricular groove:** atrium/ventricle border - Atrioventricular valve level - Course of coronary vessels
- **Sulcus terminalis:** junction between the right atrium and the right auricle – Crista Terminalis internally
- **Anterior inteventricular groove:** όριο μεταξύ RV / LV - Πορεία LAD και συνοδών φλεβών
- **Acute marigin:** Course acute marigin of the right coronary artery (RCA)
- **Sulcus terminalis:** parallel to it the longitudinal atriotomy (the most common incision)

External morphology of the heart – Anterior aspect

External morphology of the heart
Diaphragmatic surface (Inferior aspect)

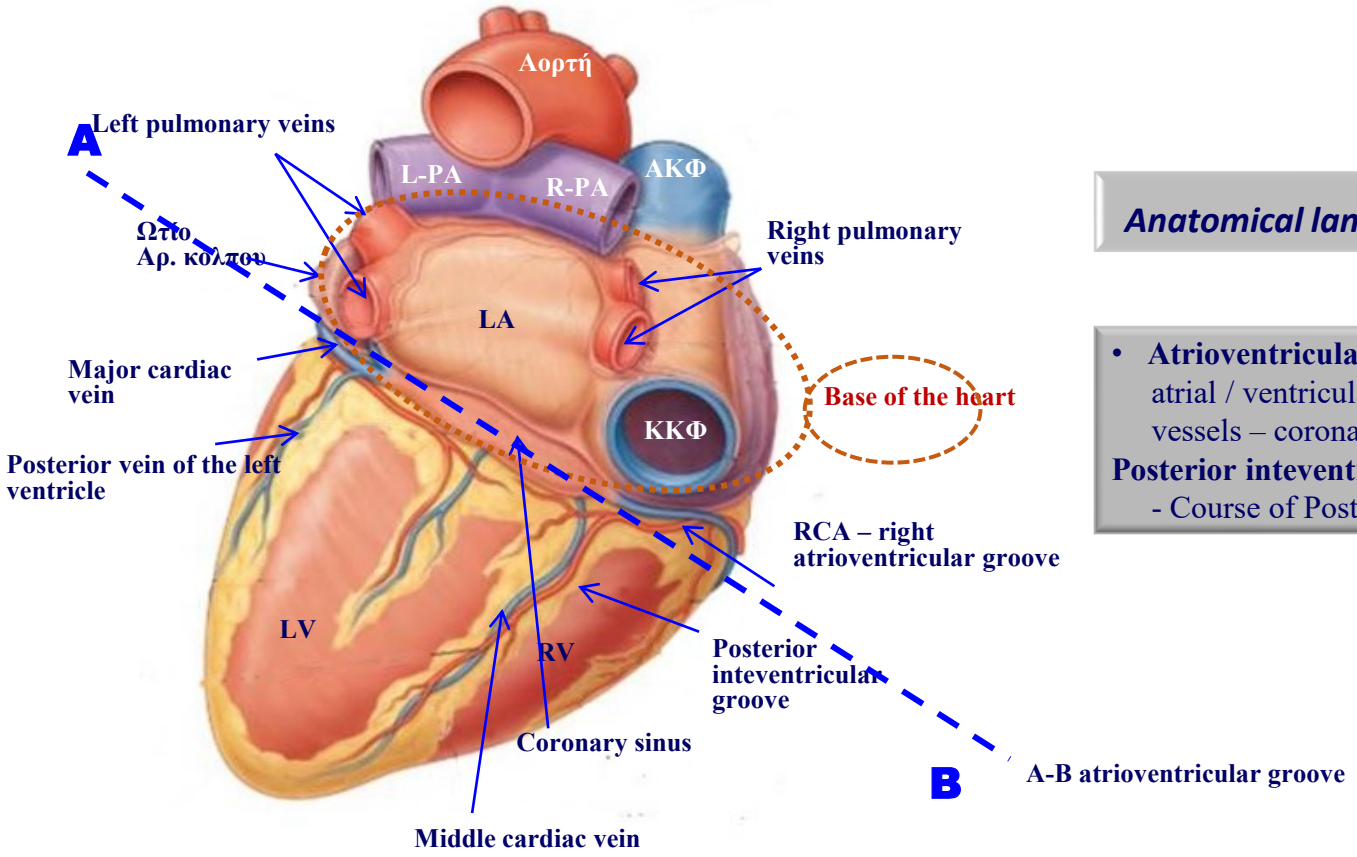


Formed by the 2-ventricles, mainly left ventricle(left 2/3).
Slightly concave as it rests on diaphragm.
Directed inferiorly & backward.
Separated from base of heart by ***posterior part of coronary sulcus.***
The 2-ventricles are separated by ***posterior interventricular groove*** which lodges:

- ***Posterior interventricular artery***
- ***Middle cardiac vein***

External morphology of the heart
Diaphragmatic surface (Inferior aspect)

External morphology of the heart (posterior aspect)

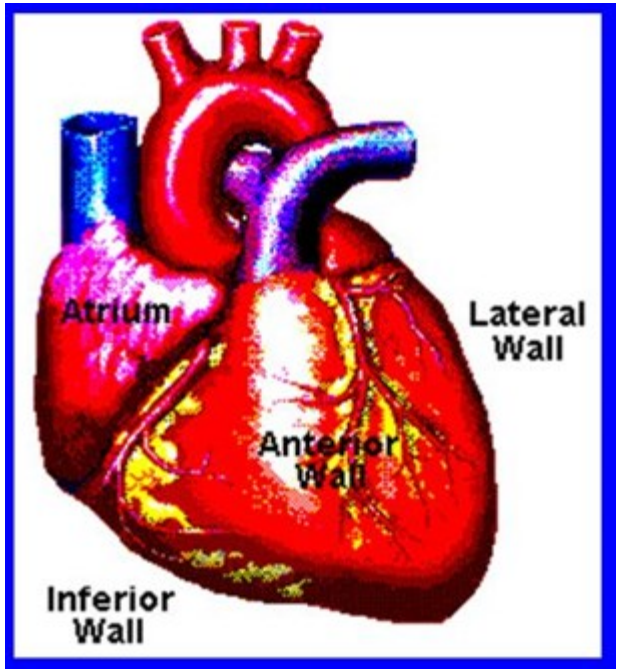


Anatomical landmarks in cardiovascular sugery

- **Atrioventricular groove (dotted line A -B):**
  atrial / ventricular border - Atrioventricular level valves - Course of coronary vessels – coronary sinus

Posterior inteventricular groove : Border RV / LV
- Course of Posterior descending artery (PDA) and the middle cardiac vein

Lateral surface of the heart



- It is formed by the ***lateral wall of the left ventricle***
- ***Electrocardiographically*** it is studied in leads V5, V6, I and aVL
- It is mostly supplied by branches of the ***Circumflex artery.***

Left & Right surface of the heart

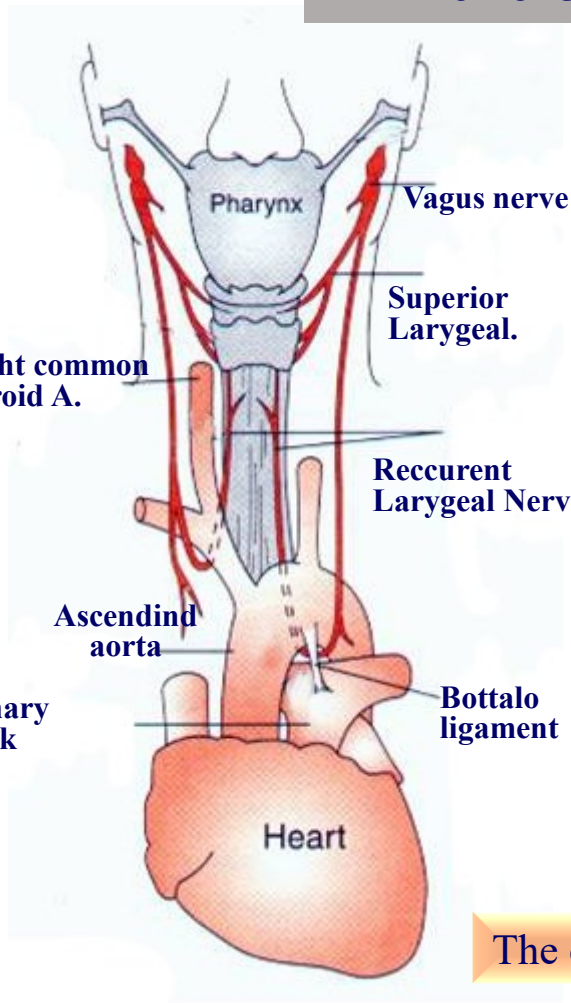
Left surface

It is formed mainly by the ***left ventricle***, in relation to the fossa of the left lung

Right surface

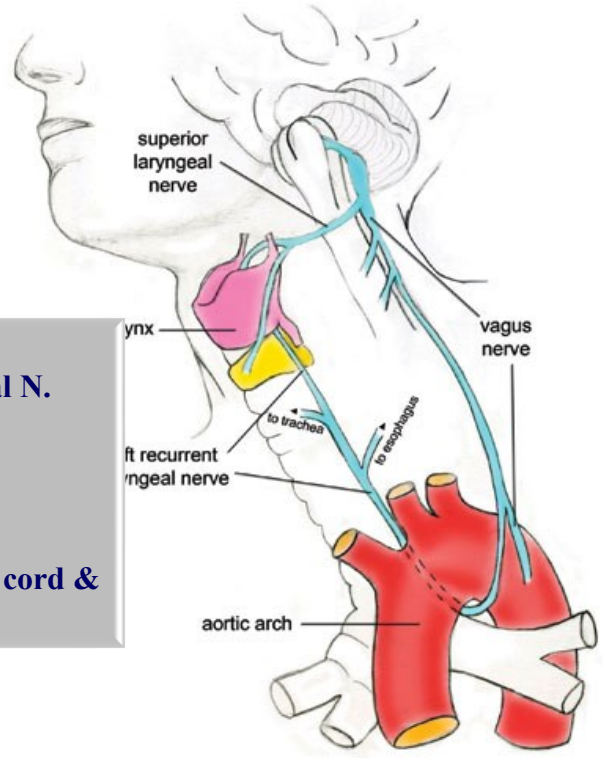
It is formed mainly of the right surface of ***the right atrium***. It lies anterior to the hilus of the right lung and it is separated from the cardiac impression on its mediastinal surface by the layers of pericardium and pleura.

Position - course - relations of the vagus nerve with the heart – the great vessels & lungs



Caution:
Injury of the reccurent laryngeal N.
(e.g. during its preparation
Of the Bottalo duct)

Paralysis of the consistent vocal cord &
Hoarseness

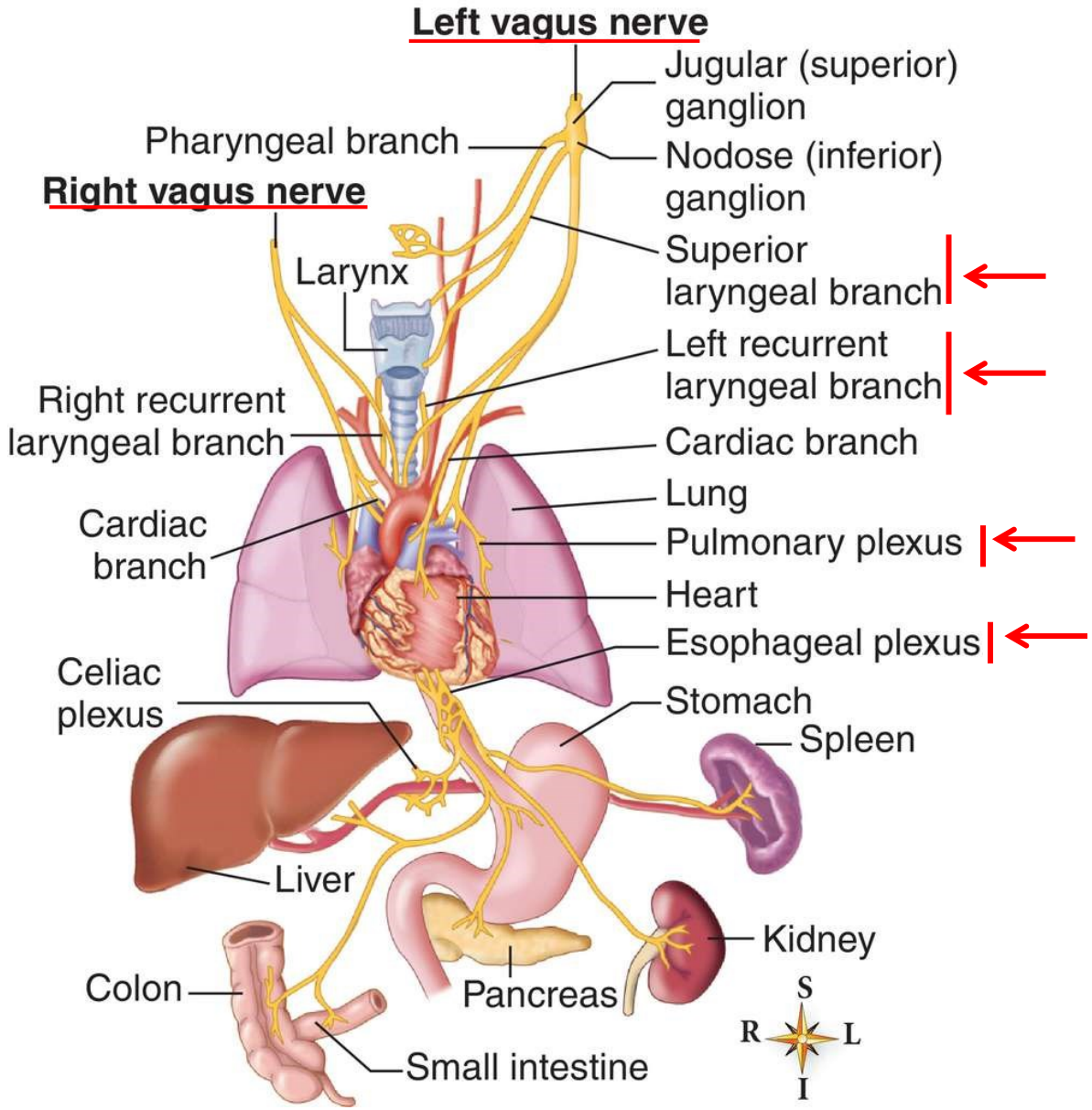


The course of the vagus nerve in the Thorax

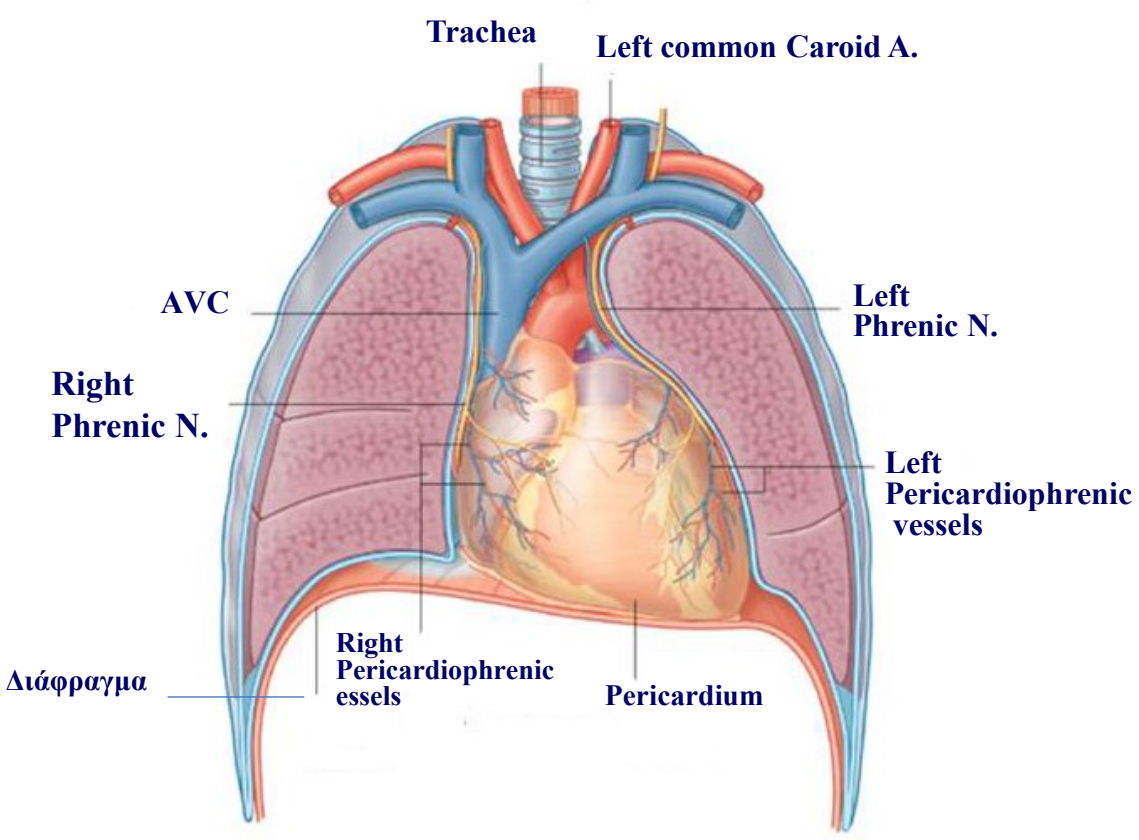
Right vagus nerve: runs under the right portal, forms the right pulmonary plexus, then along the esophagus → the posterior esophageal plexus.
Left vagus N: left portal forms the left pulmonary plexus, then along of the esophagus → anterior esophageal plexus

Vagus nerve

Mixed nerve



Phrenic nerve



Phrenic nerve injury:

- during the preparation of the thymus gland
- during its longitudinal opening pericardium (no. pleural cavity)
- application of local cooling of the myocardium

↓

The consequences:

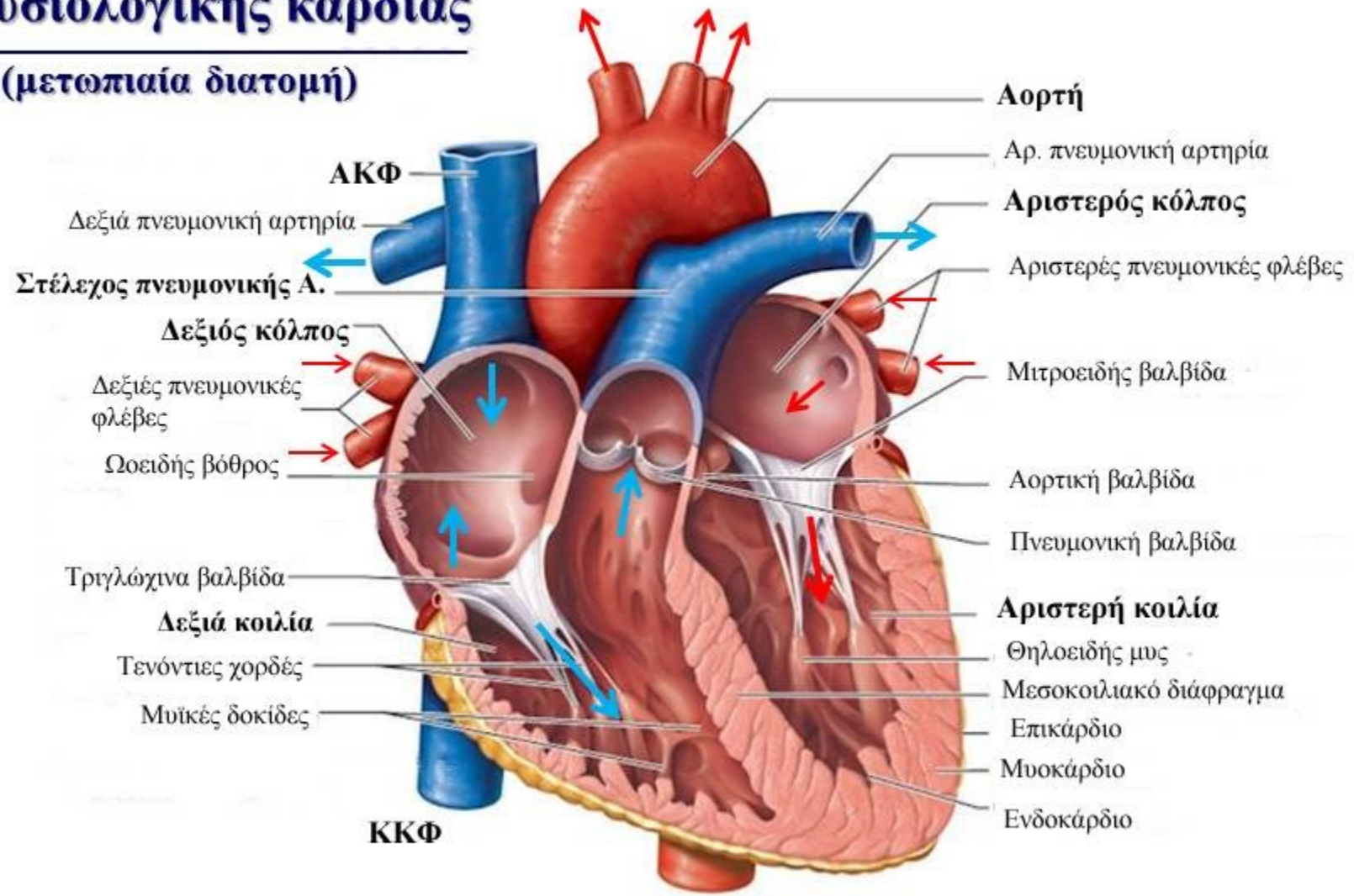
-Hiccups

-Paradoxical mobility semi-diaphragm array

7. THE CAVITIES OF THE HEART AND ITS VALVES

το εσωτερικό φυσιολογικής καρδιάς

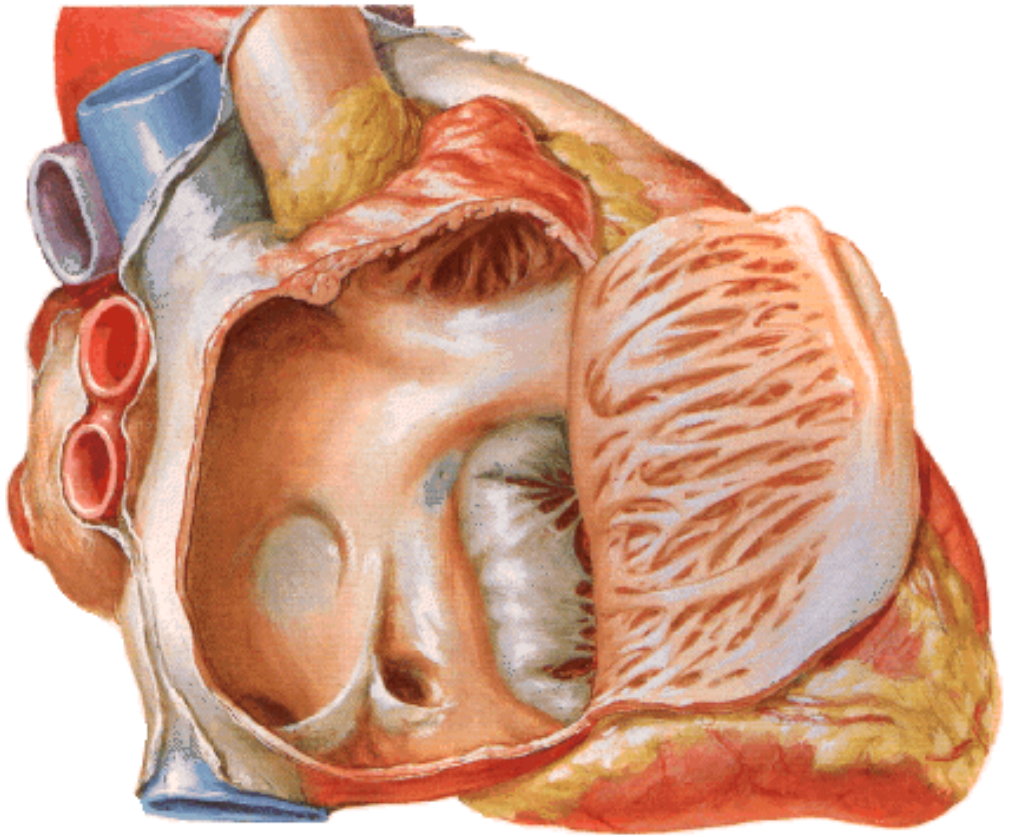
(μετωπιαία διατομή)



η ενδοκαρδιακή ροή του αίματος

Right cardiac cavities

Right atrium



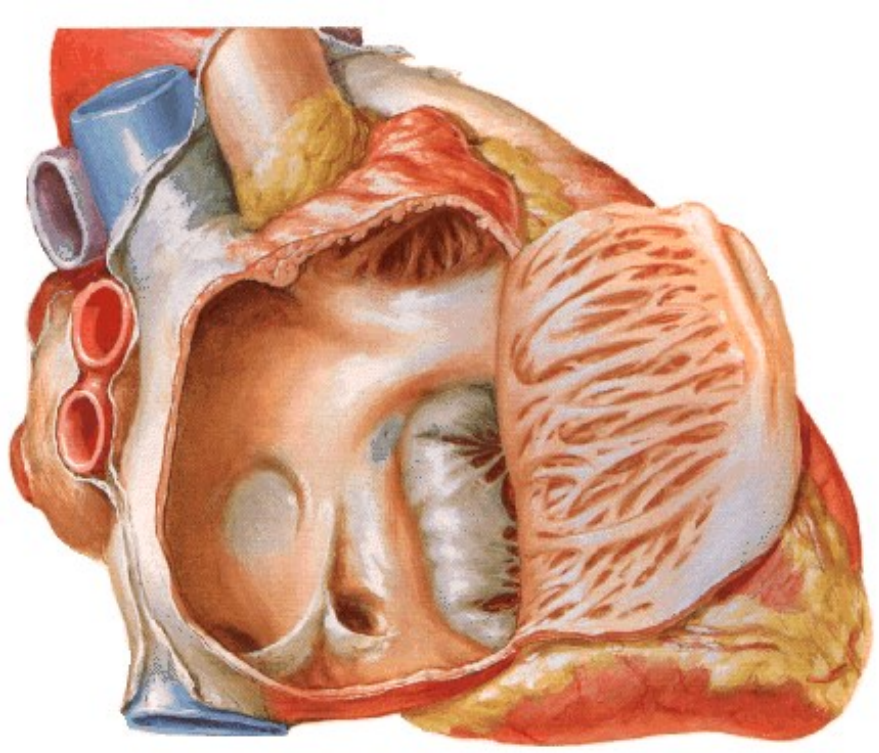
- consists of a main cavity and a small **outpouching**, the **auricle.**
- On the outside of the heart at the junction between the right atrium and the right auricle is a **vertical groove**, **the sulcus terminalis**, which on the **inside** forms a ridge, the **crista terminalis.**

➢ Crista terminalis divides right atrium into:

1. Anterior part: **rough** and trabeculated by bundles of muscle fibres **(musculi pectinati).**
2. Posterior part (sinus venarum) is **smooth.**

- The interatrial septum carries an oval depression called **Fossa ovalis** The margin of this depression is called **Annulus ovalis.**
- The blood leaves right atrium to right ventricle via **tricuspid valve.**

Right cardiac cavities
Morphology of Right Atrium (interior aspect)

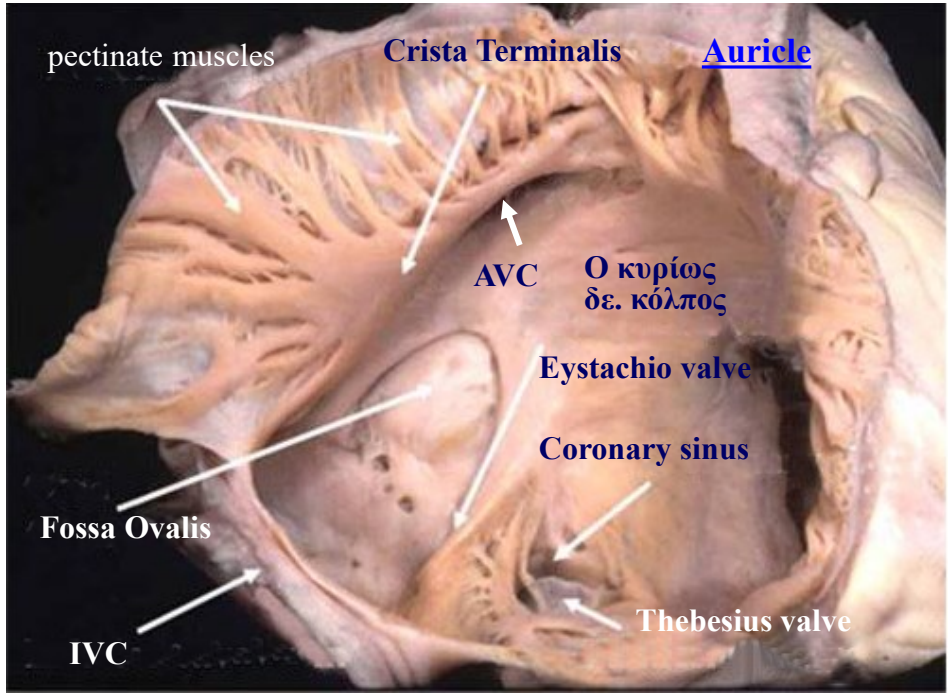


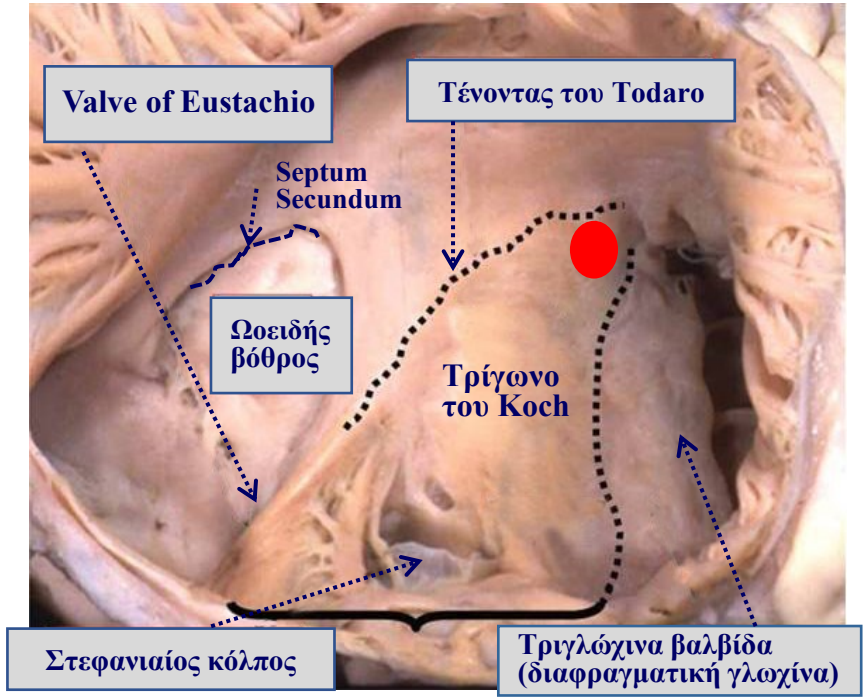
- *Superior wall*
  - **SVC (superior vena cava) --- has no valve**
- *Inferior wall*

1. **IVC (inferior vena cava)-- guarded by a valve**
2. **Coronary sinus : has a well defined valve**
3. **Right atrioventricular orifice lies anterior to IVC opening , it is surrounded by a fibrous ring which gives attachment to the tricuspid valve**
4. **Small orifices of small veins**

Right cardiac cavities

Right atrium





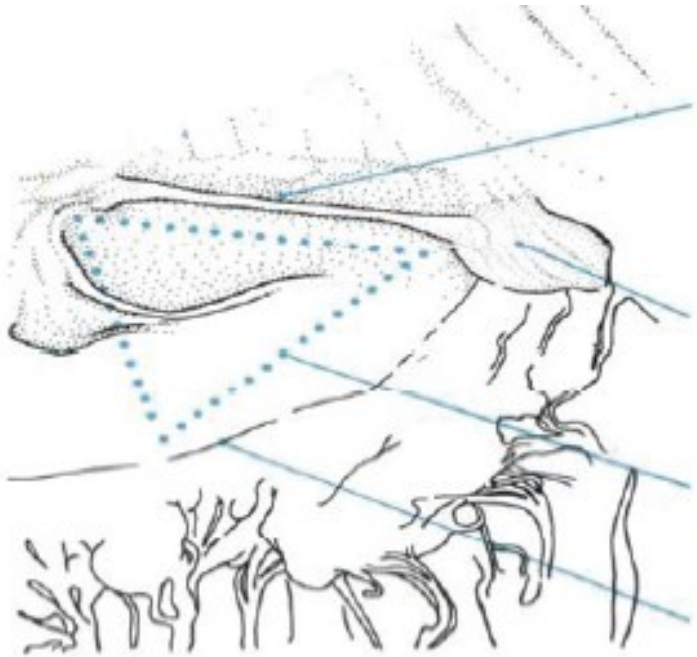
Anatomical landmarks in cardiovascular sugery

SOS

- **Koch's triangle:** AV node is located / Injury to it causes AV block.
- **Red circle:** indicates the apex of the triangle. From here begins the bundle of His, which initially runs on the right side of the membranous septum.

SOS

Koch's triangle

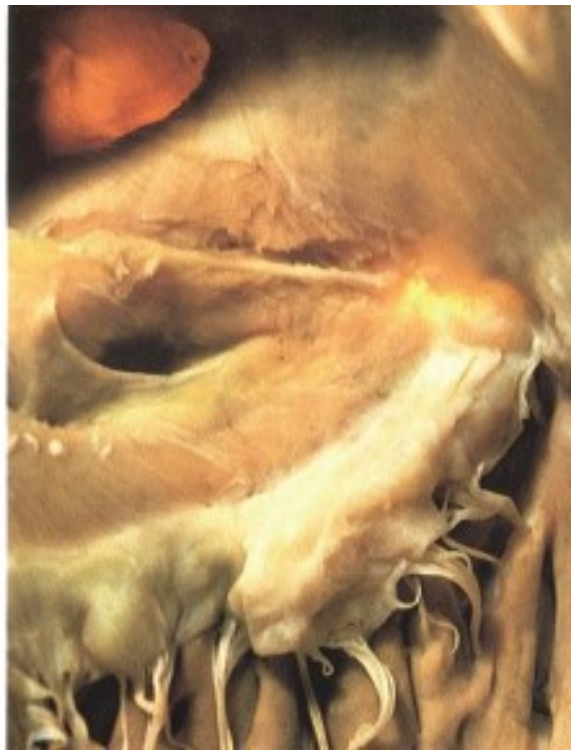


Τένοντας του Tondaro

Υμενώδες διάφραγμα

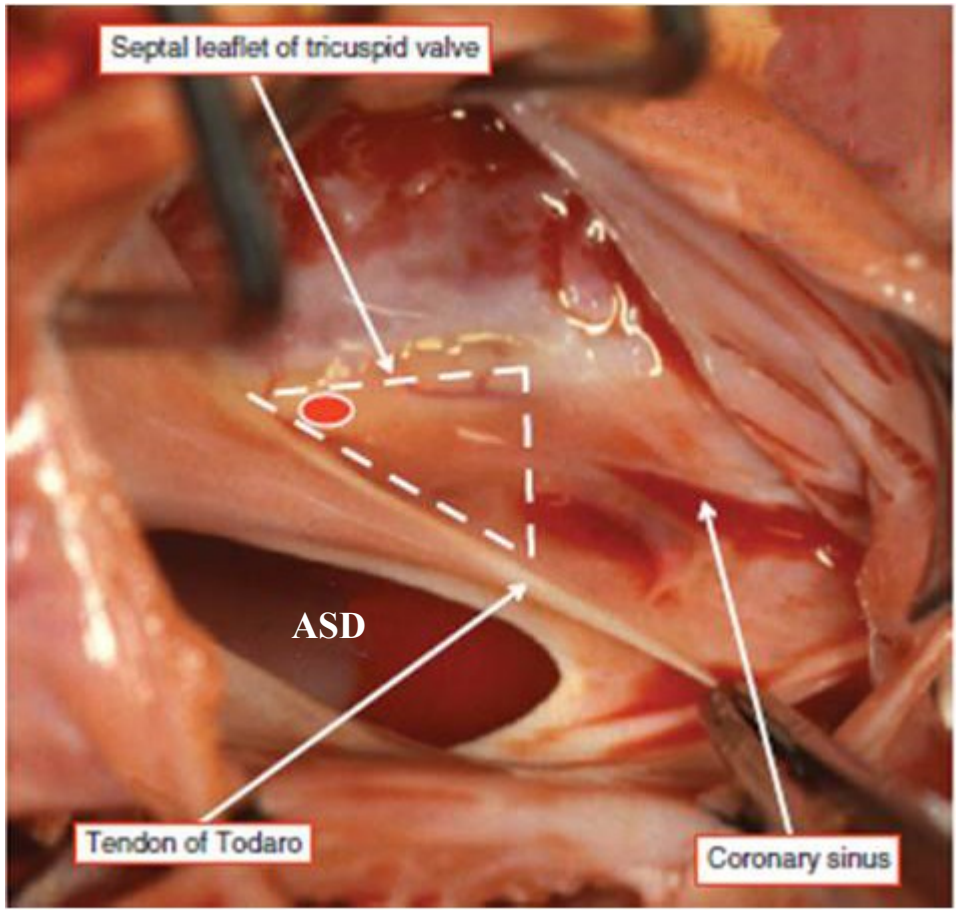
Τρίγωνο του Koch

Προσπεφυκός χείλος διαφραγματικής γλωχίνας



Οι δεξιές καρδιακές κοιλότητες

ο δεξιός κόλπος

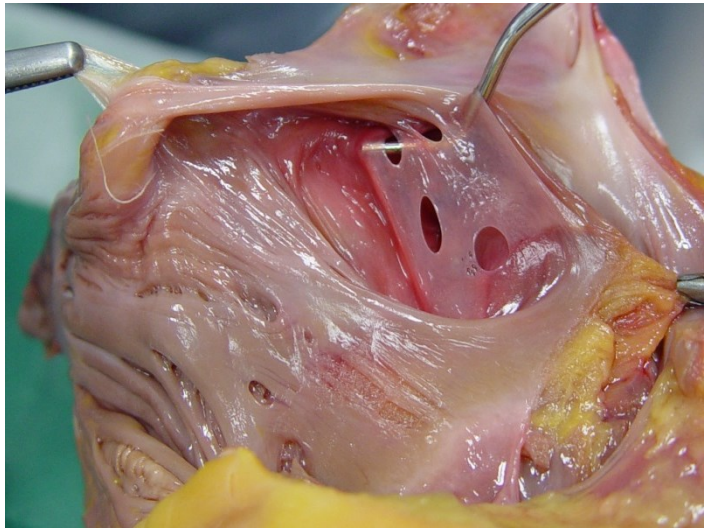


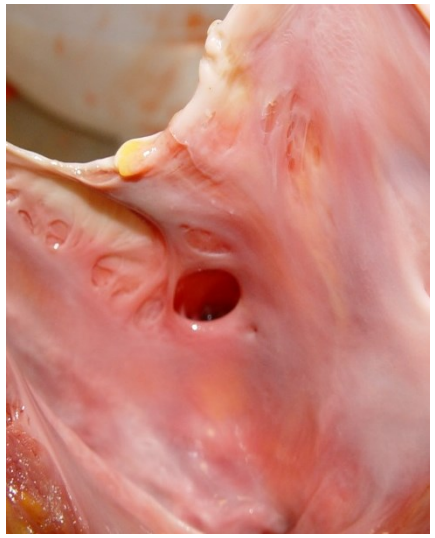
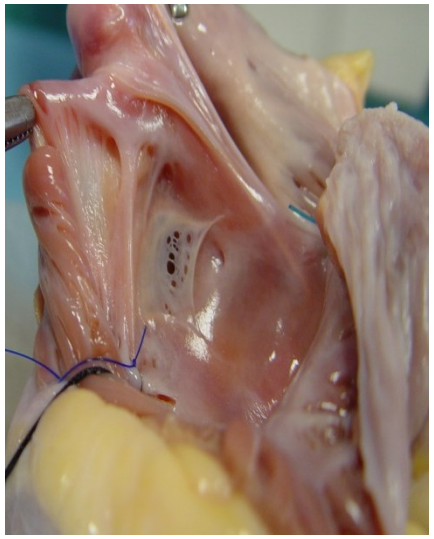
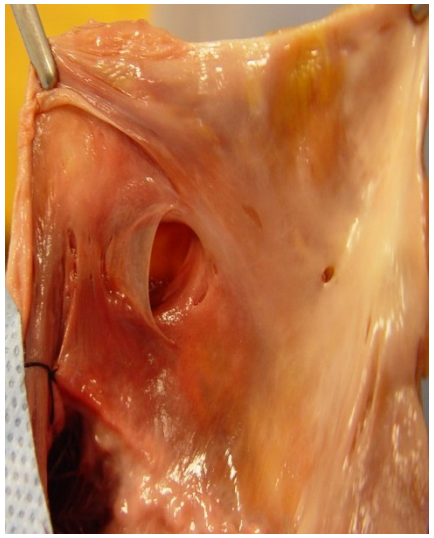
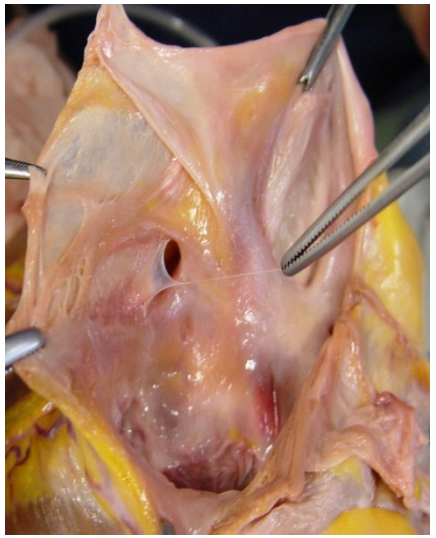
Κεφαλή ←

→ Κάτω άκρα

Εικόνα από χειρουργείο σε ασθενή με δευτεροπαθές ASD.
Έλκεται η ευσταχιανή βαλβίδα για την ανάδειξη του τένοντα του Todaro

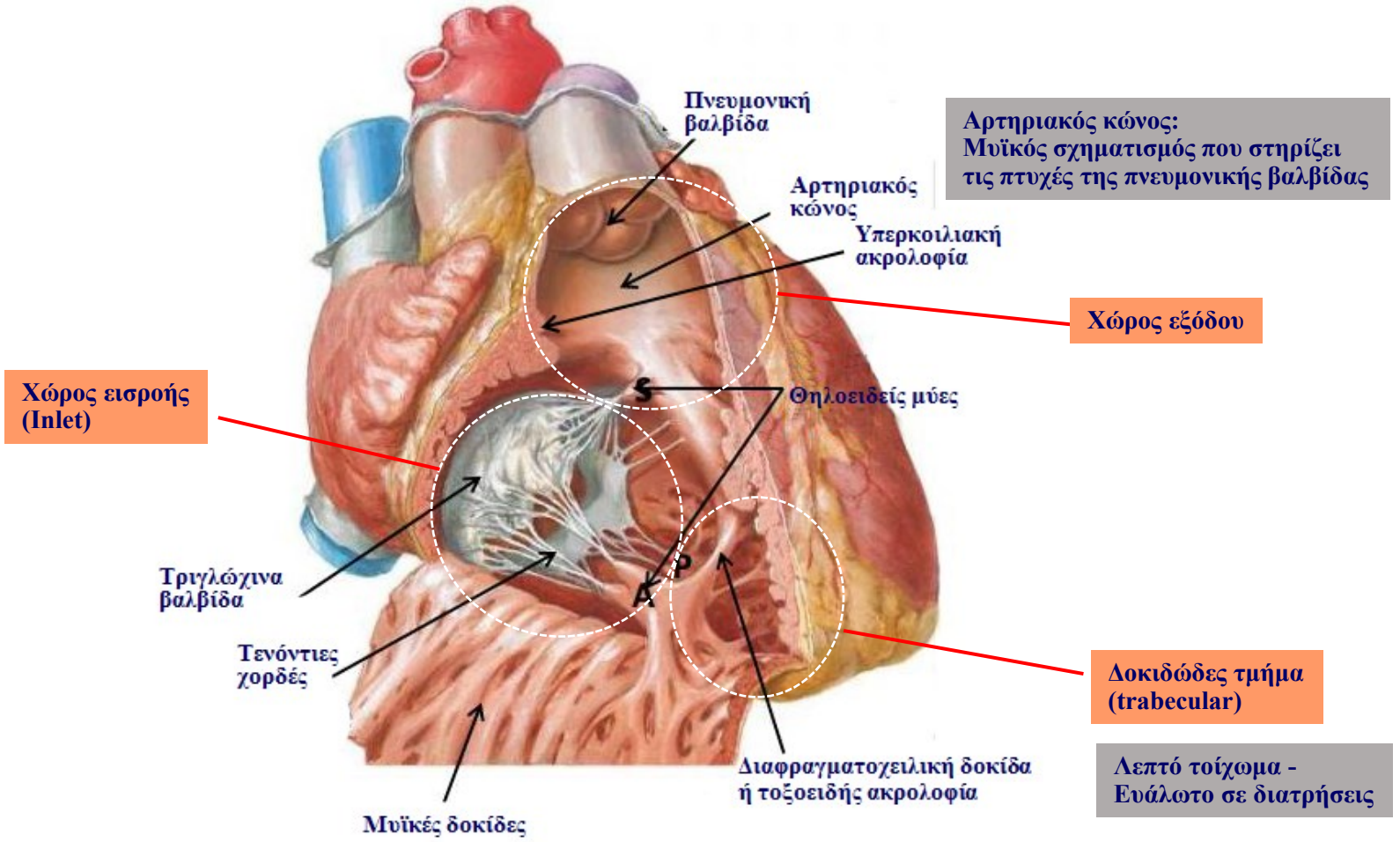
Right cardiac cavities – Anatomical variation of the coronary sinus ostium

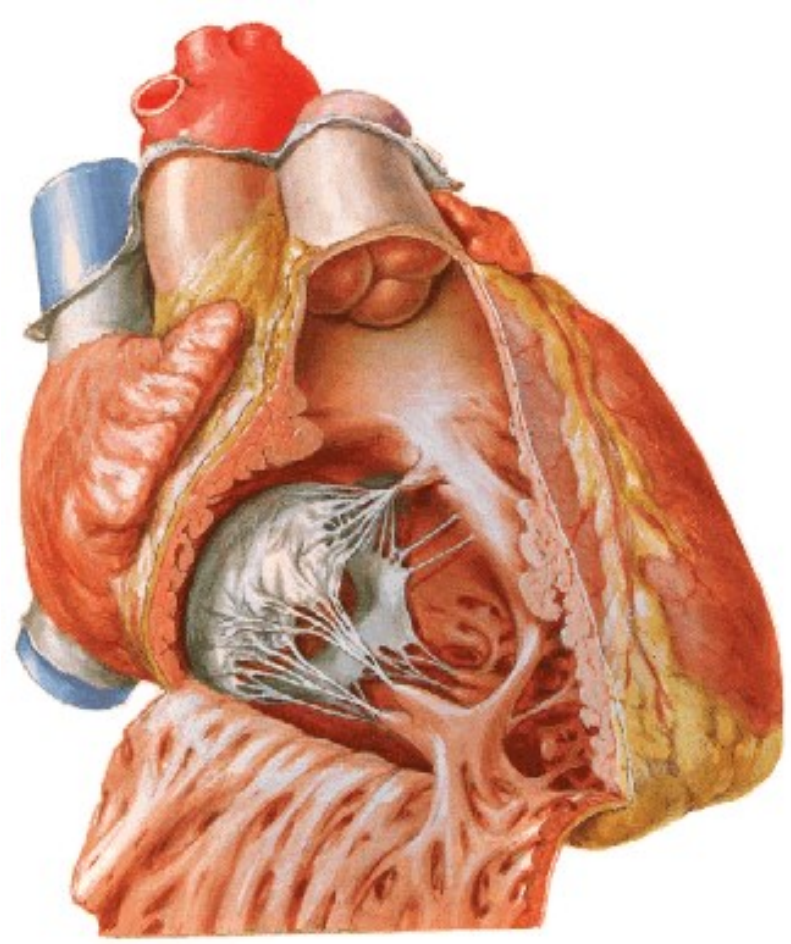





Right cardiac cavities

Right Vetricle

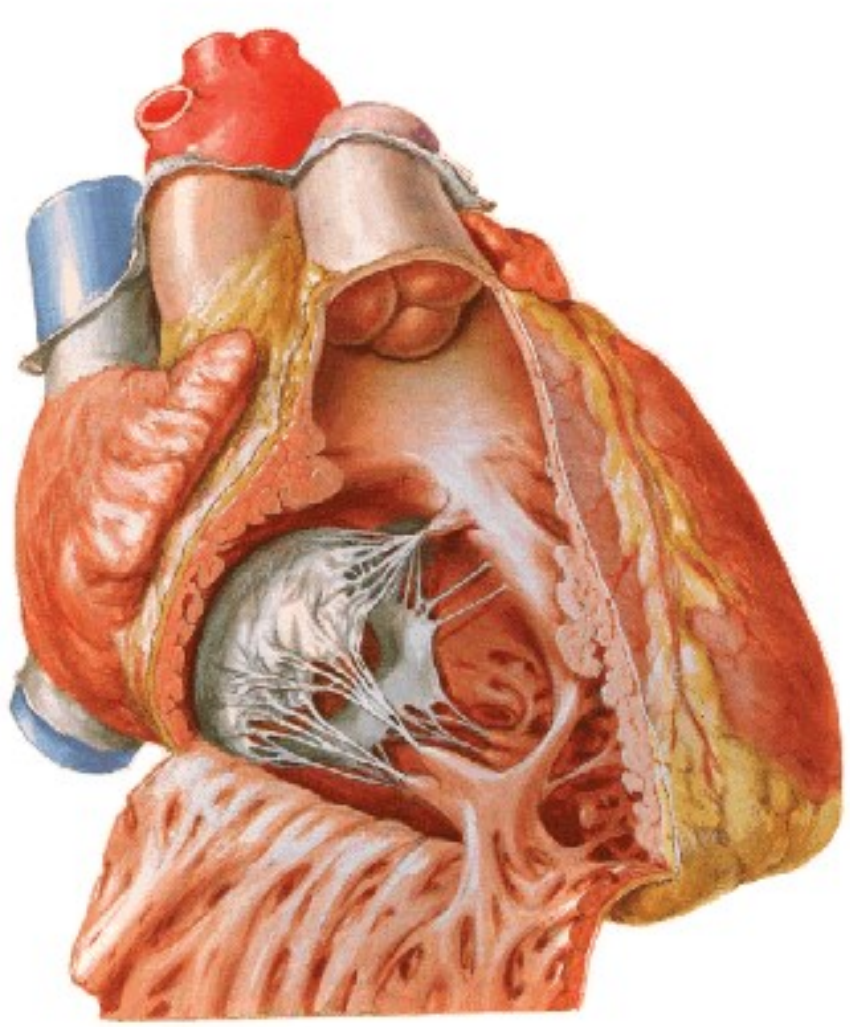


Right cardiac cavities
Morphology of the interior of the Right Ventricle



- **Its wall is thinner than that of left ventricle**
- **Its wall contains projections called trabeculae carnae.**
- **The right ventricle communicates with right atrium through**
  1. **The right atrioventricular orifice**
  2. **The pulmonary trunk through pulmonary orifice**
- **As the cavity approaches the pulmonary orifice it becomes funnel shaped, at which point it is referred to as the infundibulum.**
- **The wall of infundibulum (conus arteriosus) is smooth and contains no trabeculae.**
- Blood leaves the right ventricle to pulmonary trunk through pulmonary orifice

Right cardiac cavities
Morphology of Right Ventricle (interior aspect)

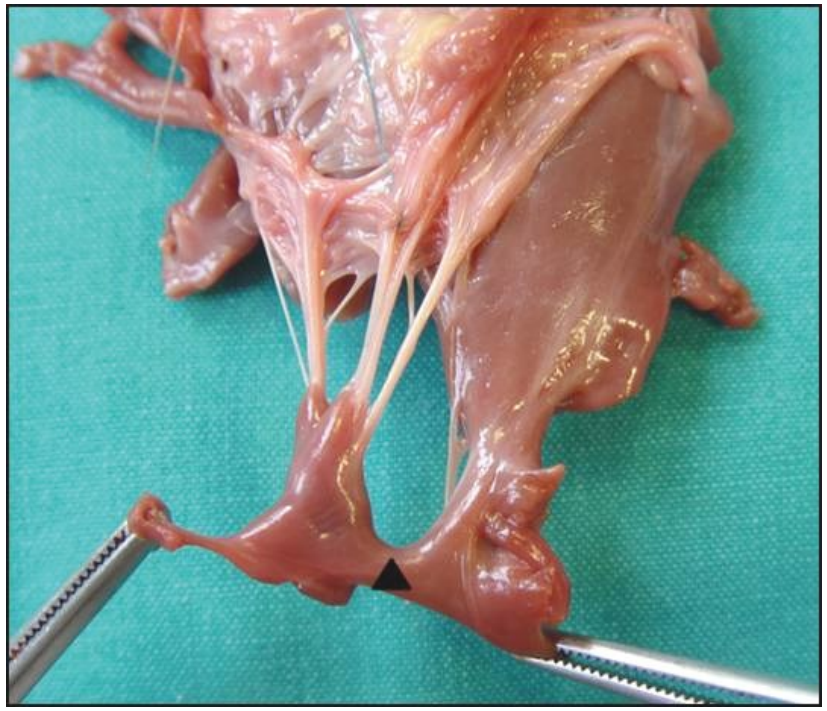


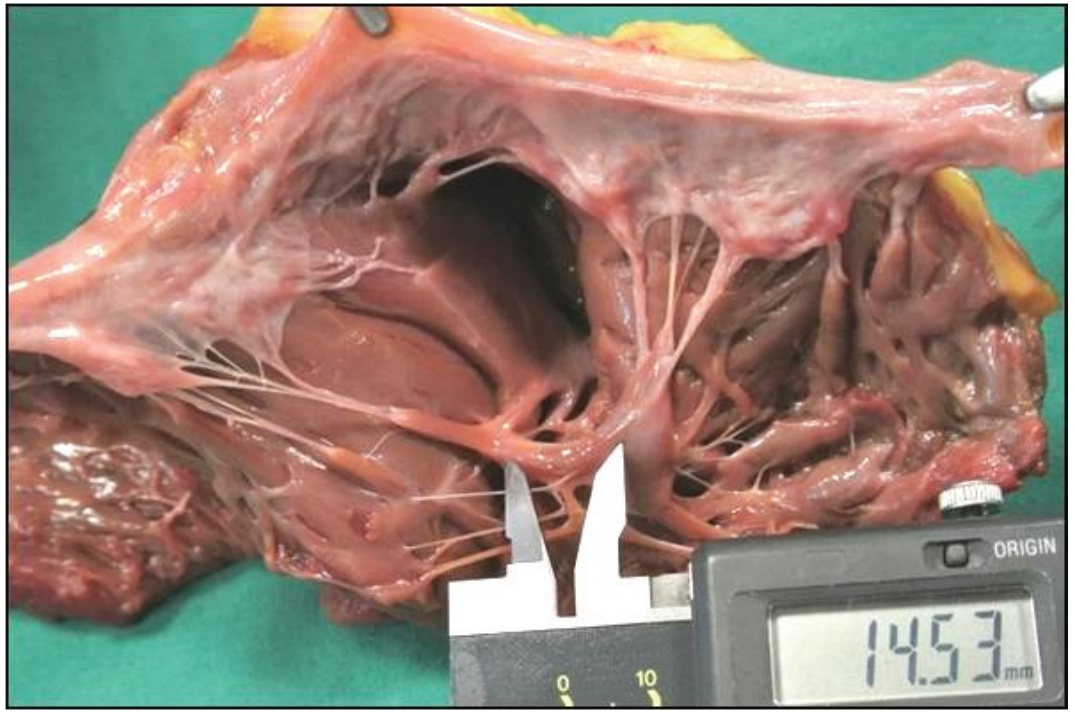
- **Large projections arise from the walls called papillary muscles :**
  1. **Anterior papillary muscle**
  2. **Posterior papillary muscle**
  3. **Septal papillary muscle**

- **Each papillary muscle is attached to the cusps of tricuspid valve by tendinous threads called chordae tendineae.**

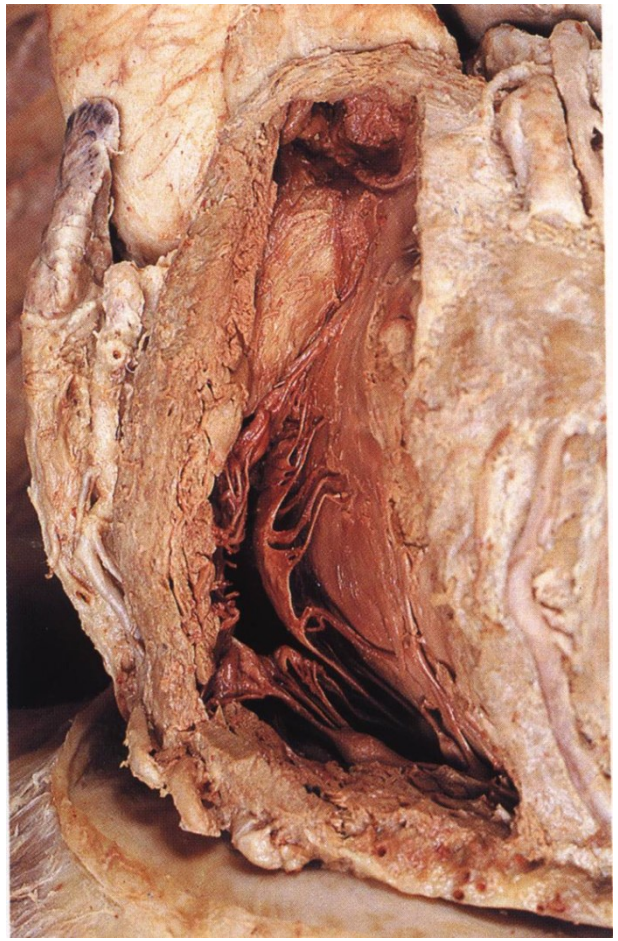
- **Interventricular septum is connected to anterior papillary muscle by a muscular band called moderator band.**

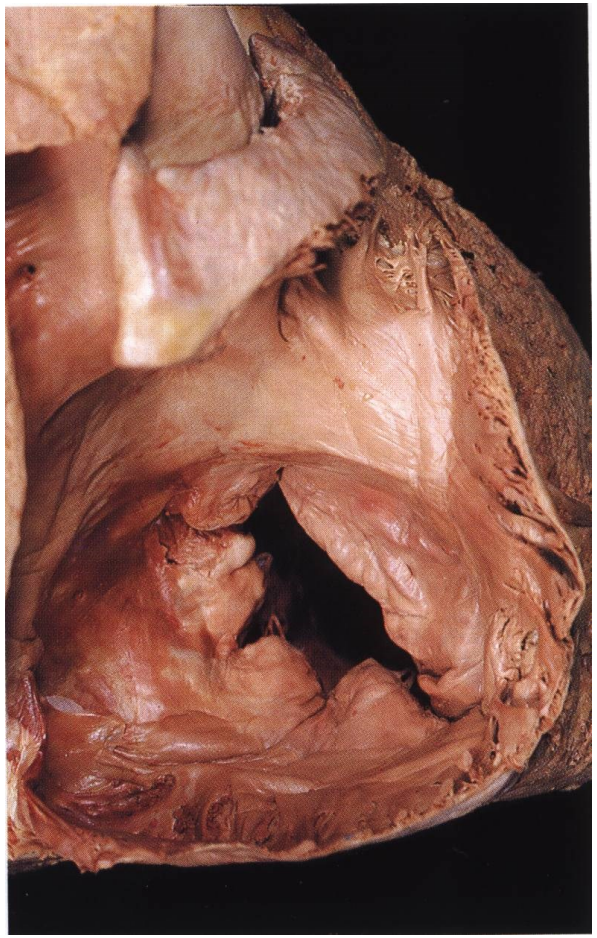
Right cardiac cavities-
Moderator band or axillary crest





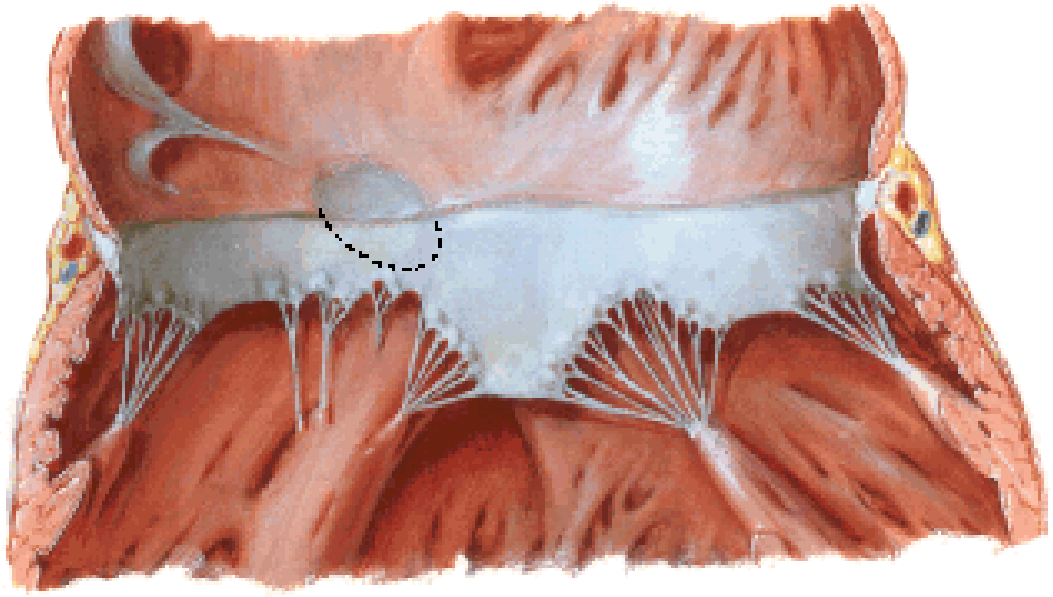
Right cardiac cavities
Right Atrioventricular or Triscuspid valve



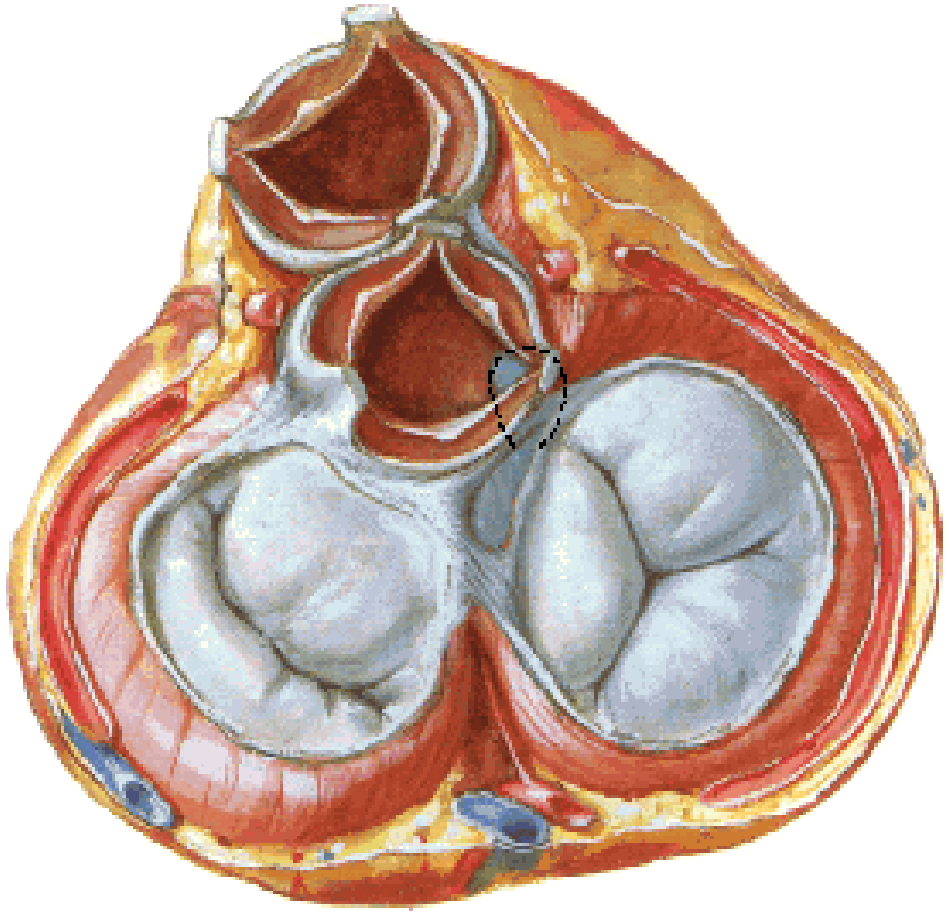


Right cardiac cavities

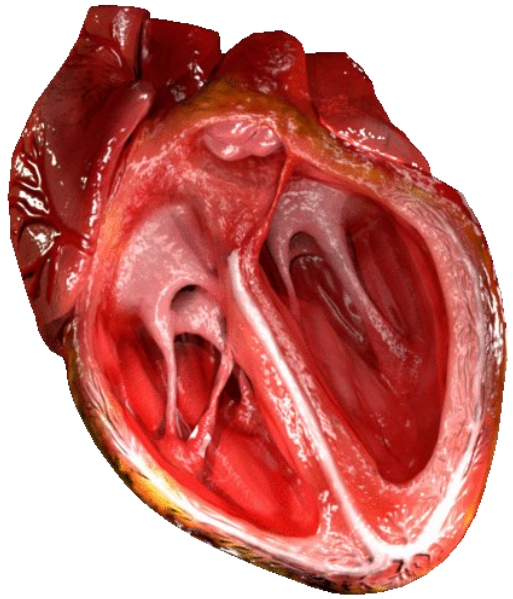
Right Atrioventricular or Triscuspid valve



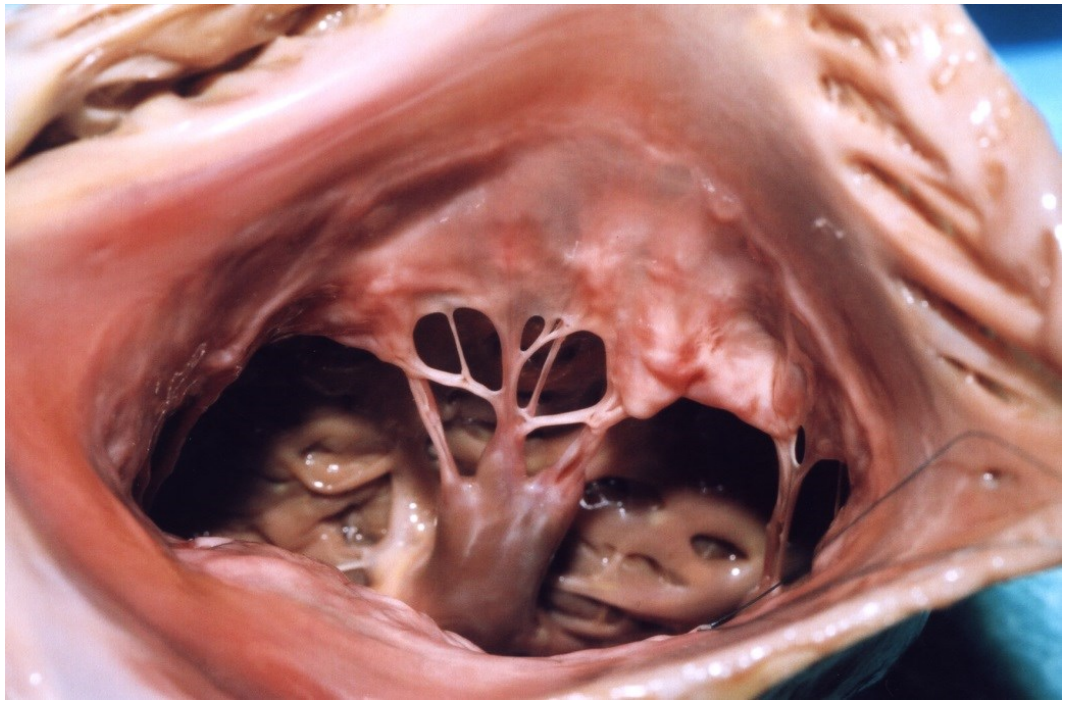
Right cardiac cavities
Right Atrioventricular or Triscuspid valve



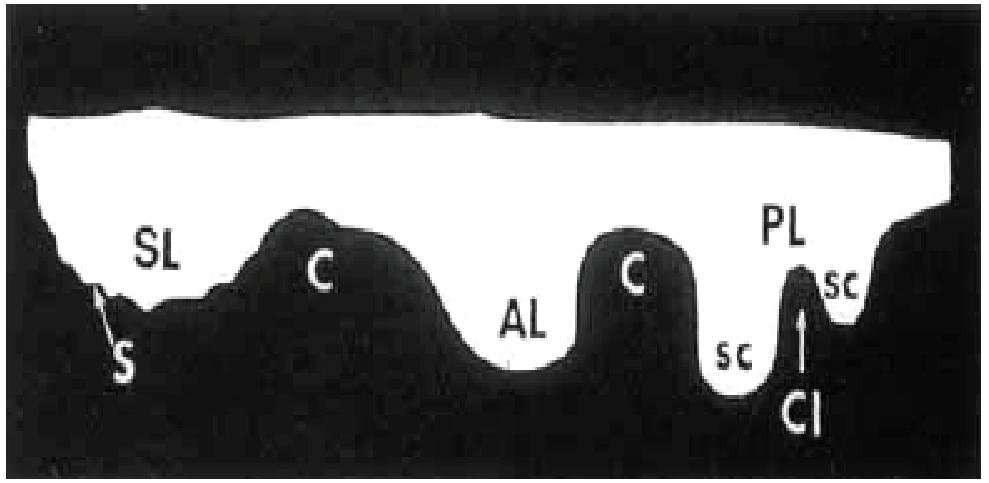
- **Septal leaflet or medial**
- **Anterior leaflet or superior**
- **Posterior Leaflet or inferior**



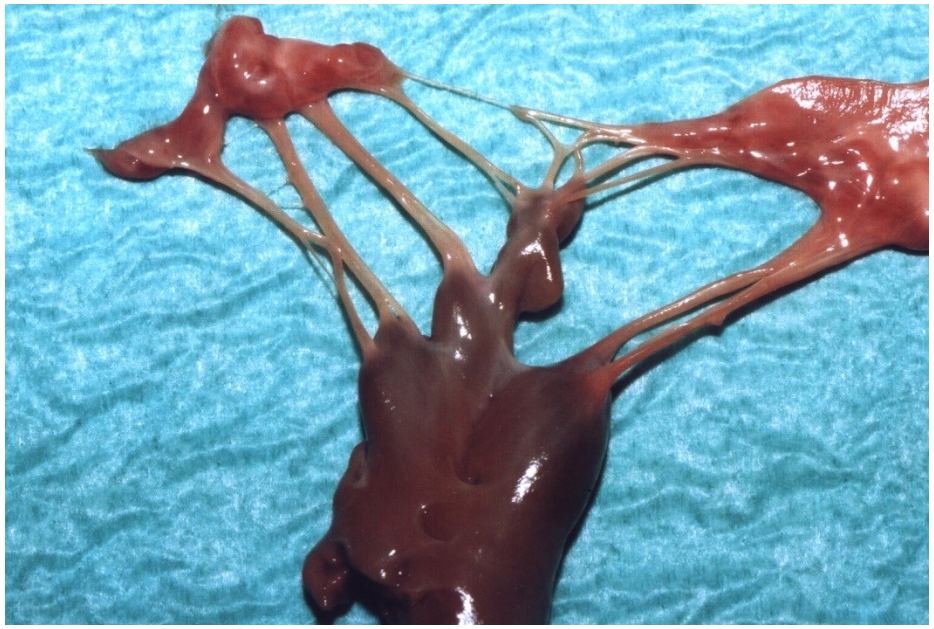
Right atrioventricular or Triscuspid valve



Right atrioventricular or Triscuspid valve



Right cardiac cavities-
Papillary muscles

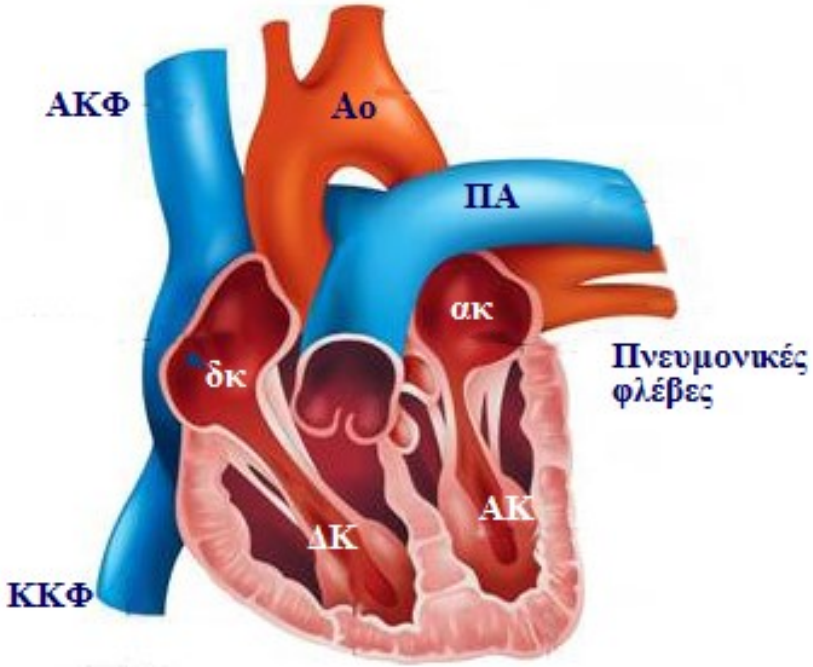


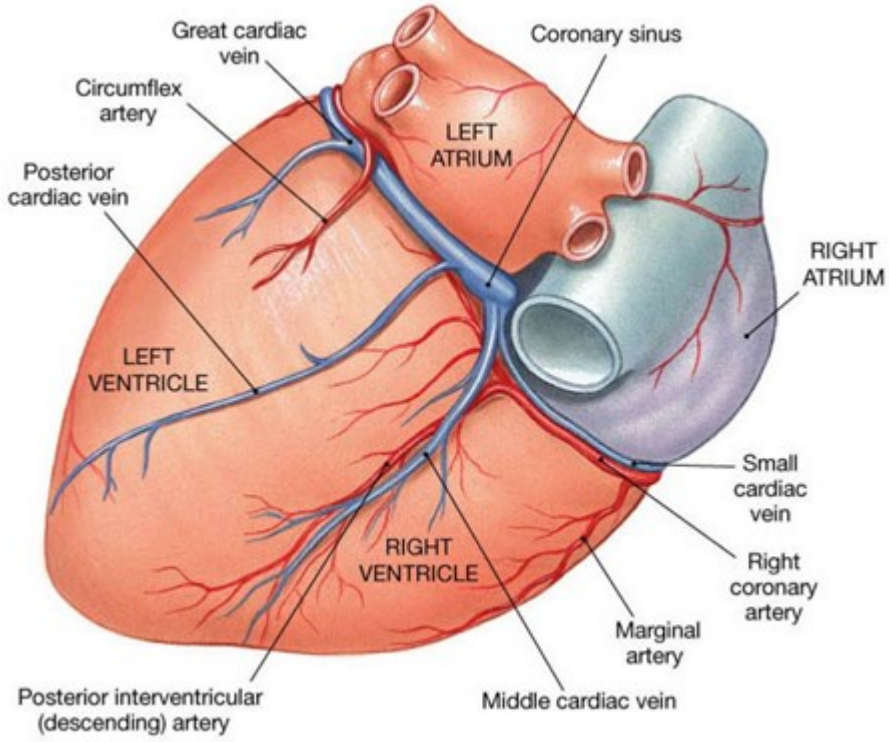
Conoidal projections of the myocardium surrounded everywhere by endocardium.

Morphological classification of the right ventricular papillary muscles

Left cardiac cavities

Left Atrium



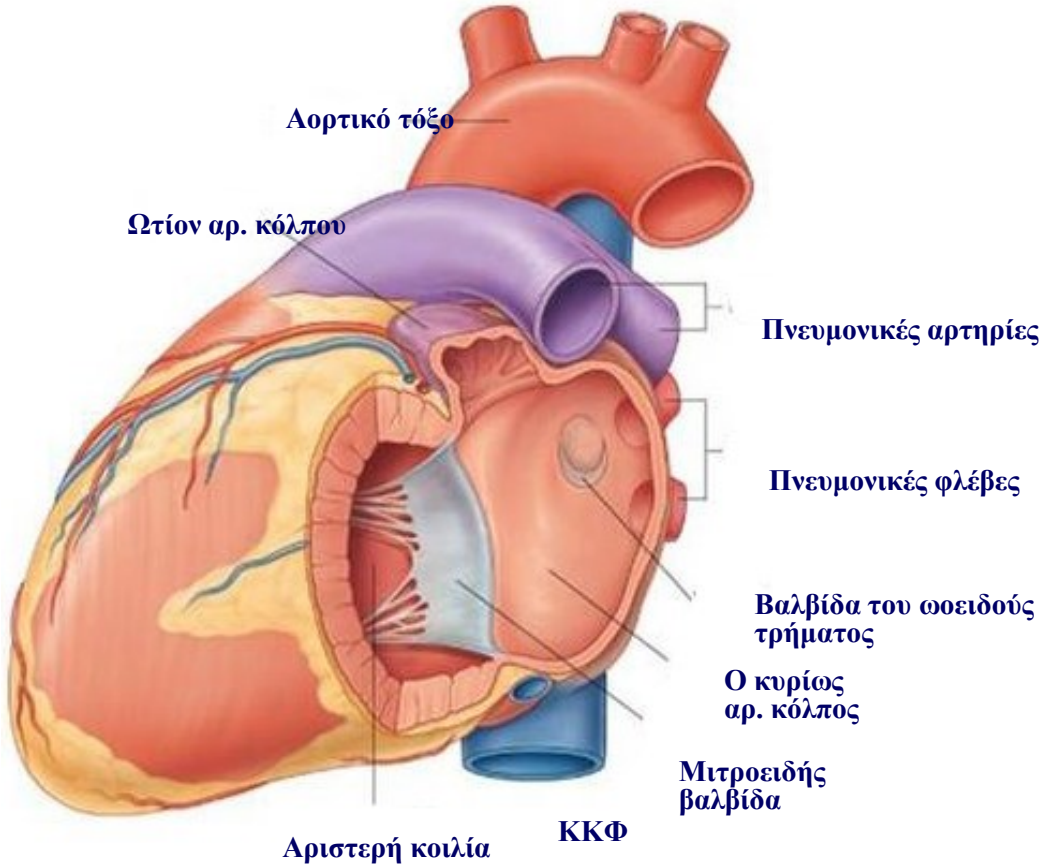


Left cardiac cavities

Left atrium

his characteristics:

- smaller than the right one
- Auricle with fewer & thinner pectineal muscles
- Area of clot formation
- ejection
  of 4 (3-5) pulmonary veins on the back wall
- Interatrial groove or Waterstone's groove or Sondergaard's sulcus

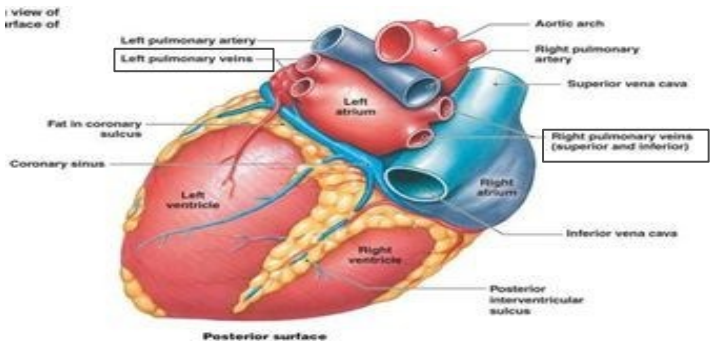


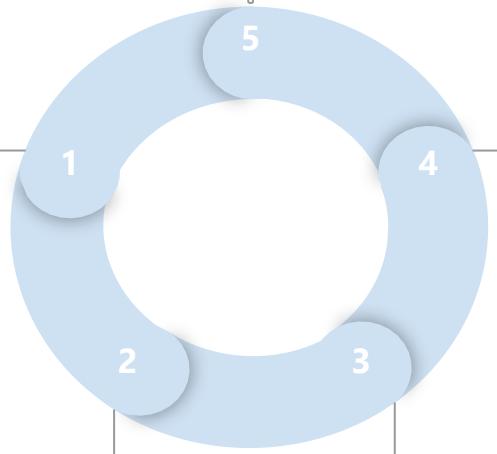
Left atrium of the heart

The **left atrium** communicates with the **left ventricle**

through

the left atrioventricular orifice.



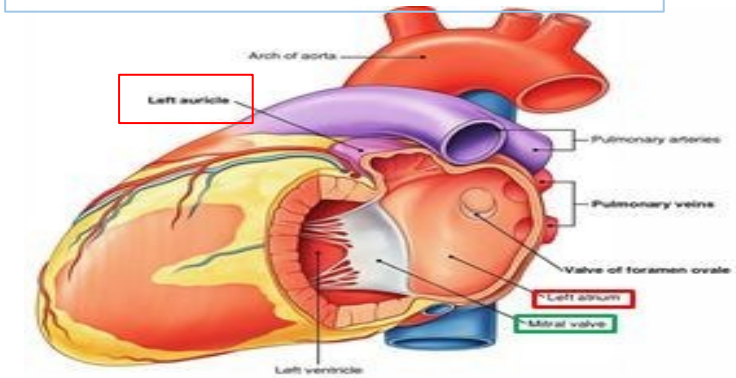


Sends blood to **left ventricle**

through

The **left atrioventricular orifice** which is

guarded by **mitral valve (Bicuspid valve).**



It forms the greater part of **base of heart.**

It **Recieves 4 pulmonary** veins which have **no valves.**

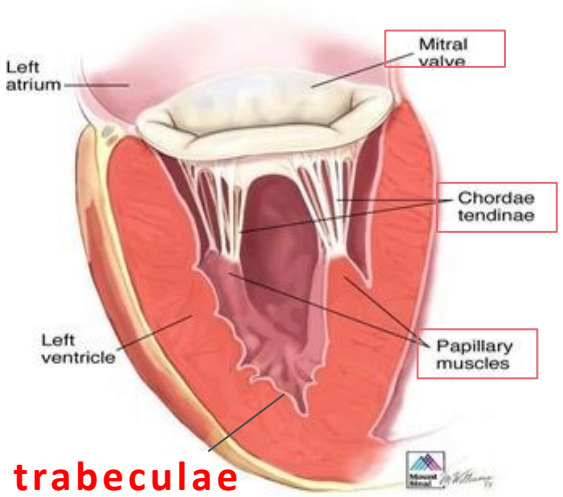
Its **wall is smooth**

except

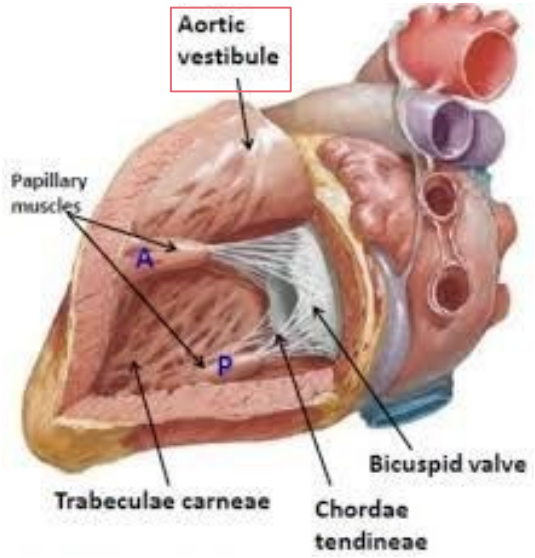
for **small musculi pectinati** in the **left auricle**

Left ventricle of the heart

Video



trabeculae carnae.



1

It receives blood from left atrium through

left atrio- ventricular orifice which is

guarded by **mitral valve (bicuspid)**

2

- Its wall is **thicker** than that of right ventricle.
- Its wall contains **trabeculae carnae.**
- Its wall contains: **2 large papillary muscles** (anterior & posterior) They are attached by **chordae tendinae** to cusps of mitral valve.

4

- The **part of left ventricle** leading to ascending aorta is called **aortic vestibule.**
- The wall of this part is fibrous and smooth.

3

The **blood** leaves the **left ventricle** to

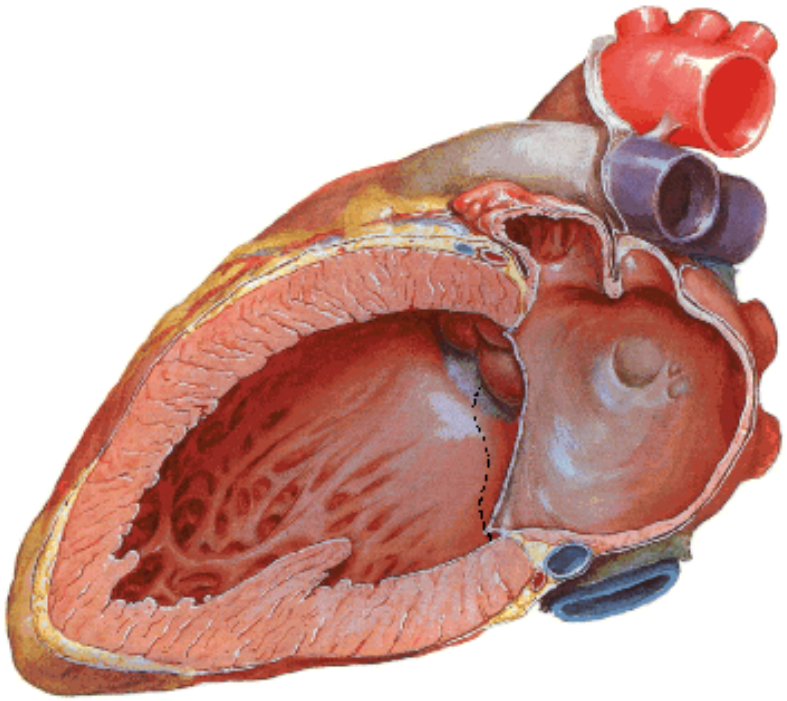
↓

the **ascending aorta** through

↓

the **aortic orifice.**

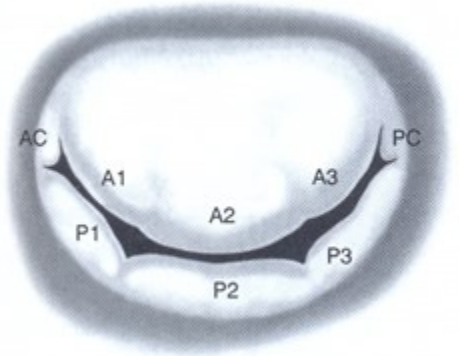
Left cardiac cavities
Morphology of the interior of the left atrium



- **Έξω τοίχωμα** Αριστερό ωτίο
- **Έσω τοίχωμα** (αριστ. επιφάνεια μεσοκ. Διαφράγματος) Εντύπωμα
- **Άνω, κάτω τοίχωμα**
- **Οπίσθιο τοίχωμα** Στόμια εκβολής πνευμ. φλεβών
- **Πρόσθιο τοίχωμα** Αριστερό κολποκοιλιακό στόμιο

Left cardiac cavities

Mitral valve

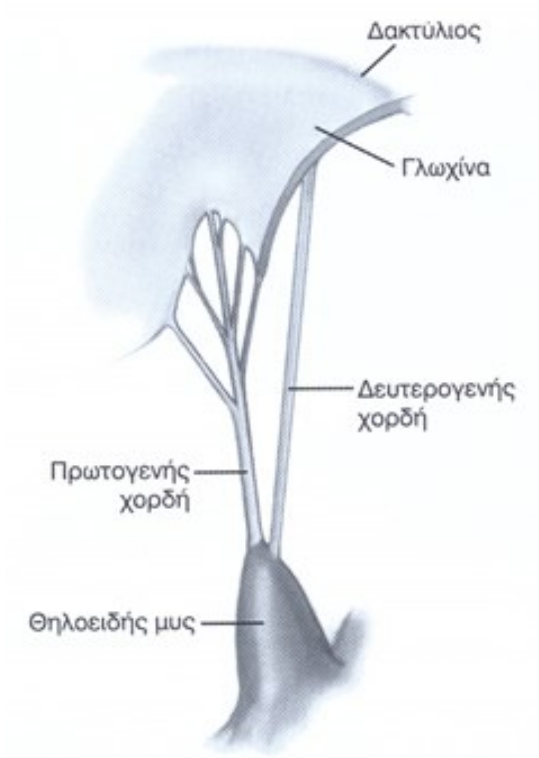


SOS **The mitral annulus is associated with:**
Circumflex artery – Coronary sinus – aortic vlave - His bundle **SOS**

(από Selke F.W., del Nido P.J., Swanson S.J. (eds), 2010)

Left cardiac cavities

Mitral valve



Tendinous cords:

- **primary**
- **secondary**
- **Tertiary** **(Only to the posterior leaflet # βάση - με τοίχωμα αρ. κοιλίας)**

Papillary msucles:

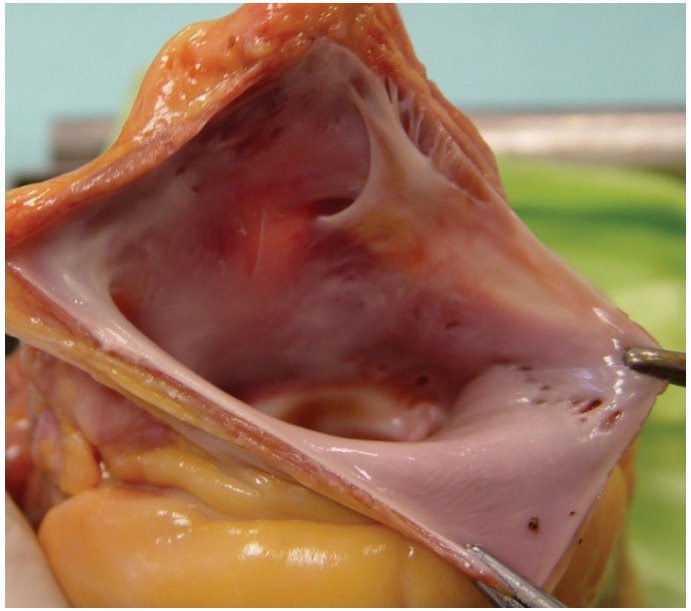
- **Anterior - External**
- **Posterior - Internal**

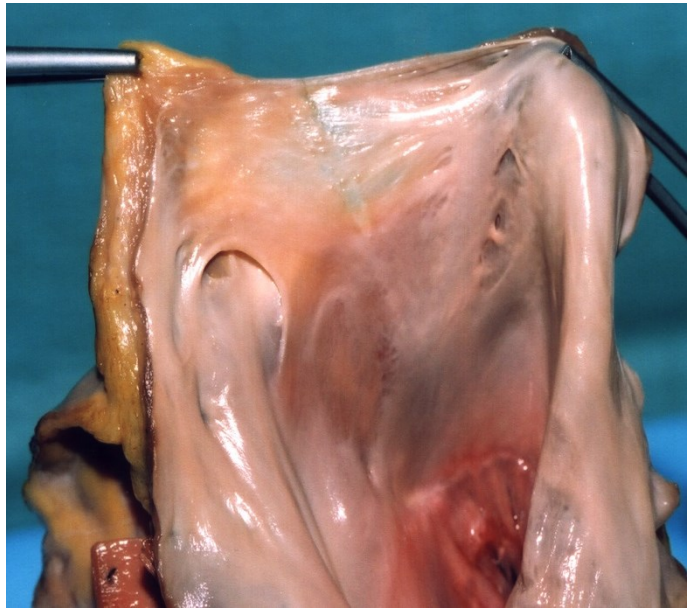
Blood supply of the papillary mucles:

- **Anterior** **(LAD + marginal branches of LCx)**
- **Posterior** **(PDA)**

(από Selke F.W., del Nido P.J., Swanson S.J. (eds), 2010)

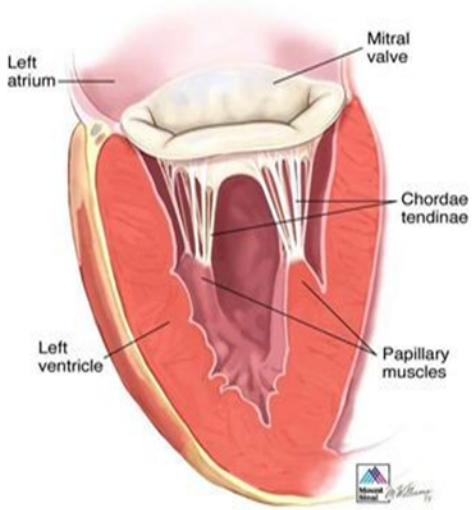
Αριστερές καρδιακές κοιλότητες- *Αριστερός κόλπος*





Left atrioventricular or Mitral valve

Left atrio-ventricular (mitral) orifice:



Smaller than the right, admitting only tips of 2 fingers.

Guarded by a **mitral valve.**

Surrounded by a fibrous ring which gives attachment to the cusps of mitral valve.

The atrial surfaces of the cusps are smooth, while ventricular surfaces give attachment to chordae tendinae.

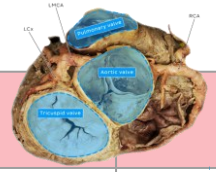
Mitral valve is composed of 2 cusps:

Anterior cusp

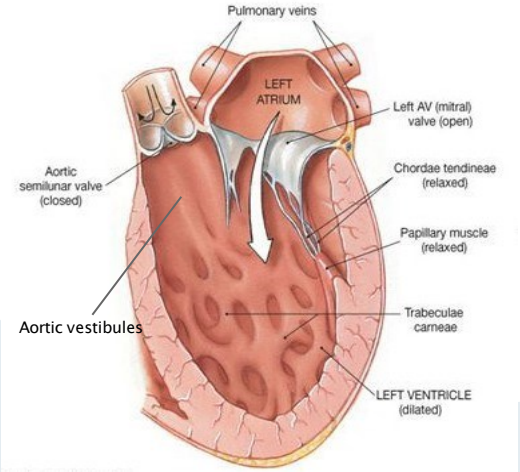
Posterior cusp

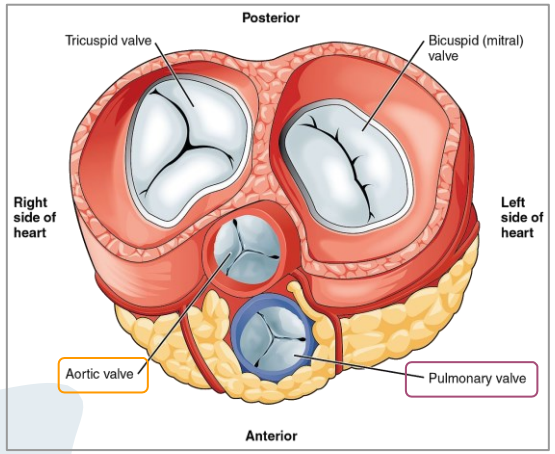
lies posteriorly and to left.

Semilunar Orifice

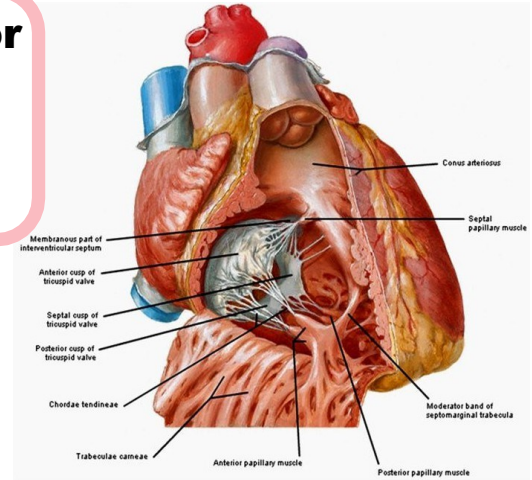


Aortic orifice	Pulmonary orifice:
Surrounded by a fibrous ring which gives attachment to the cusps of aortic valve.	Surrounded by a fibrous ring which gives attachment to the cusps of the pulmonary valve.
is formed of 3 semilunar cusps which are similar to those of pulmonary valve, but the position of the cusps differs being one anterior and 2 posterior.	The valve is formed of 3 semilunar cusps : 2 anterior and one posterior which are concave superiorly and convex inferiorly.

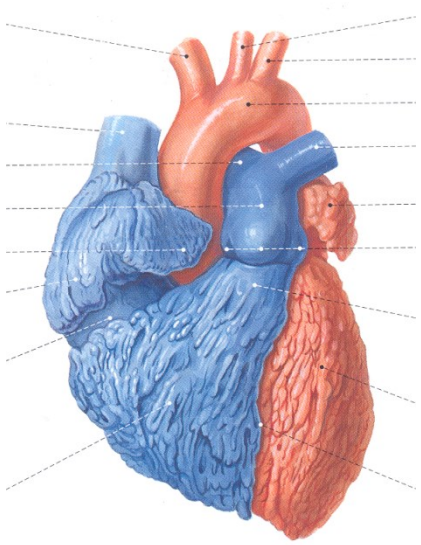


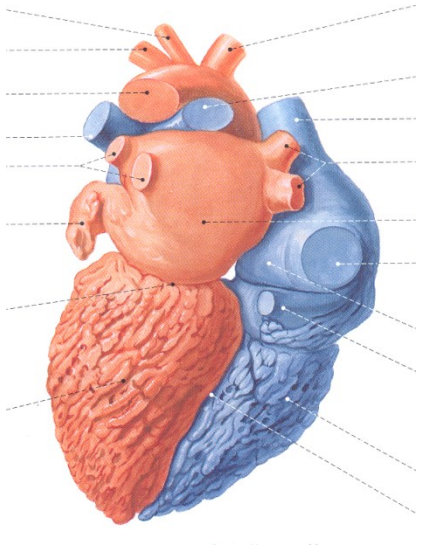


No chordae tendineae or papillary muscles are attached to these cusps



Μορφολογία εσωτερικού Αριστερής Κοιλίας

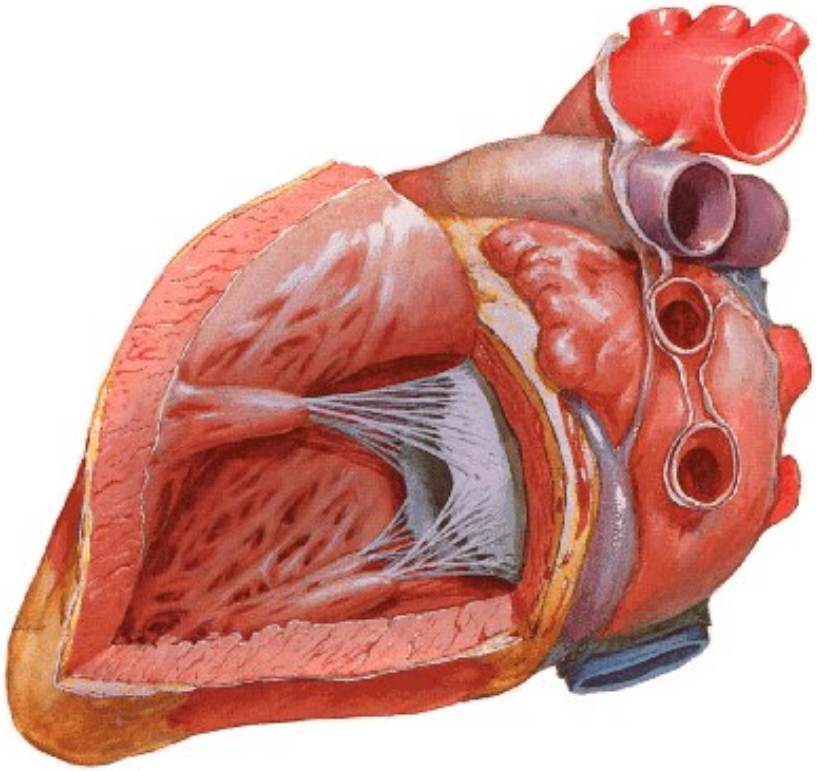




- **Η κοιλότητα,** με όριο την πρόσθια γλωχίνα, σε:
- -Οπίσθιο χώρο (σχέση με κολποκοιλιακό στόμιο), Χώρος εισροής
- -Πρόσθιο χώρο (σχέση με αορτή) Χώρος εκροής

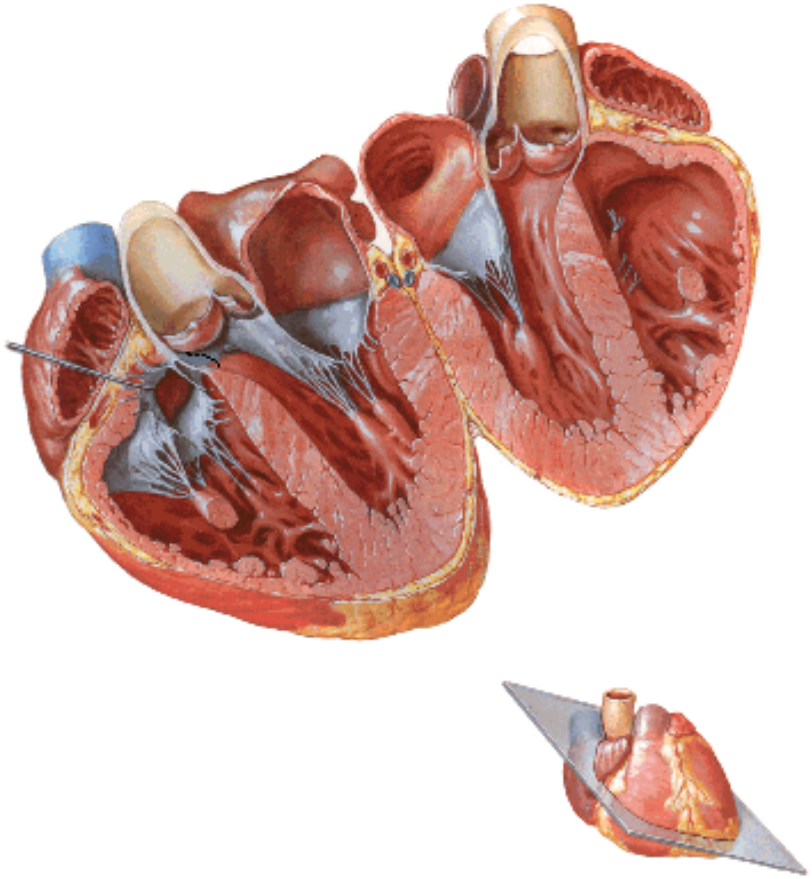
πρόδομος αορτής

Μορφολογία εσωτερικού Αριστερής Κοιλίας



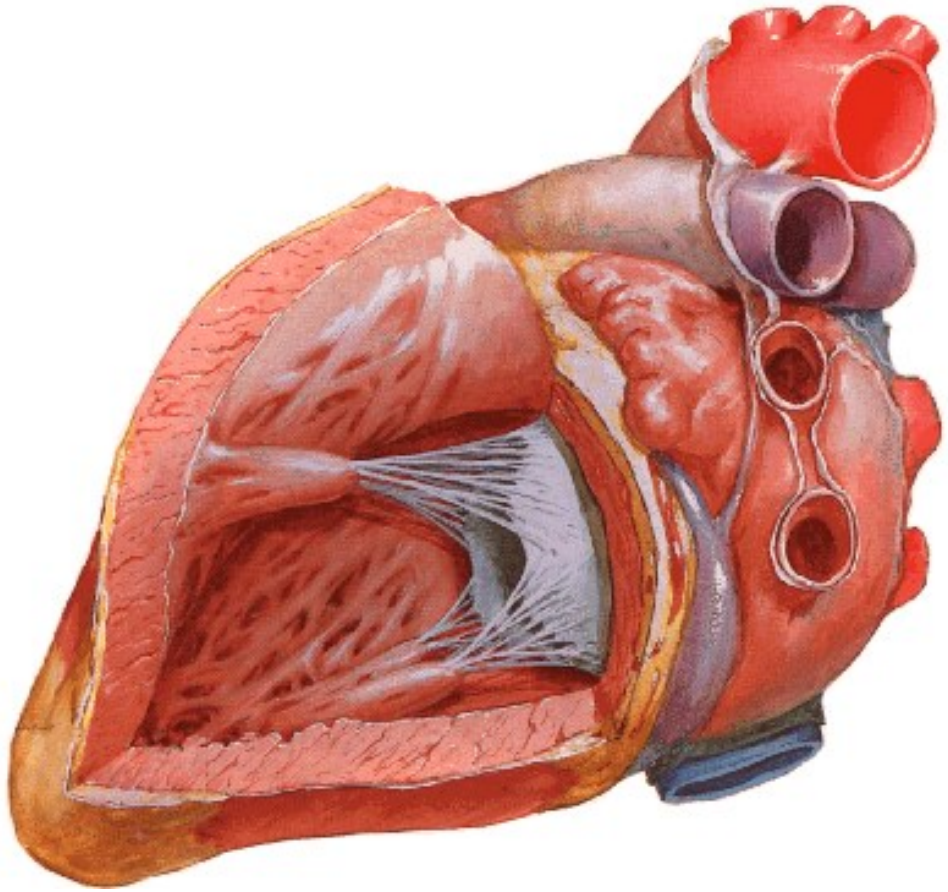
- **Θέση** (σε σχέση με δεξιά καρδιά)
- **Χωρητικότητα** 143-212 κ.εκ. (δηλαδή, μικρότερη από την δεξιά).
- **Πάχος τοιχωμάτων** 8-12 χλστ. περίπου (τριπλ. της δεξιάς).
- **Σχήμα**: Κώνου, αποπλατυσμένου από τα πλάγια. Δύο τοιχώματα (έσω και έξω), δύο χείλη (πρόσθιο και οπίσθιο), βάση και κορυφή.

Μορφολογία εσωτερικού Αριστερής Κοιλίας



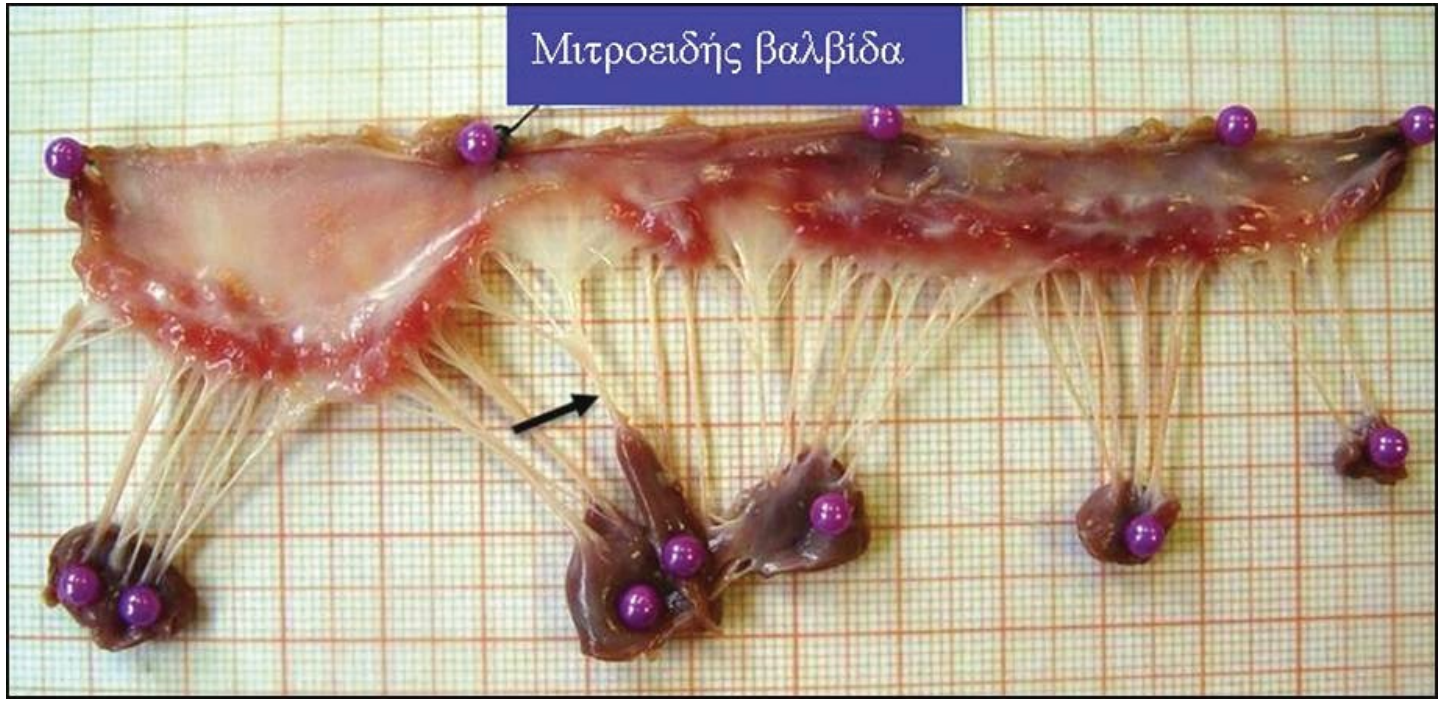
- **Βάση** Αριστερό κολποκοιλιακό στόμιο, μιτροειδής βαλβίδα. Αορτικό στόμιο, μηνοειδείς βαλβίδες αορτής.

Μορφολογία εσωτερικού Αριστερής Κοιλίας



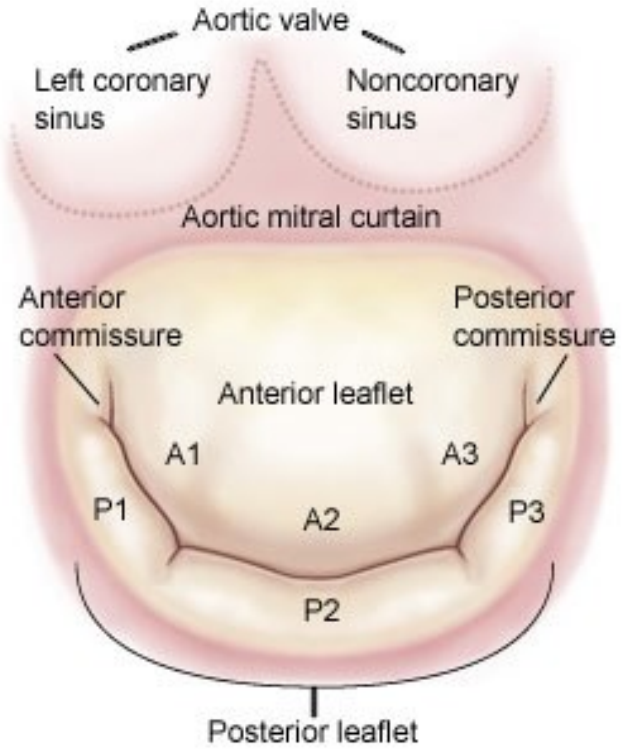
- **Έσω τοίχωμα** (υπόκοιλο) Μεσοκοιλιακό διάφραγμα Μυώδες,υμενώδες
- **Έξω τοίχωμα** Μυϊκές δοκίδες
- **Πρόσθιο χείλος** Πρόσθιος θηλοειδής μυς
- **Οπίσθιο χείλος** Οπίσθιος θηλοειδής μυς
- **Κορυφή** Όψη σπόγγου (άφθονες μυϊκές δοκίδες)

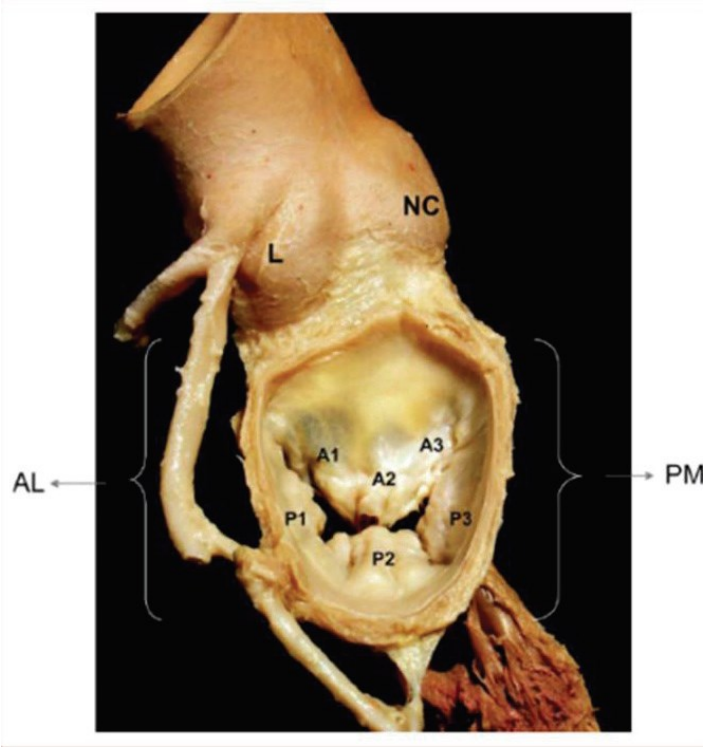
Mitral valve



Mitral valve

Mitral valve
clinical terminology of the Mitral valve leaflets

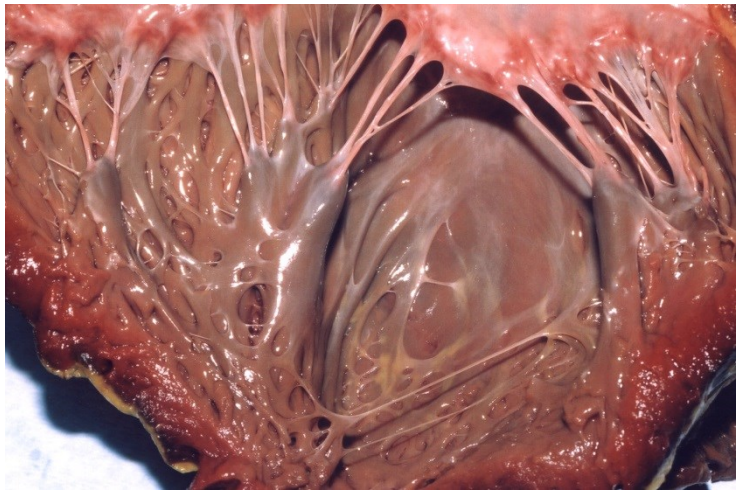


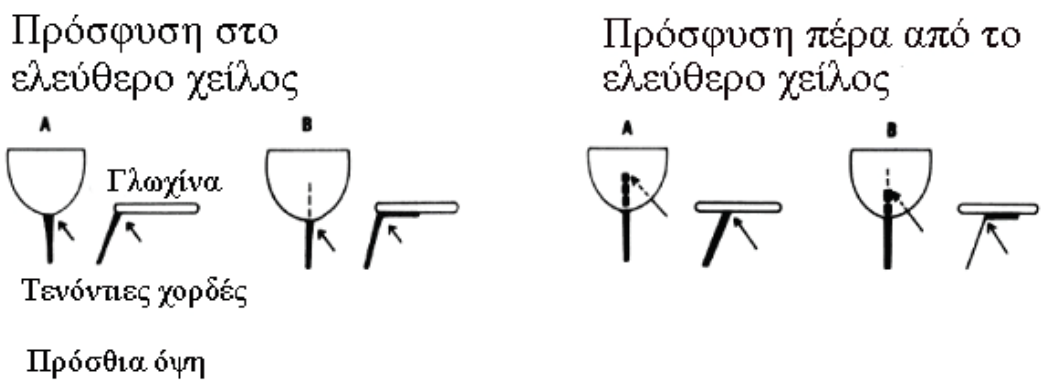


- Allows the exact determination of leaflets –
- Determination of the degree of severity in both diagnostic and pathological conditions

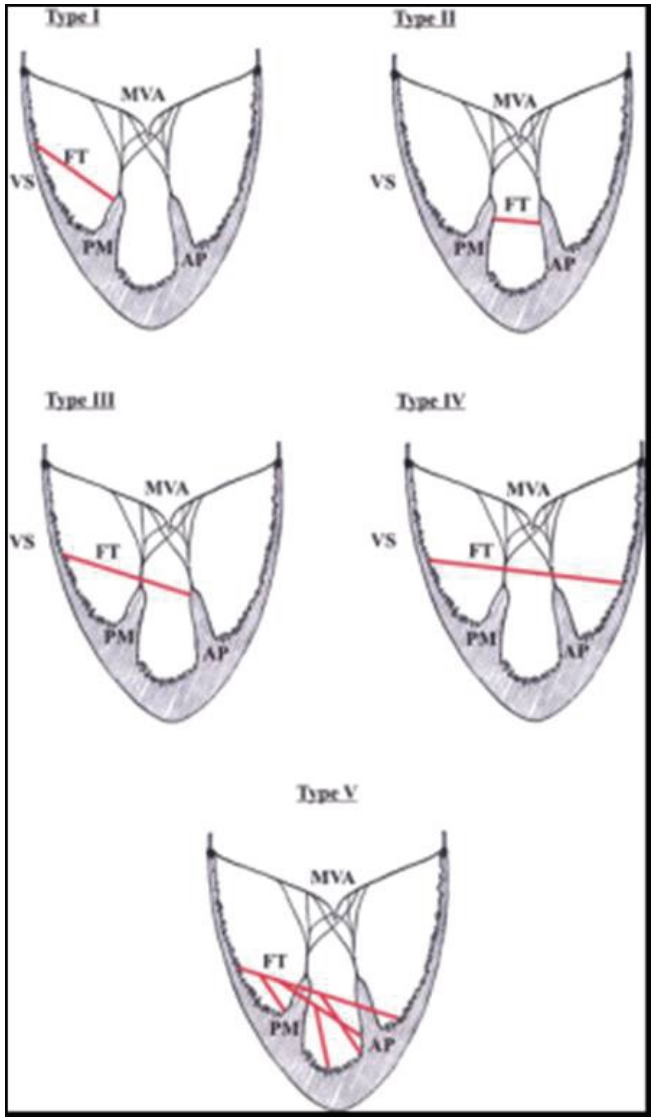
Mitral valve – Subvalvular apparatus

Mitral valve – Tendinous cords

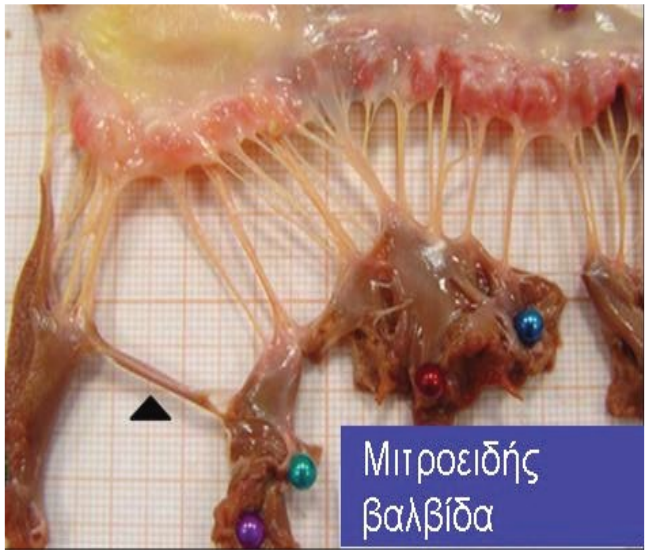


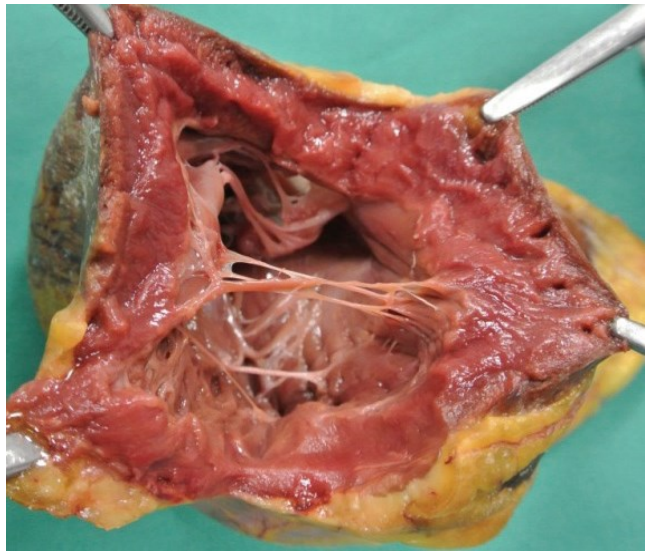


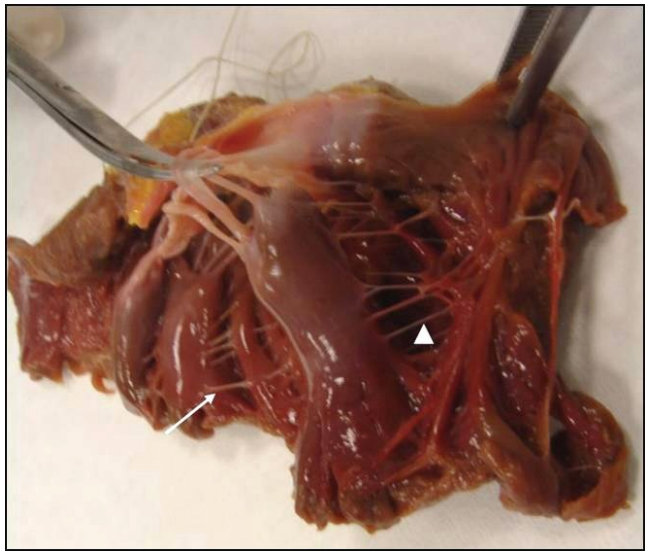
Classification of the false tendinous cords



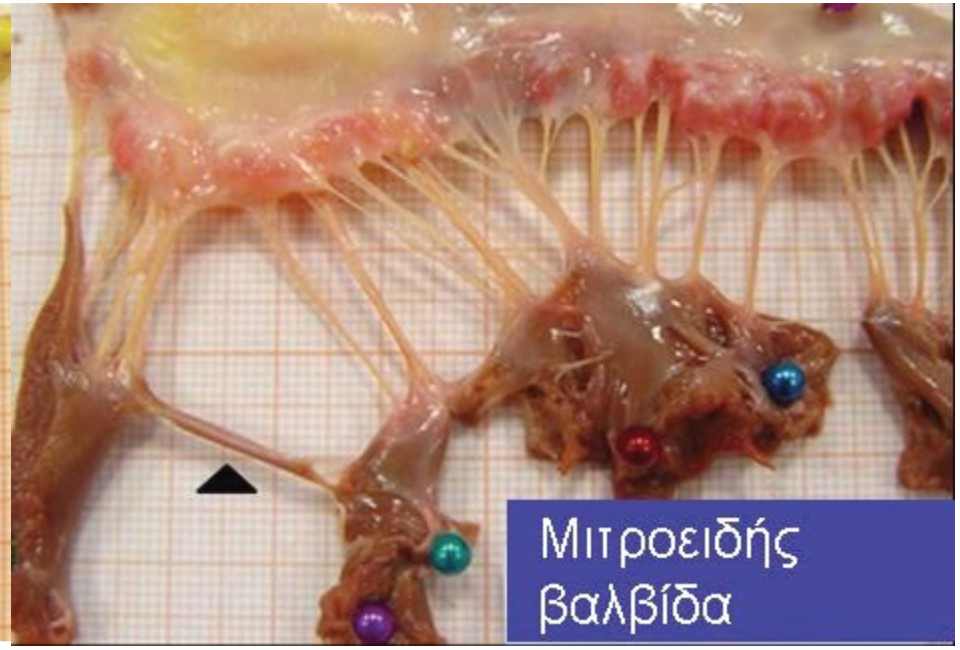
Anatomical variation of the tendinous cords



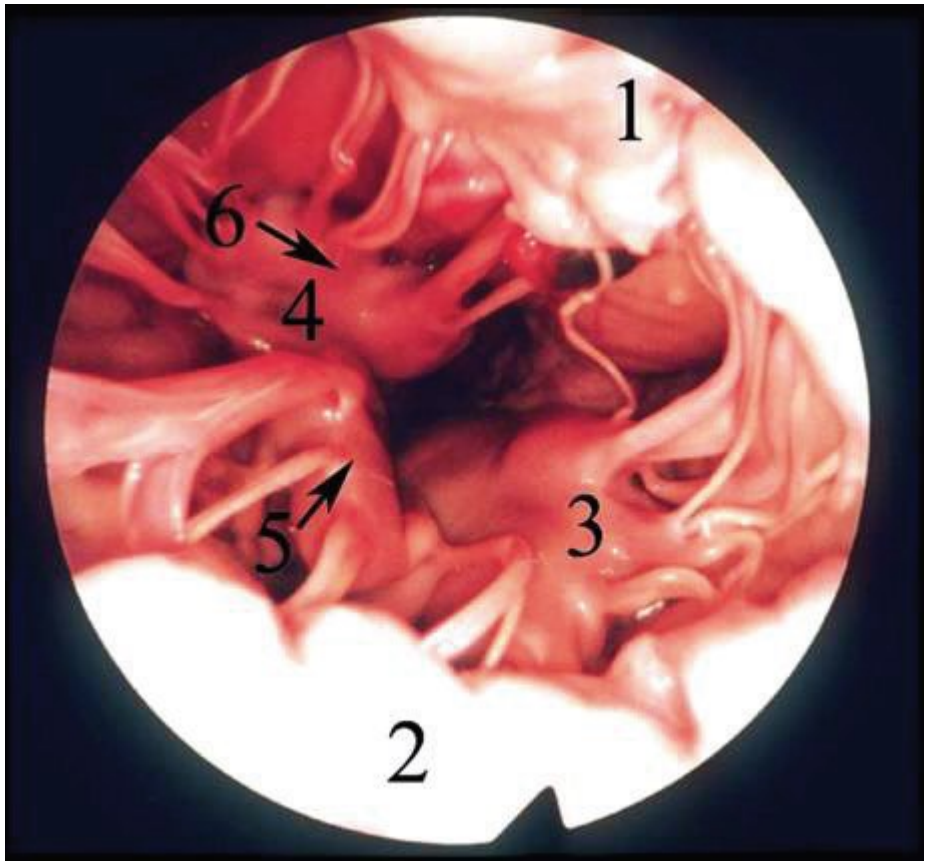


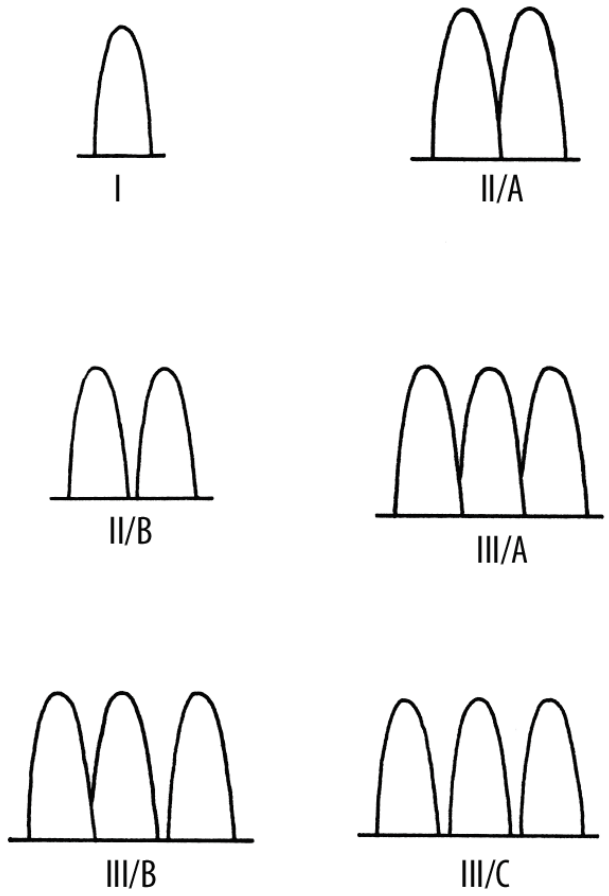


Ανατομικές παραλλαγές των τενοντίων χορδών – Μυϊκές γέφυρες



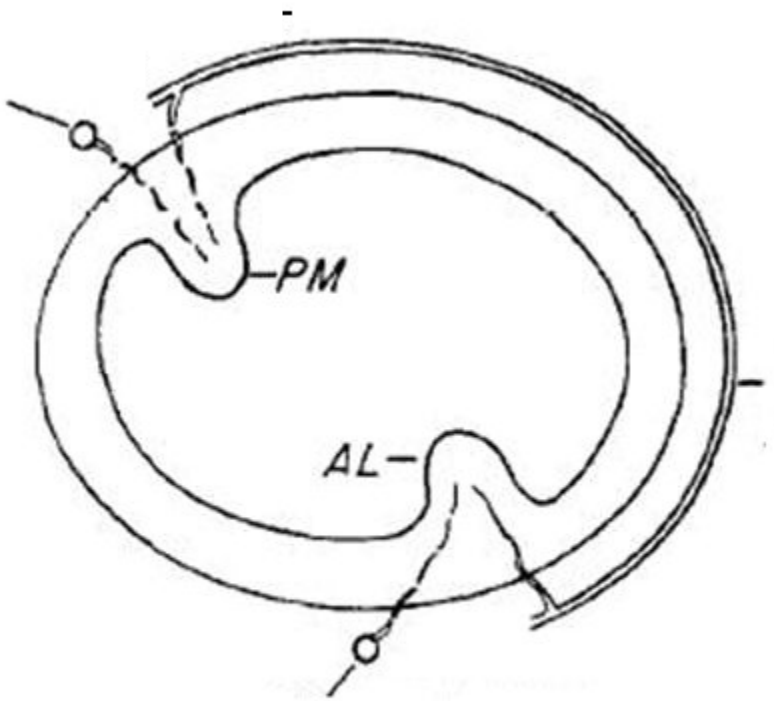
Morphological classification of the papillary muscles - Left Ventricle





Perfusion of the papillary muscles of the left ventricle

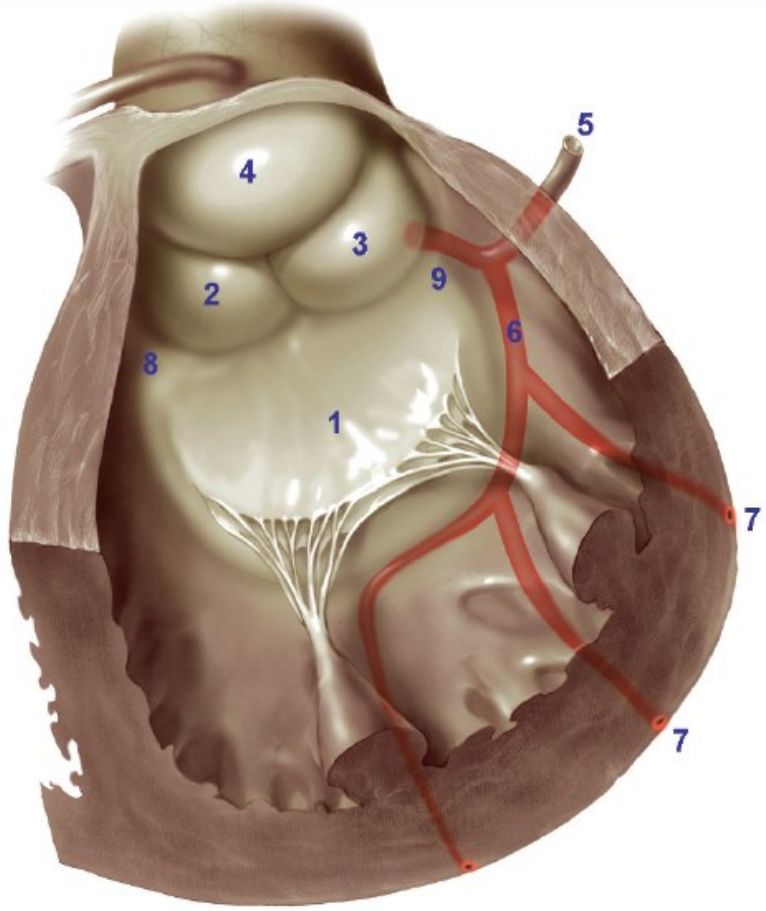
Right Coronary artery - Posterior descending artery of the



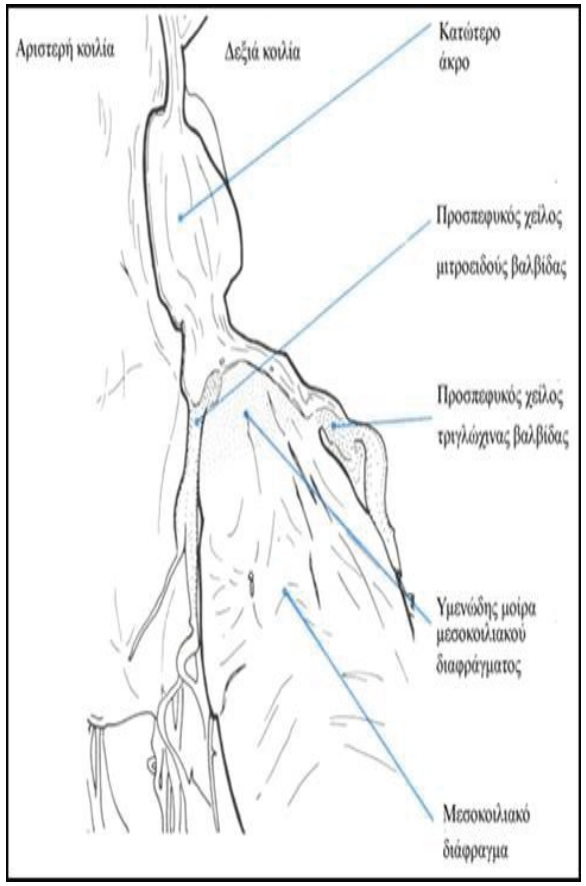
Circumflex artery

Left anterior descending artery

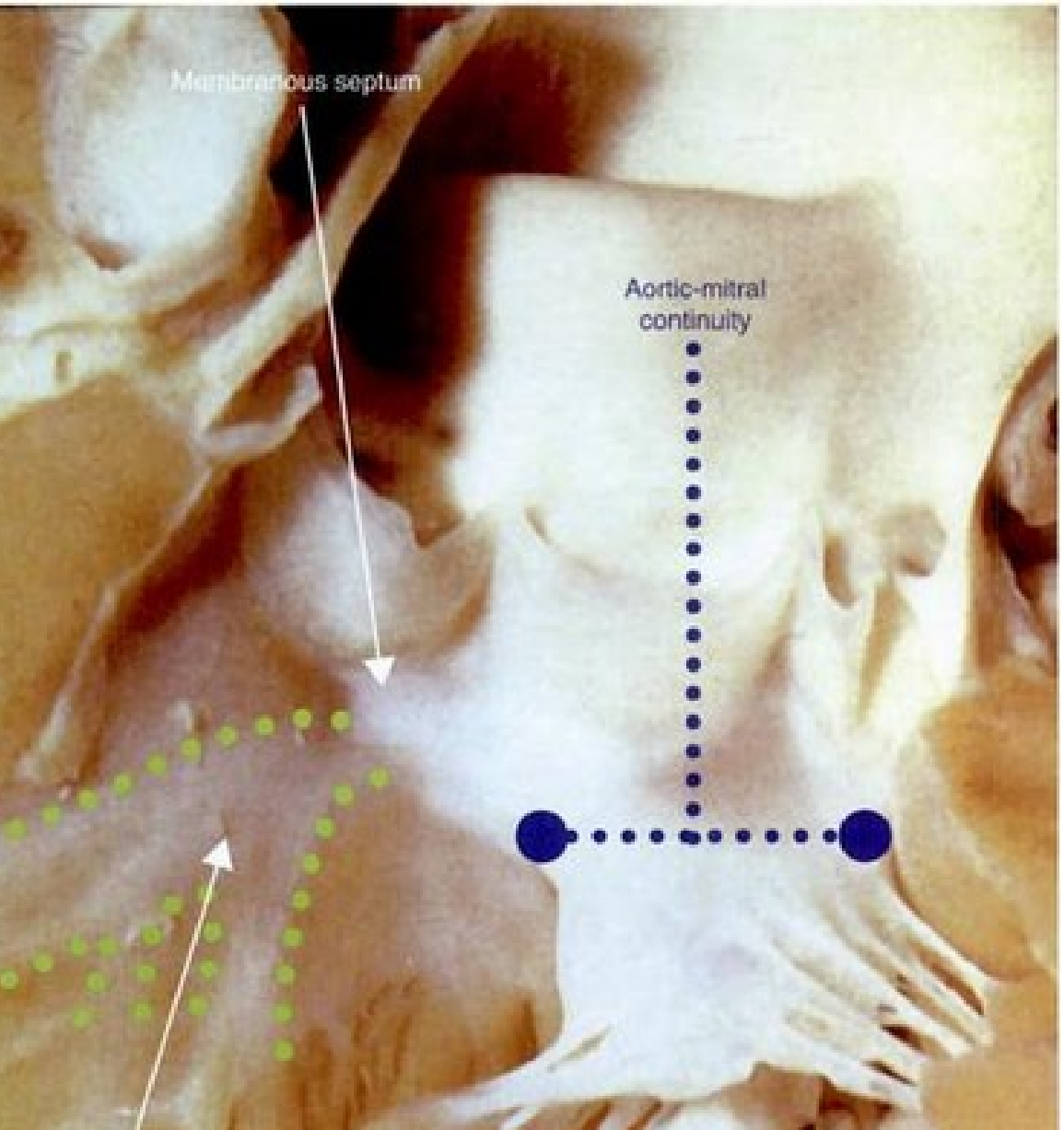
Perfusion of the papillary muscles of the left ventricle



Intervetricular septum

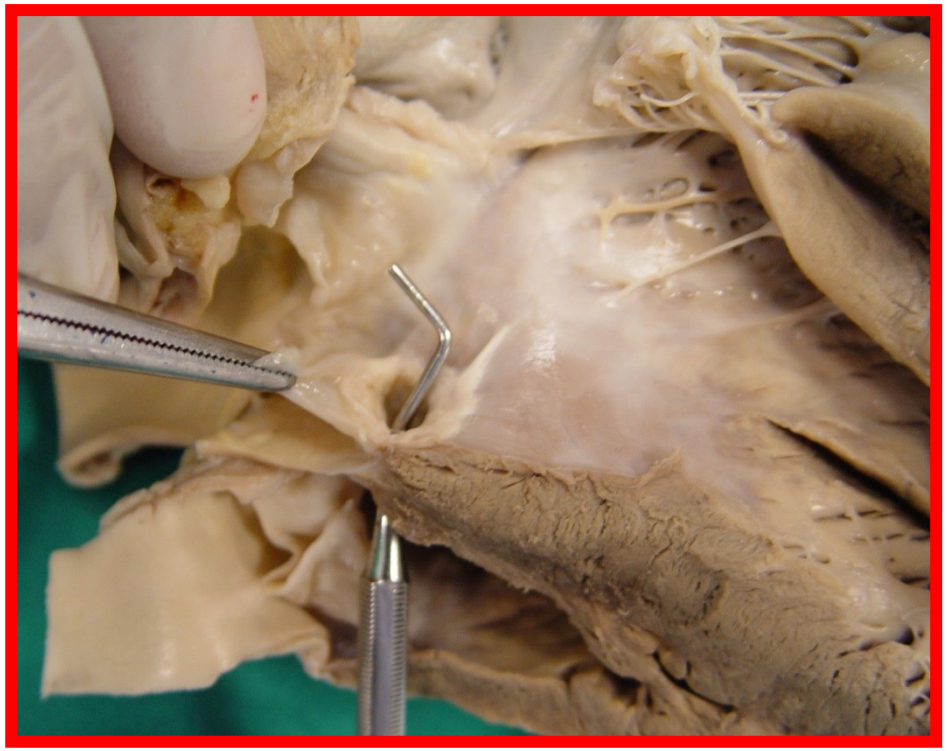


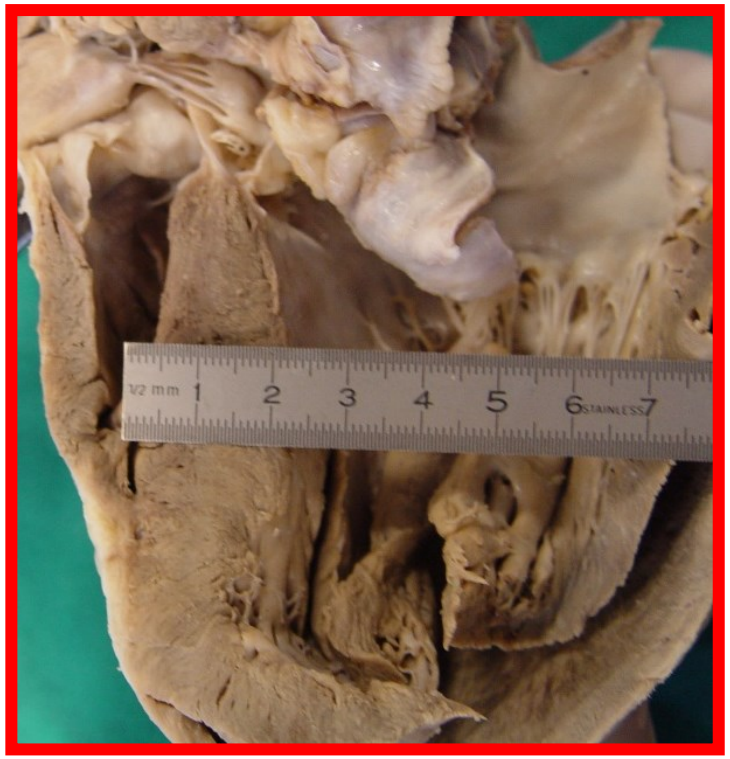
Aortomitral continuity



The **aortomitral continuity** (also known as the **aortomitral curtain**, **aorticomitral junction**, **intervalvular fibrous body**)
is a fibrous sheet located between the noncoronary and left coronary leaflets of the aortic valve and anterior leaflet of the mitral valve. It is attached by the left and right fibrous trigones to the left ventricular myocardium

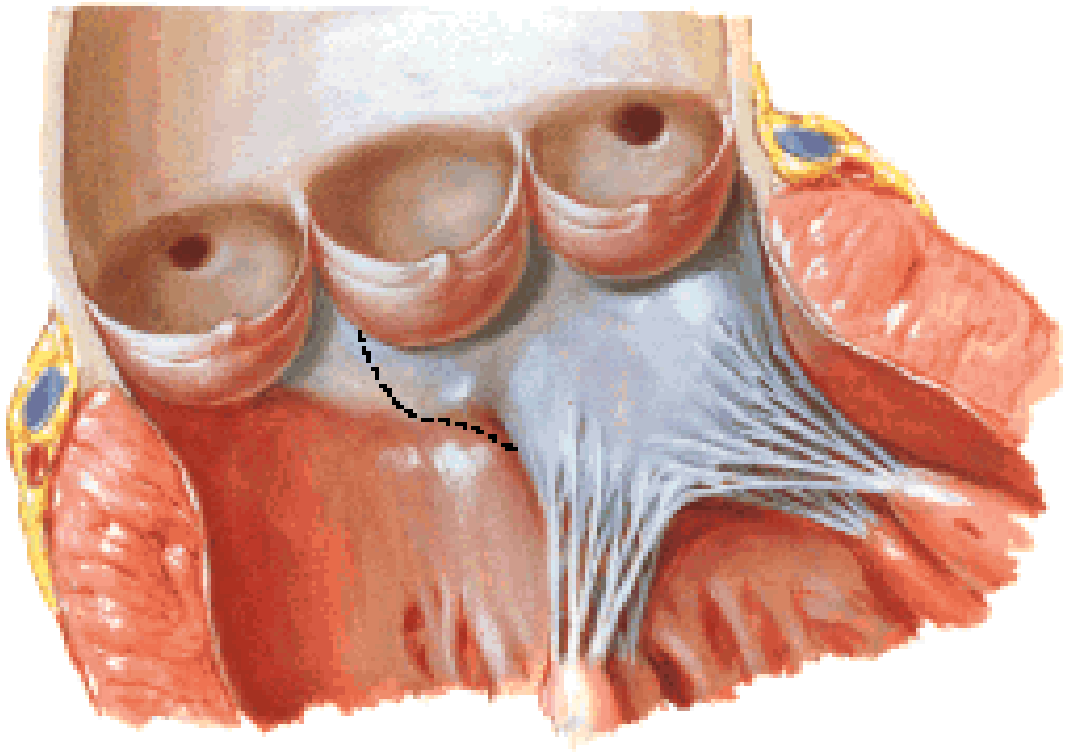
Ventricular septal defect





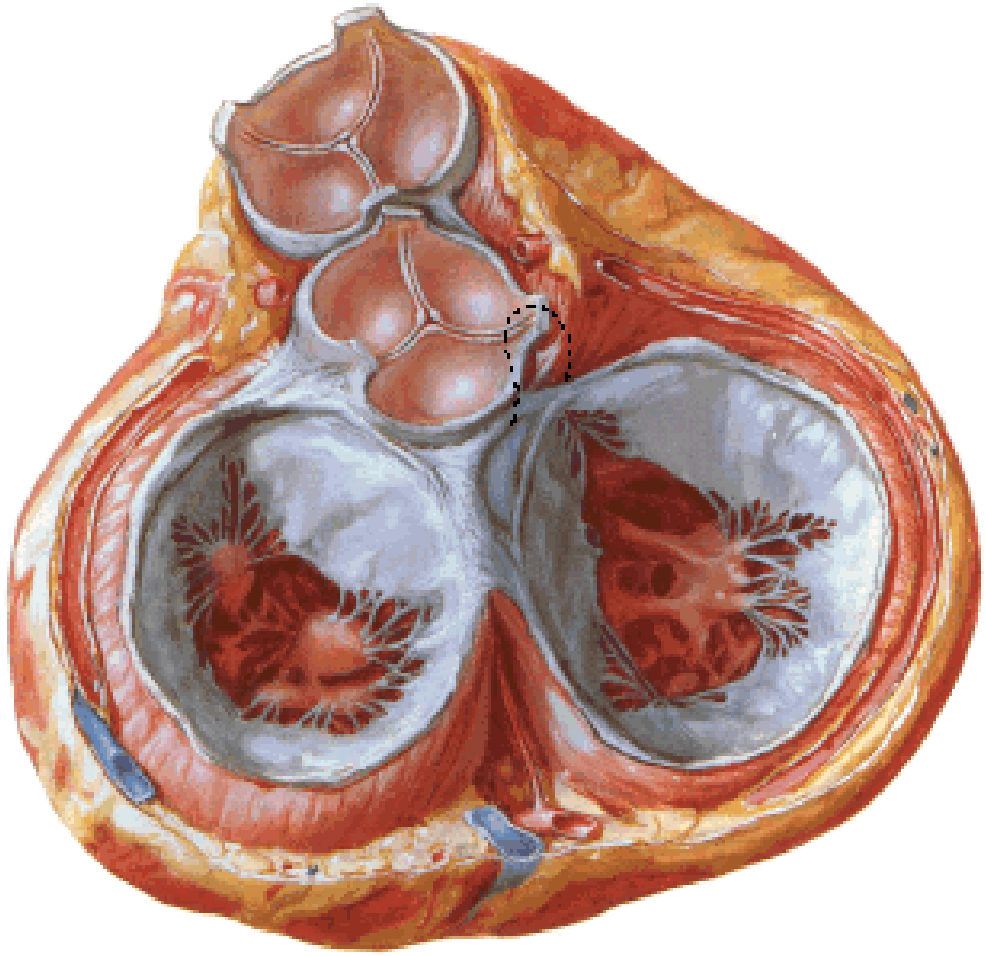
The smaller part of the defect lies on the membraneous part of the AV septum and the rest of it lies on the muscular part

Aortic – Pulmonary valve leaflets and Valsalva sinuses



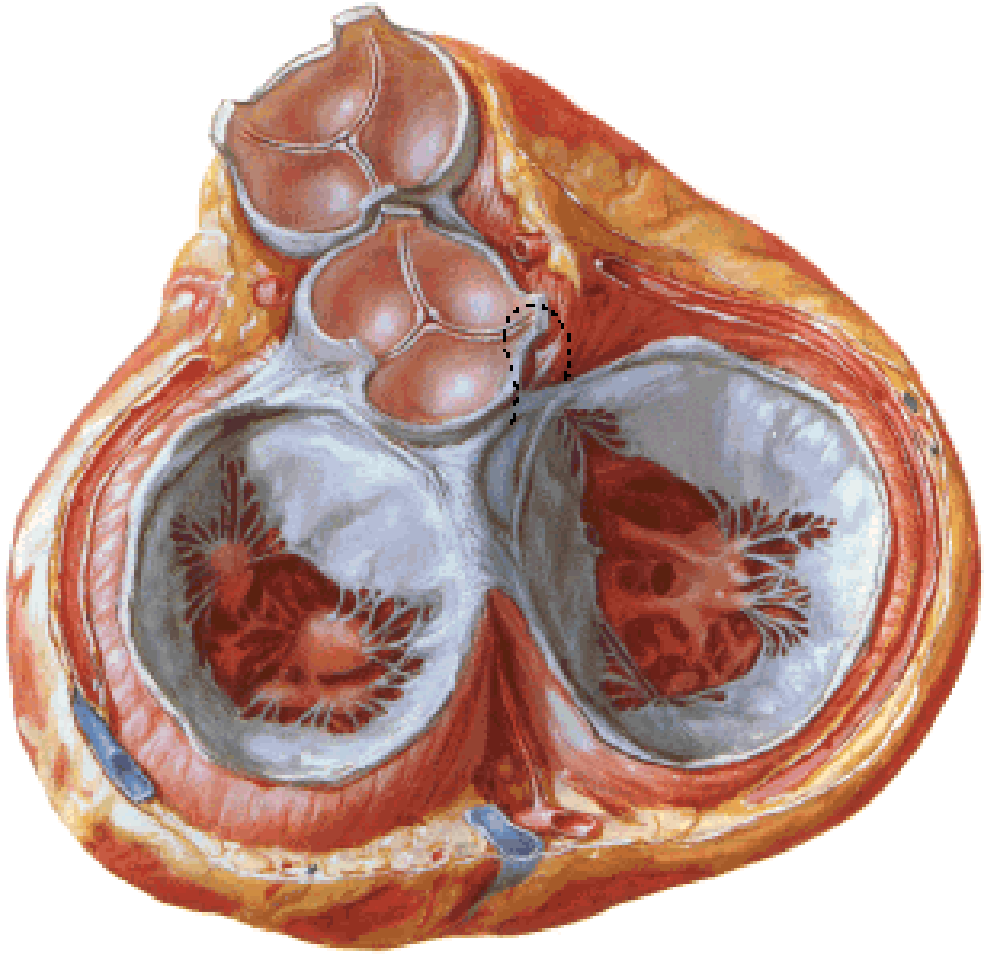
- Swallow's nest shape
- Nodule(Arantius)
- Lunula
- Aortic sinuses (Valsalva)

Aortic valve

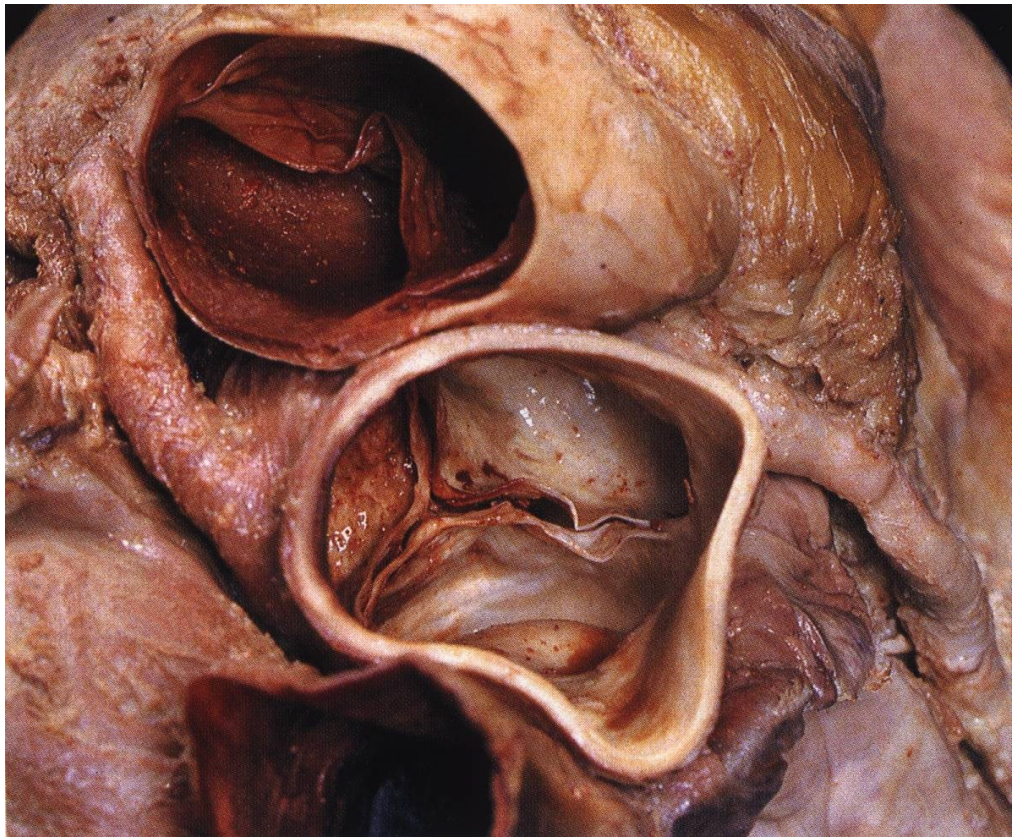


- Normal tricuspid aortic valve (TAV) consists of three semilunar, swallow nest cusps,
- 3 commissures (the highest part of attachment of the cusps at the aortic sino-tubular junction), and
- 3 interleaflet triangles

Aortic valve

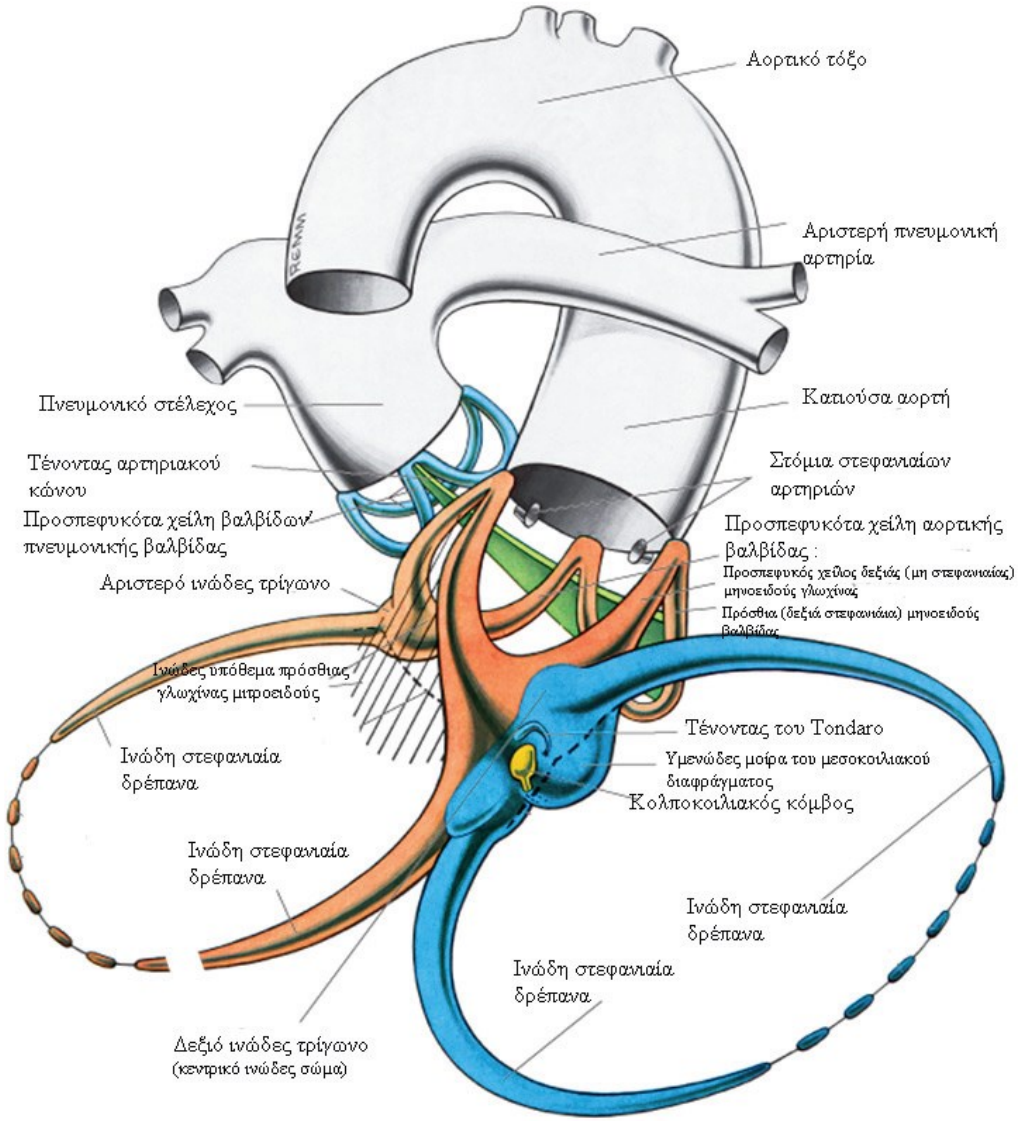


Aortic and pulmonary ostium

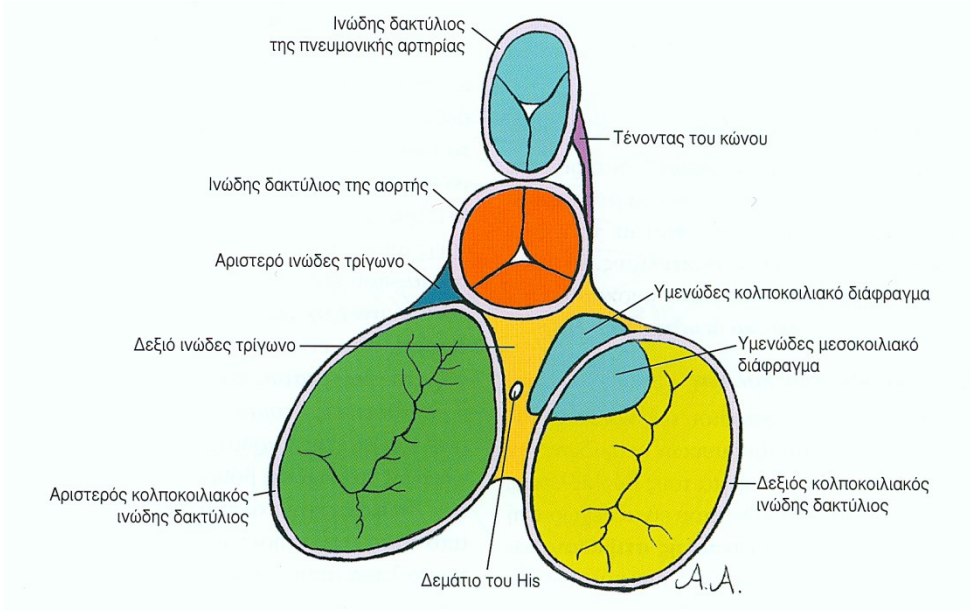


Note: Aortic menisci are thicker, longer and stronger..

The fibrous skeleton of the heart

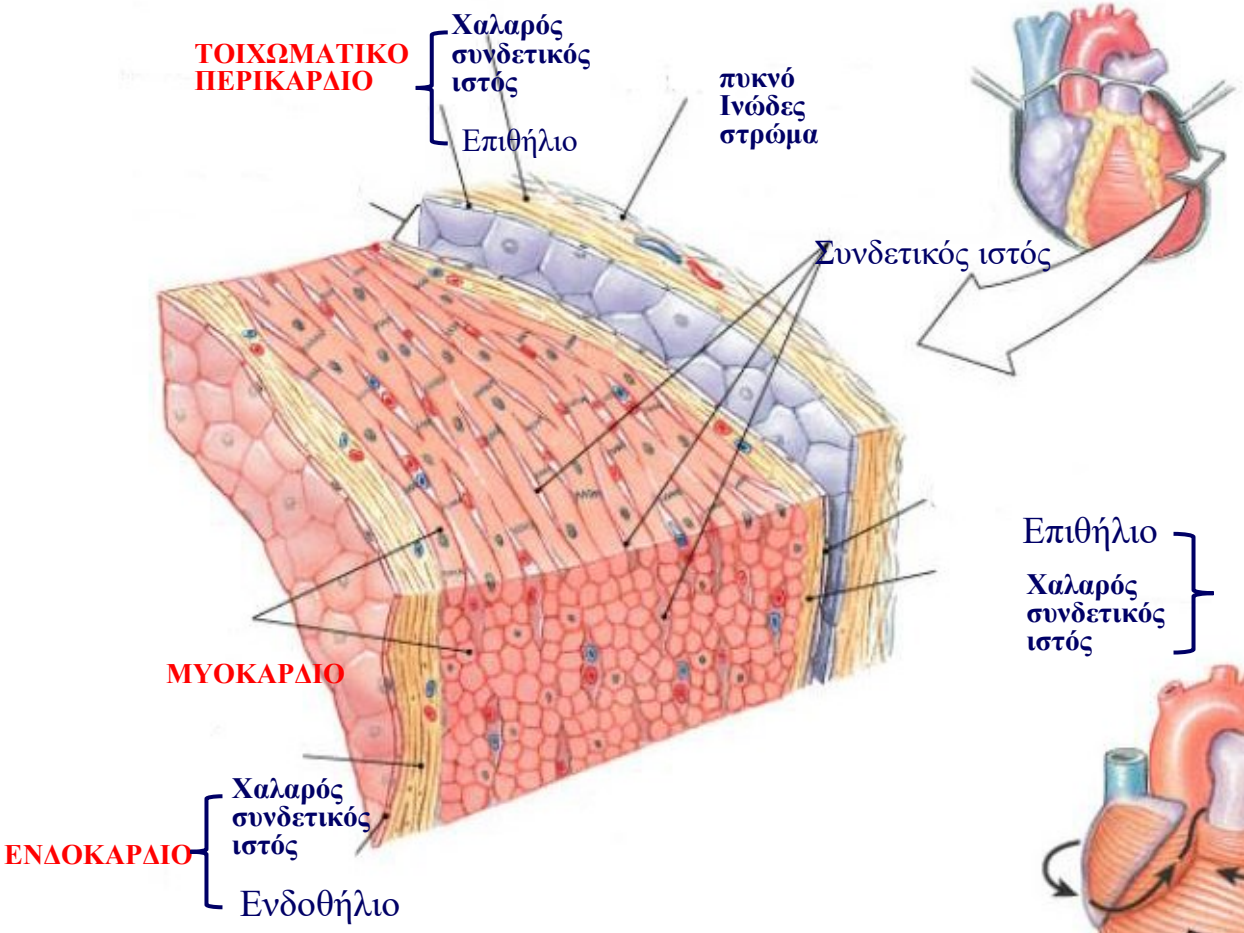


- This skeleton is located at the base of the ventricles, between the atria and the ventricles.
- The rings of the fibrous skeleton are composed of dense, fibrous connective tissue that ***encircle the orifices of the heart valves***.
- These fibrous rings are interconnected by connective tissue called the ***right and left trigones*** and form the structural support for the heart on which the valvular leaflets and cardiac muscle fibers are anchored.



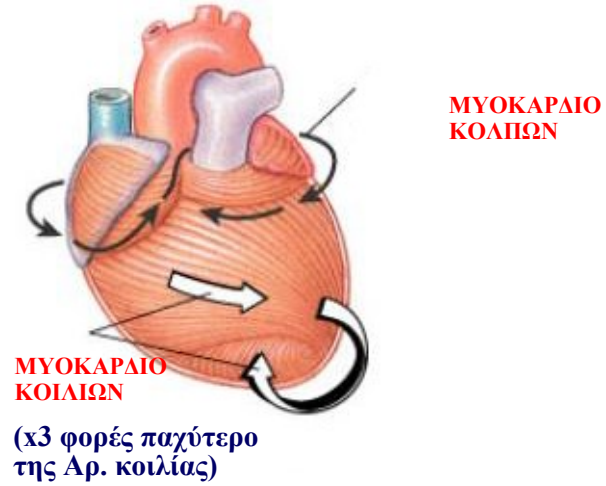
8. Myocardium

Myocardium

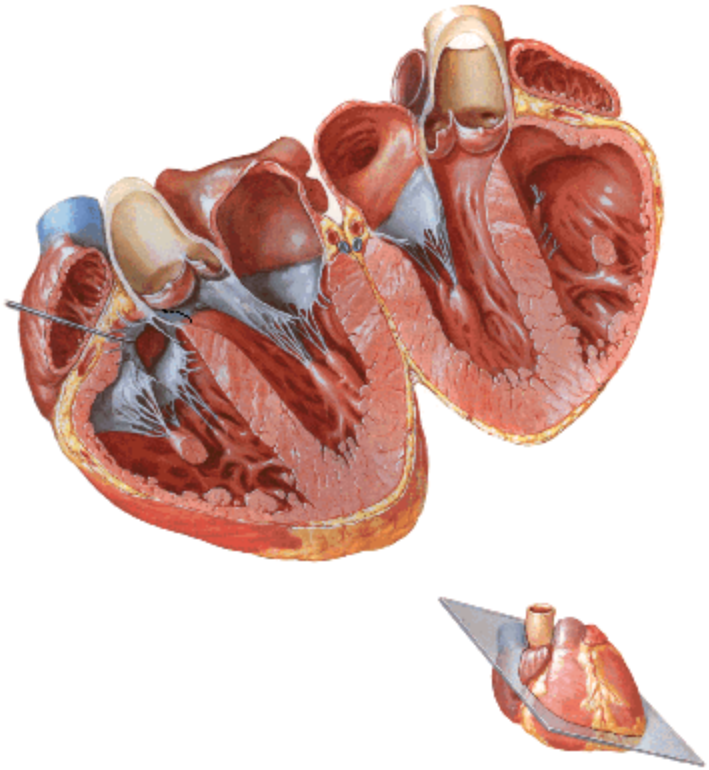


MYOCARDIUM:
Its muscle fibers form 2 layers:
A) the Superficial layer, and
B) the deep layer

MYOCARDIUM
- Functional syncytium of m. fibers
Loose connective tissue
Blood vessels
Nerve endings

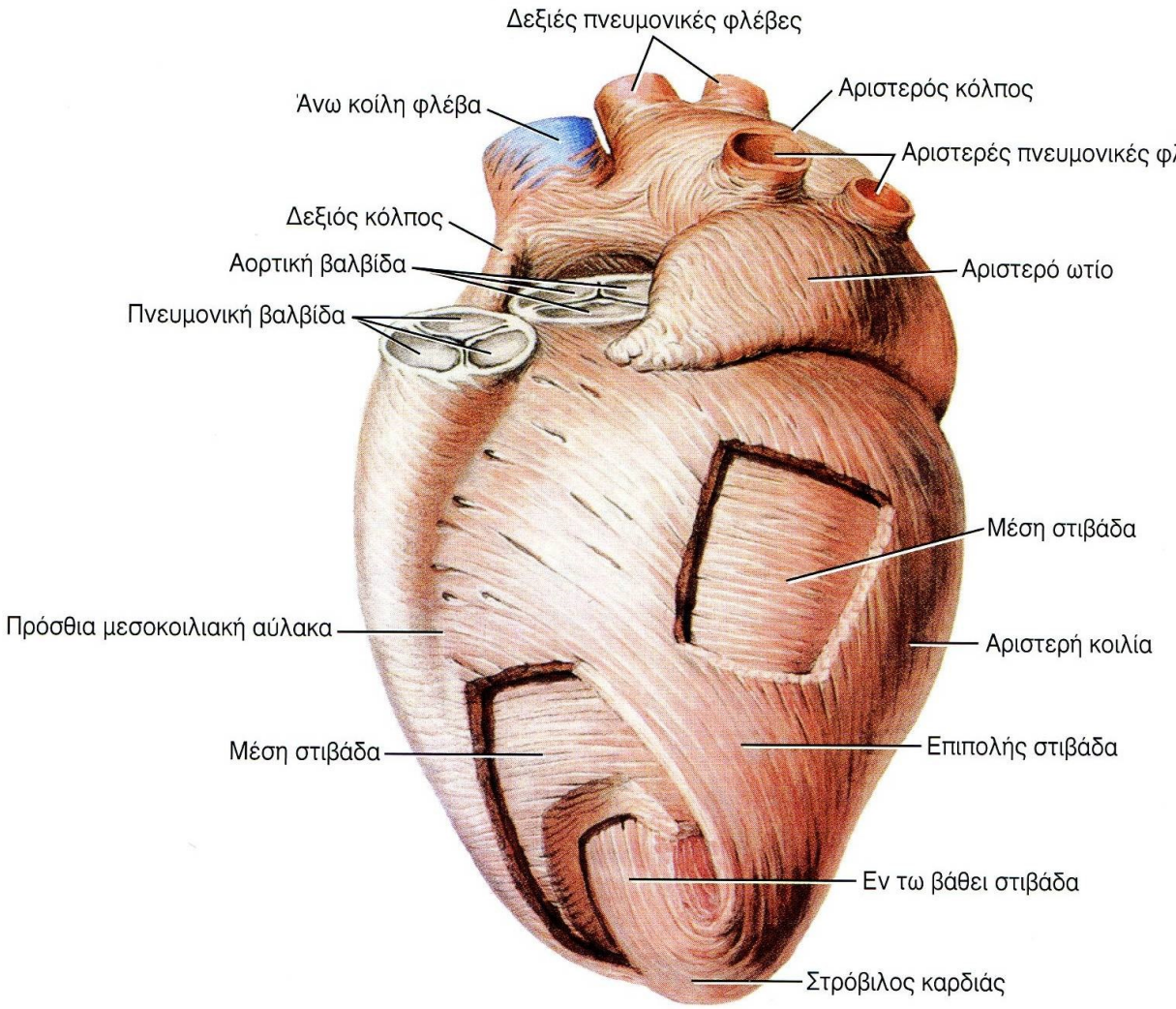


Το μυοκάρδιο
Επικάρδιο και Ενδοκάρδιο



- **Myocardium of the atria**
  - Superficial layer
  - Deep layer

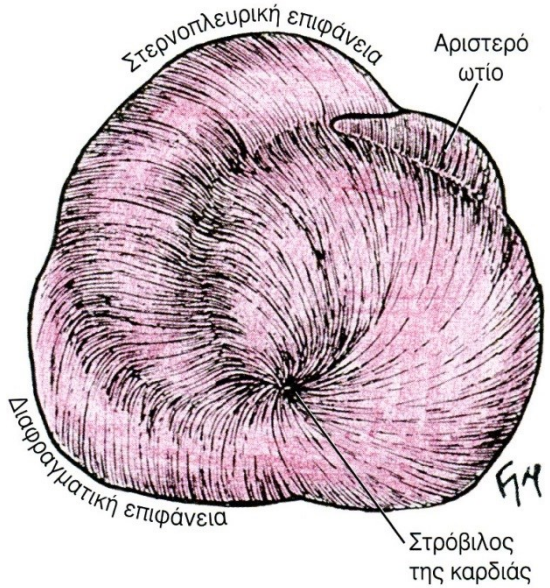
Myocardium or Cardiac muscle



It consists of a *syncytial network* of striated muscle fibers, which carry transverse muscle fibers (they differ from the striated fibers of skeletal muscles because they carry their nucleus in the center. From a physiological point of view, it consists of a) working (or especially myocardium) b) conducting myocardium.

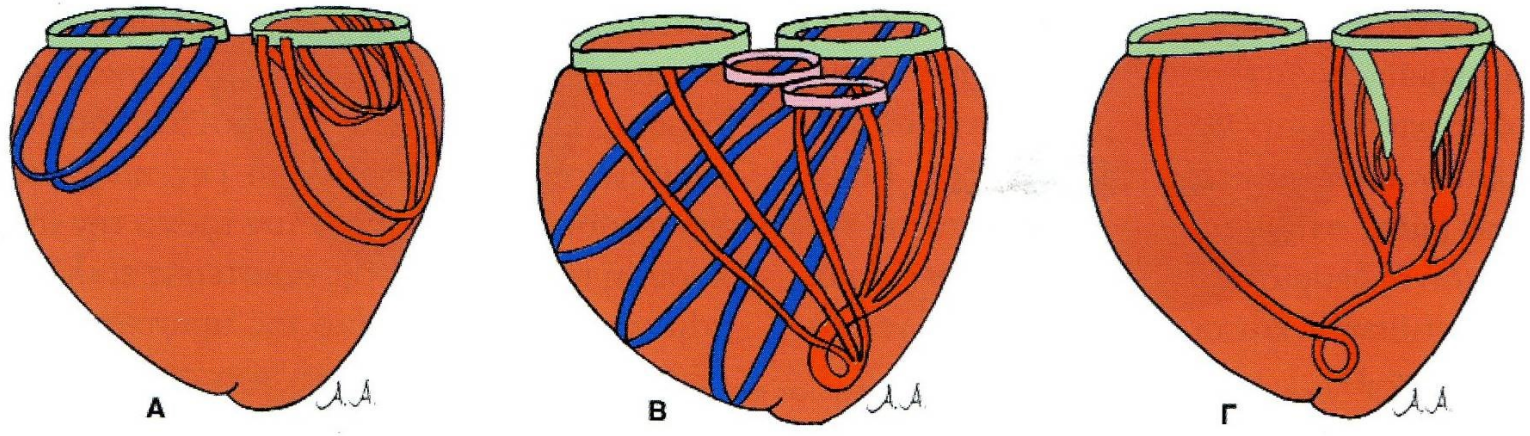
It does not show the same thickness everywhere (different engineering work)

Myocardioum of the ventricles

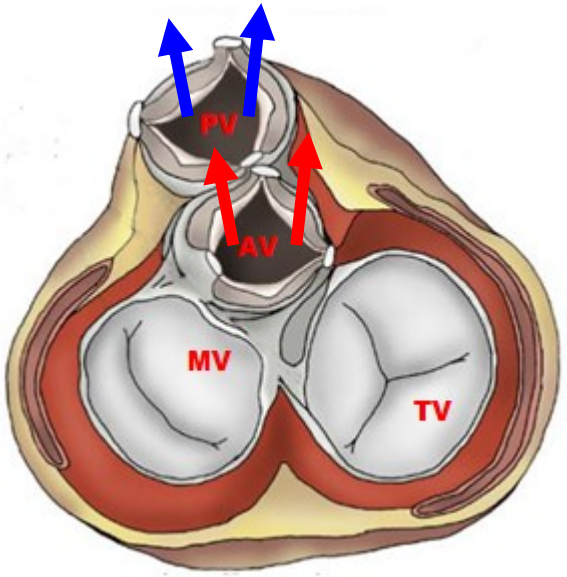


Myocadium of the ventricle

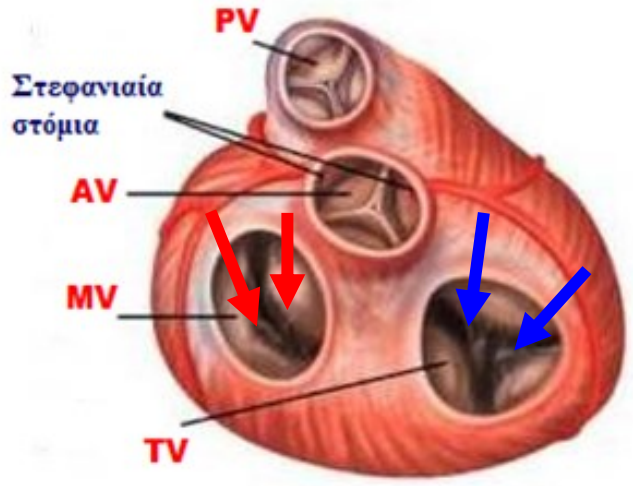
- Superficial layer
- Middle layer
- Deep layer



Myocardium

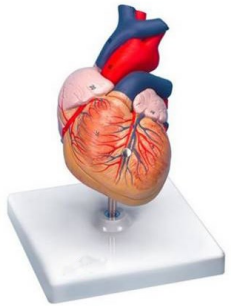


Συστολική φάση



Διαστολική φάση

Η πολύπλοκη διάταξη των μυϊκών ινών του μυοκαρδίου και ο σχηματισμός ενός λειτουργικού συγκυτίου, εξυπηρετεί την συγχρονισμένη συστολή των δύο κοιλιών, με την ταυτόχρονη σύγκλειση των κολποκοιλιακών βαλβίδων



9. Η ΑΙΜΑΤΩΣΗ ΤΗΣ ΚΑΡΔΙΑΣ

- *γενικά περί στεφανιαίας κυκλοφορίας*
- *η αριστερή στεφανιαία αρτηρία*
- *η δεξιά στεφανιαία αρτηρία*
- *οι φλέβες της Καρδιάς*

Η αιμάτωση της καρδιάς

γενικά περι Στεφανιαίας Κυκλοφορίας

- *Οι στεφανιαίες αρτηρίες υποδέχονται το 5-10% του ΚΛΟΑ*
- *η διάμετρος τους: 1,5 - 5,0mm*
- *εκφύονται από τα στεφανιαία στόμια (το δεξιό υψηλότερα)*
- *μαζί με τους κλάδους των σχηματίζουν:*

  μια στεφάνη στην κολποκοιλιακή αύλακα (εξ ου και η ονομασία τους)

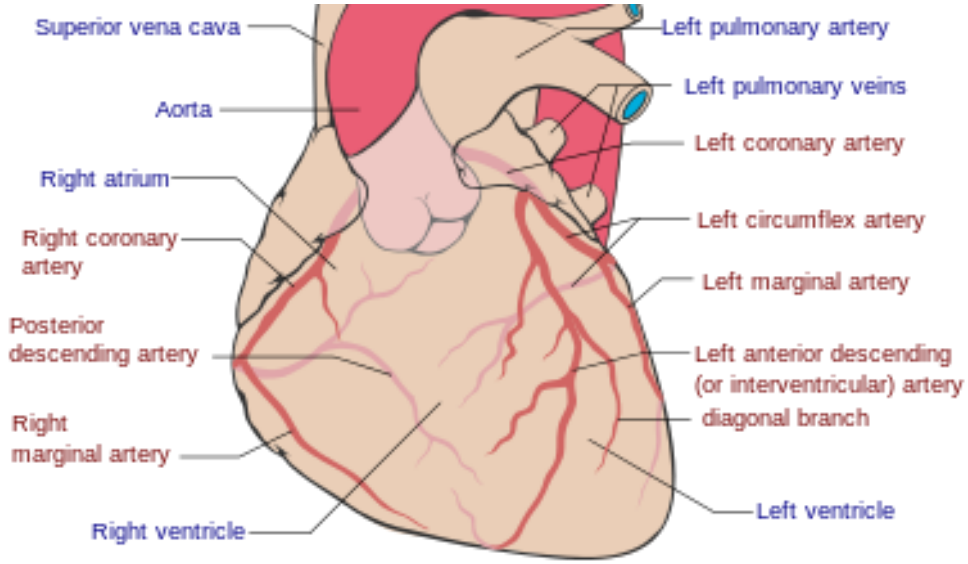
  μια αγκύλη κατά την πορεία τους στις μεσοκοιλιακές αύλακες
- *πορεύονται κάτω από το επικάρδιο - ενίοτε ενδομυοκαρδιακά (πρόβλημα στην CAB-surgery)*
- *σχηματίζουν 2 πλέγματα : το μυοκαρδιακό και το υπενδοκάρδιο*
- *"δίκτυο παράπλευρης κυκλοφορίας" (ιδιαίτερα σημαντικό στην εξέλιξη ενός ΟΕΜ)*
- *το στεφανιαίο δένδρο λειτουργικά χωρίζεται στο: 1) σύστημα του LAD, 2) στο σύστημα της LCx, και 3) στο σύστημα της RCA*
- *Η έκφυση του PDA καθορίζει την επικράτηση του δεξιού ή αριστερού συστήματος (στο 85% εκφύεται από από την RCA και η κυκλοφορία είναι δεξιά επικρατούσα)*

Η αιμάτωση της καρδιάς

γενικά περι Στεφανιαίας Κυκλοφορίας

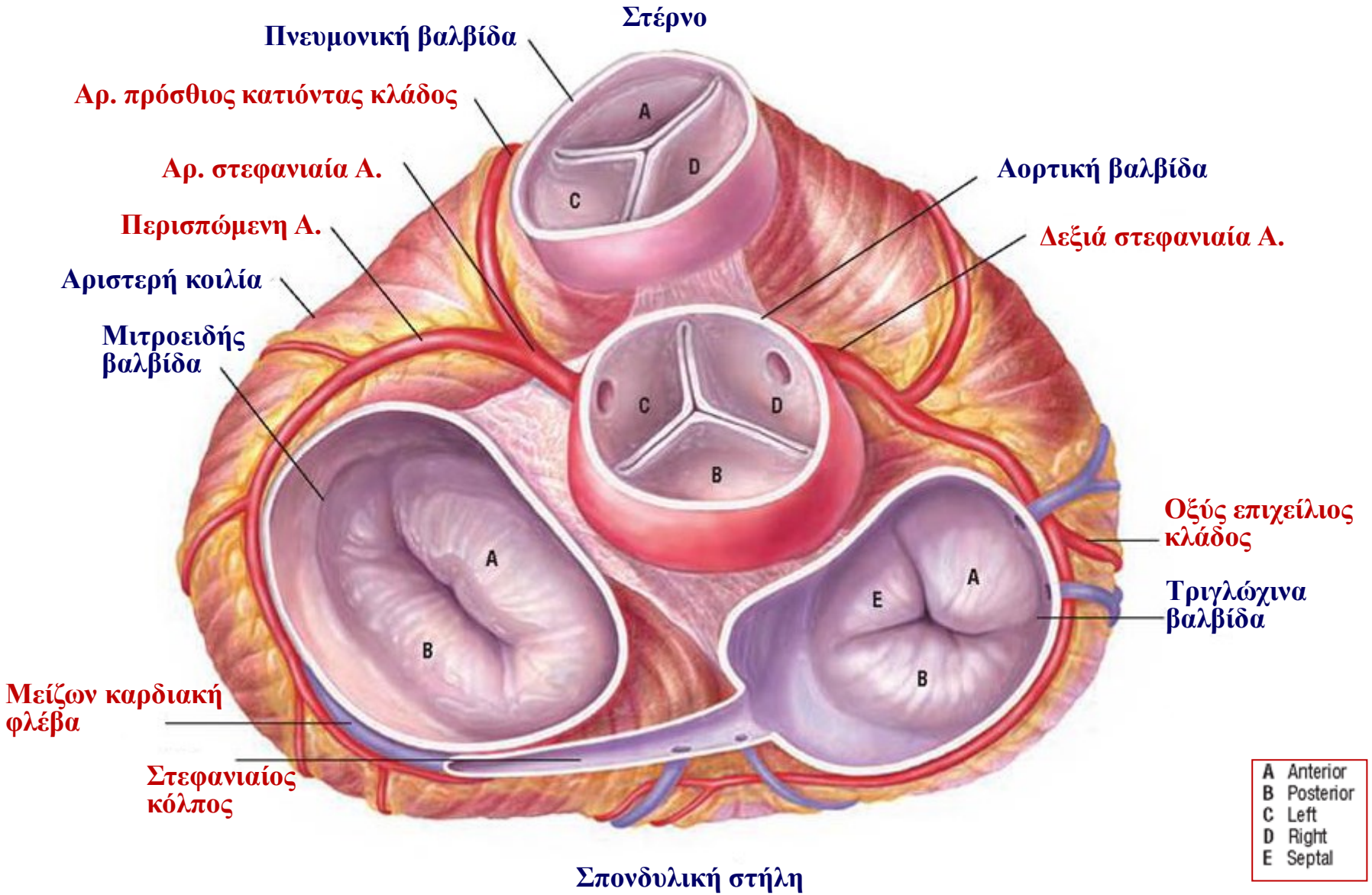
Κλάδοι του στεφανιαίου αρτηριακού δικτύου

Αριστερή στεφανιαία αρτηρία	Δεξιά στεφανιαία αρτηρία
Πρόσθιος κατιών κλάδος	Αρτηρία φλεβοκόμβου
Διαγώνιοι κλάδοι	Αρτηρία κώνου
Διαφραγματικοί κλάδοι	Οξύς επιχείλιος κλάδος
	Οπισθοπλάγιος κλάδος
Περισπωμένη αρτηρία	Οπίσθιος κατιών κλάδος-δεξιά επικρατούσα κυκλοφορία
Αμβλείς επιχείλιοι κλάδοι	
Κολπικοί κλάδοι	
Οπίσθιος κατιών κλάδος-αριστερά επικρατούσα κυκλοφορία	



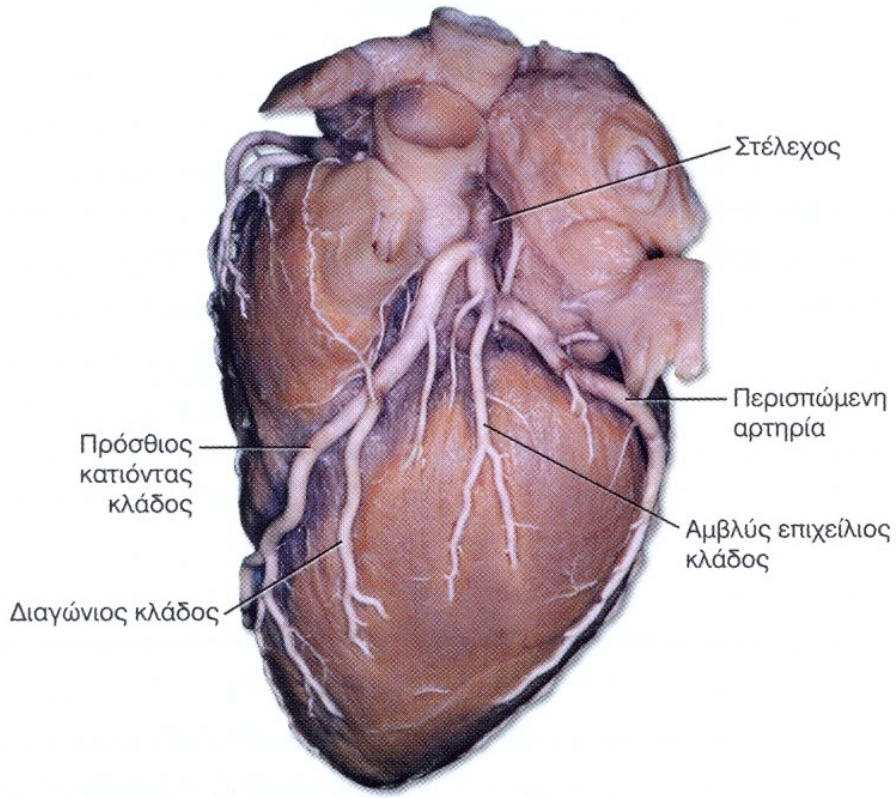
Η αιμάτωση της καρδιάς

Η Στεφανιαία Κυκλοφορία σε κολποκοιλιακό επίπεδο



Η αιμάτωση της καρδιάς

η Αριστερή στεφανιαία αρτηρία



Ανατομικό παρασκεύασμα: Το στέλεχος της αριστερής στεφανιαίας αρτηρίας και ο διχασμός του σε δύο κύριες αρτηρίες: την LAD και την LCx.

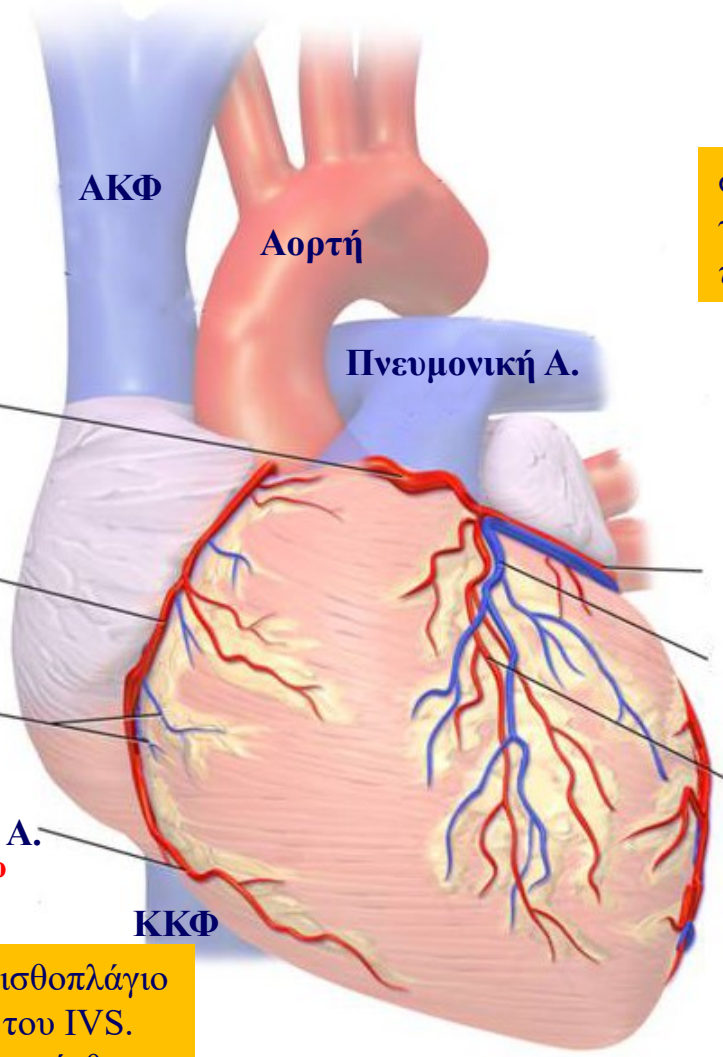
(από Berdajs D., Turina M.I. (eds), 2011)

Η αιμάτωση της καρδιάς

Αριστερή και Δεξιά στεφανιαία αρτηρία

Η RCA χορηγεί στο 50-60% την αρτηρία του Φλεβοκόμου, την αρτηρία του Κώνου, ενώ αιματώνει και τον Κ-κ κόμβο

σε ποσοστό 40% εκφύεται από την περισπώμενη Α. ,η *αρτηρία του Φλεβοκόμου*



Αρ. στεφανιαία Α.

Δεξιά στεφανιαία Α.

Πρόσθιες καρδιακές φλέβες

Οξεία επιχείλιος Α.
(αιματώνει πρόσθιο τοίχωμα Δ.Κ.)

ΚΚΦ

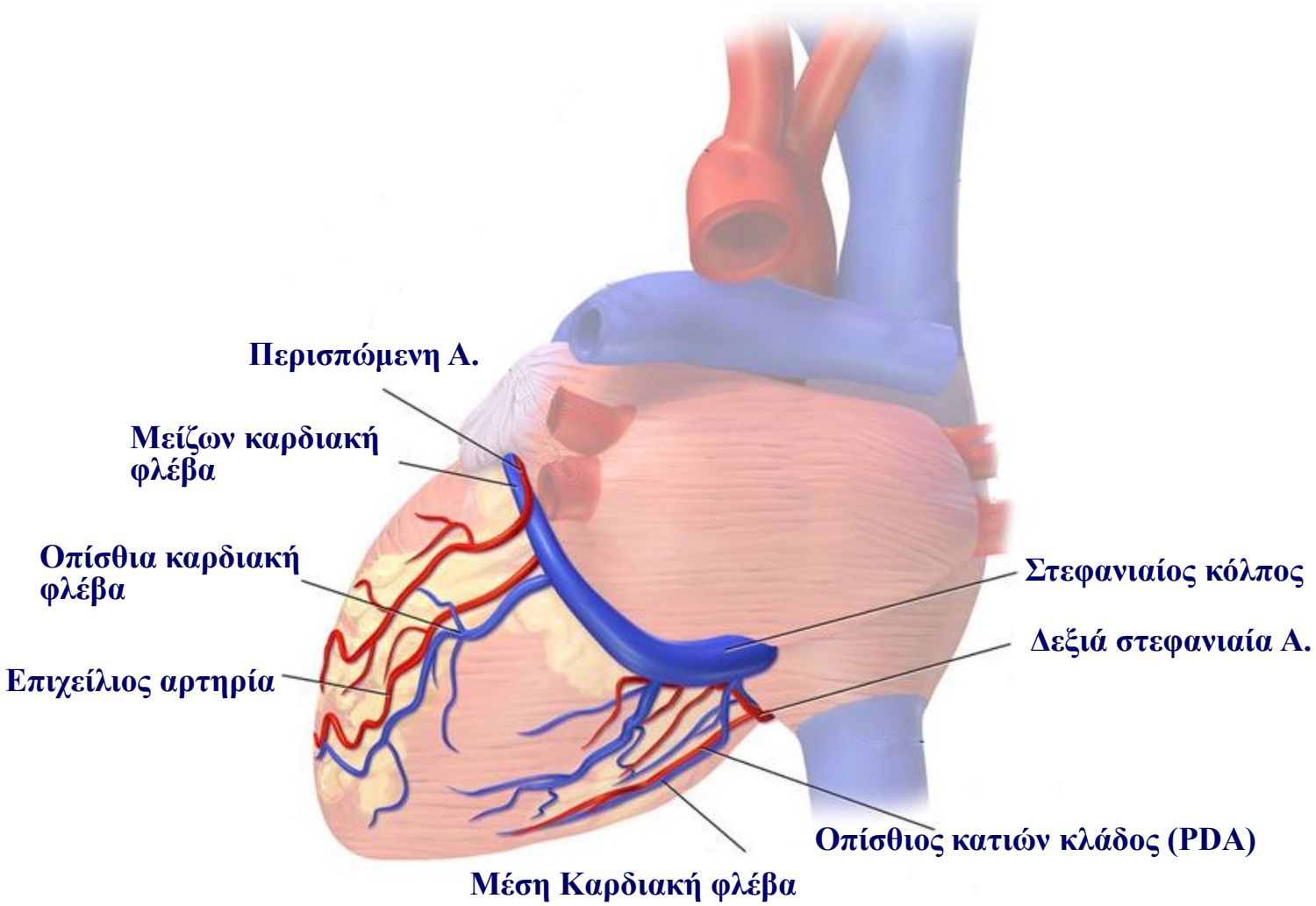
Περισπώμενη Α.
(αιματώνει το πλάγιο & οπίσθιο τοίχωμα της Α.Κ. + τοίχωμα αρ. Κόλπου + οπίσθιο θηλοειδή μυ)

Πρόσθιος Κατιόντας κλάδος (LAD)
(αιματώνει πρόσθιο & πλάγιο τοίχωμα Α.Κ. + πρόσθια 2/3 του IVS + πρόσθιο θηλοειδή μυ)

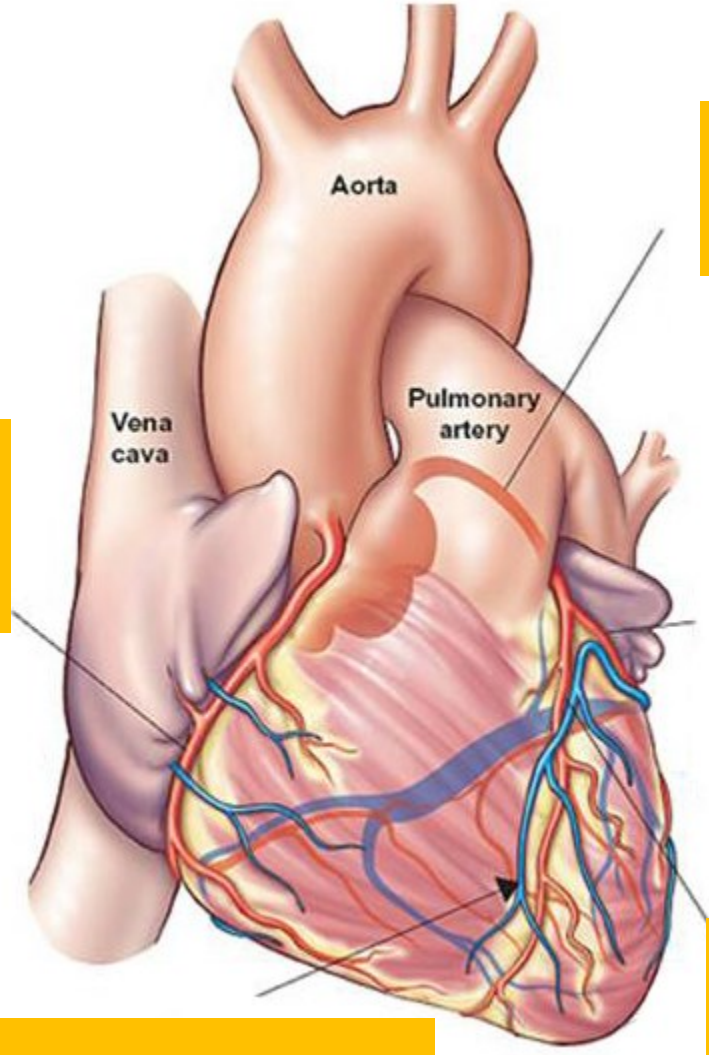
Η RCA διχάζεται στον PDA και στον οπισθοπλάγιο κλάδο. Ο **PDA** αιματώνει το οπίσθιο1/3 του IVS. Ο **οπισθοπλάγιος κλάδος** αιματώνει την οπίσθια επιφάνεια της Α.Κ.

Η αιμάτωση της καρδιάς

Αριστερή και Δεξιά στεφανιαία αρτηρία



Αριστερή και Δεξιά στεφανιαία αρτηρία
Τι ακριβώς αιματώνουν ;;;



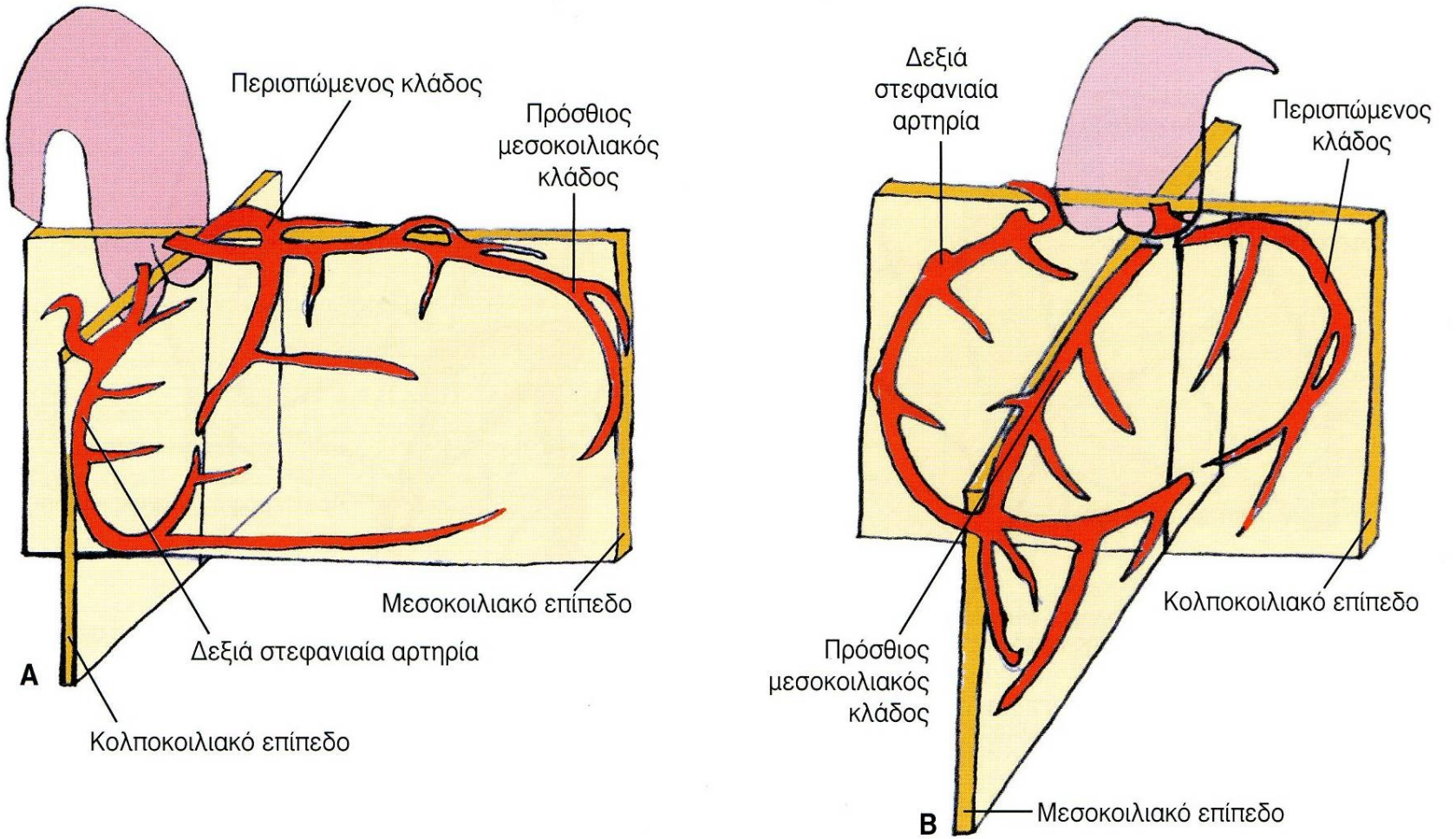
LCA:
Παρέχει αίμα σε 2 μεγάλους κλάδους, την περισπώμενη αρτηρία και τον αριστερό πρόσθιο κατιόντα κλάδο (LAD).

RCA:
Παρέχει αίμα στο δεξιό κόλπο, δεξιά κοιλία, στη βάση της αριστερής κοιλίας και στο οπίσθιο μεσοκοιλιακό διάφραγμα

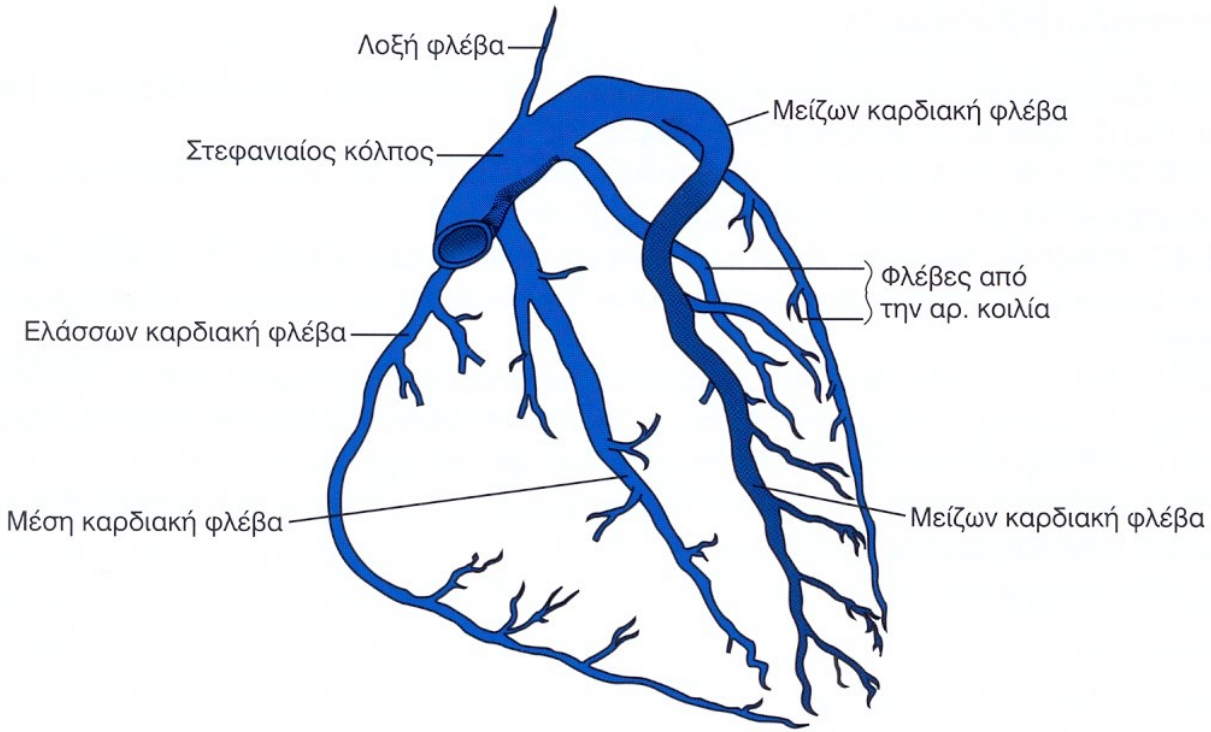
LCx:
Παρέχει αίμα στον αριστερό κόλπο και στο πλάγιο και οπίσθιο τοίχωμα της αριστερής κοιλίας

LAD:
Παρέχει αίμα στην πρόσθια επιφάνεια της αριστερής κοιλίας, στο βασικό τμήμα του μεσοκοιλιακού διαφράγματος & στα πρόσθια 2/3 του μεσοκοιλιακού διαφράγματος

Στεφανιαίες φλέβες:
Συλλέγουν το φτωχό σε O_2 αίμα λόγω της χρησιμοποίησής του από τον καρδιακό μυ και το επιστρέφουν στο δεξιό κόλπο

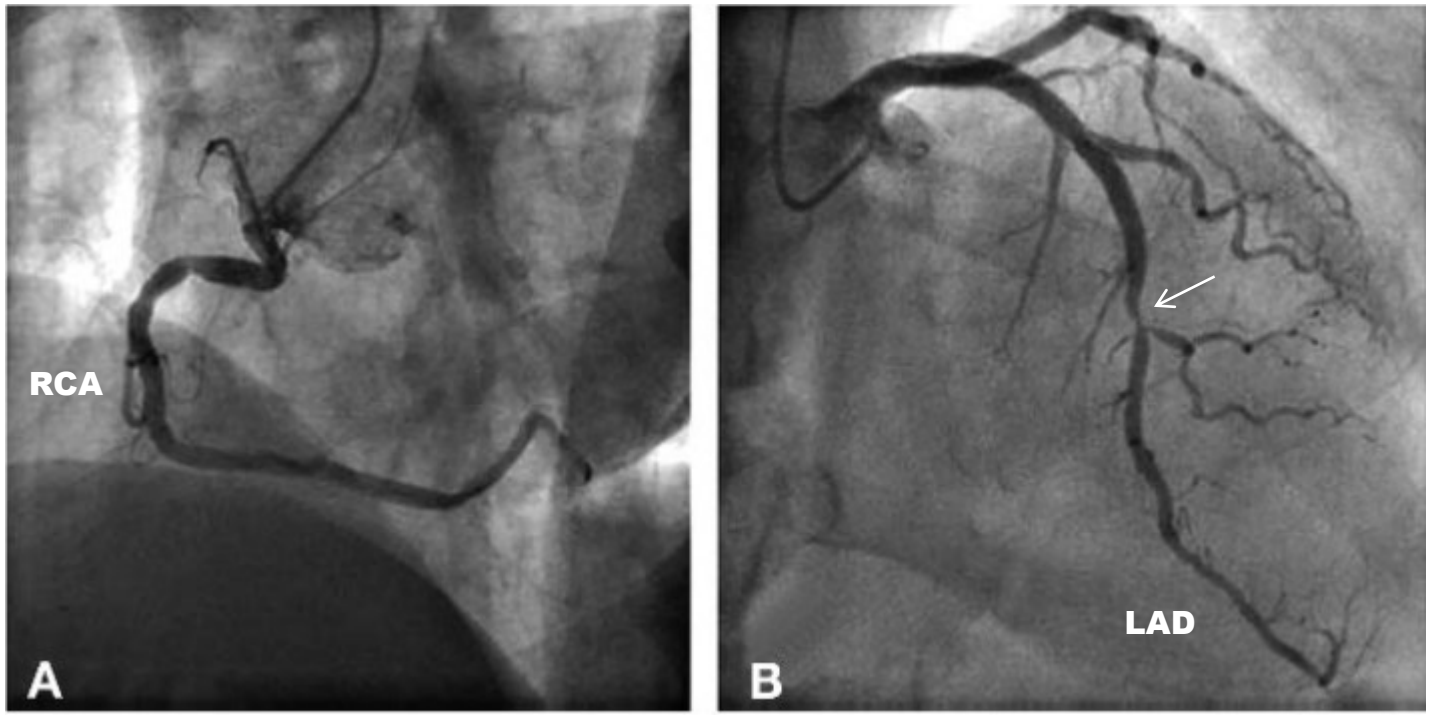

Περισπώμενος κλάδος
Πρόσθιος μεσοκοιλιακός κλάδος
Μεσοκοιλιακό επίπεδο
Δεξιά στεφανιαία αρτηρία
A
Κολποκοιλιακό επίπεδο
Δεξιά στεφανιαία αρτηρία
Περισπώμενος κλάδος
Κολποκοιλιακό επίπεδο
Πρόσθιος μεσοκοιλιακός κλάδος
B
Μεσοκοιλιακό επίπεδο

Αριστερή και Δεξιά στεφανιαία αρτηρία
Τι ακριβώς αιματώνουν ;;;

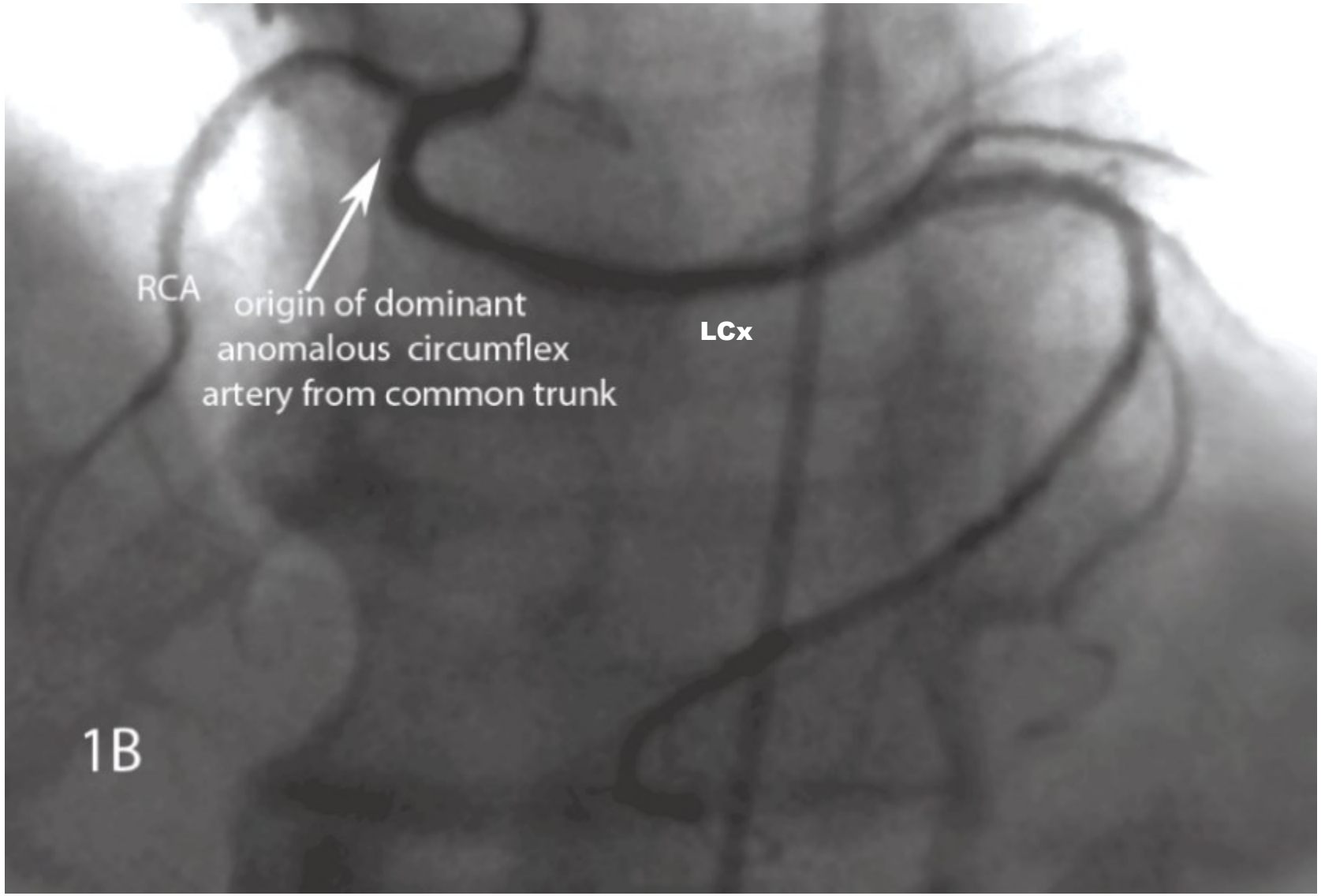


Το αίμα από τα τριχοειδή του καρδιακού μυός συγκεντρώνεται στις φλέβες, οι οποίες διαδοχικά συνενώνονται για να σχηματίσουν την ***μείζονα***, την ***ελάσσονα*** και τη ***μέση φλέβα*** της καρδιάς. Οι τρεις αυτές φλέβες σχηματίζουν τον **στεφανιαίο κόλπο**, οποίος εκβάλλει στο δεξιό κόλπο. Επίσης υπάρχουν μικρά φλεβίδια τα οποία εκβάλλουν απευθείας στο δεξιό κόλπο ή σπανιότερα στον αριστερό κόλπο και τις κοιλίες.

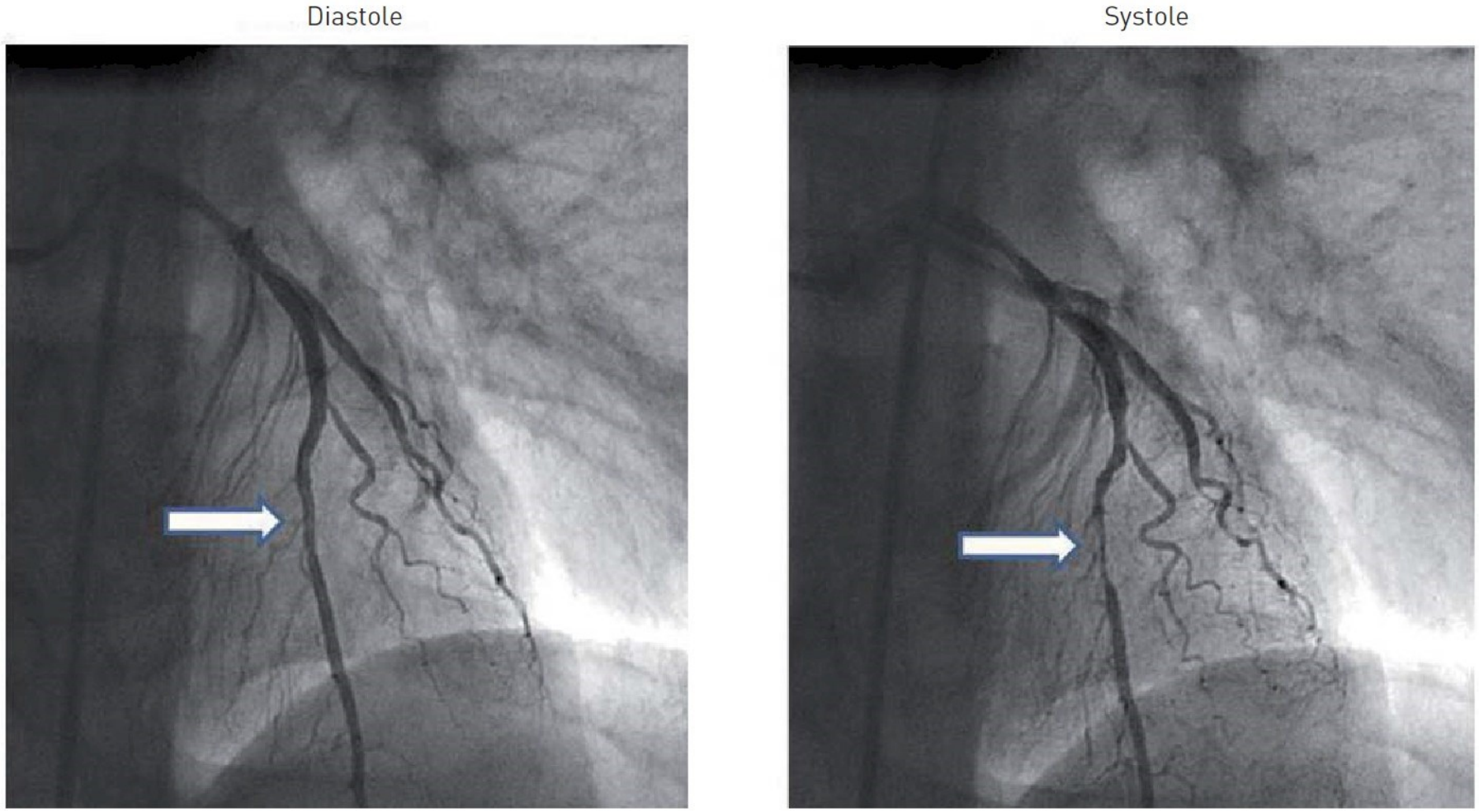
The study of the coronary arterial network



The study of the coronary arterial network



Myocardial Bridges

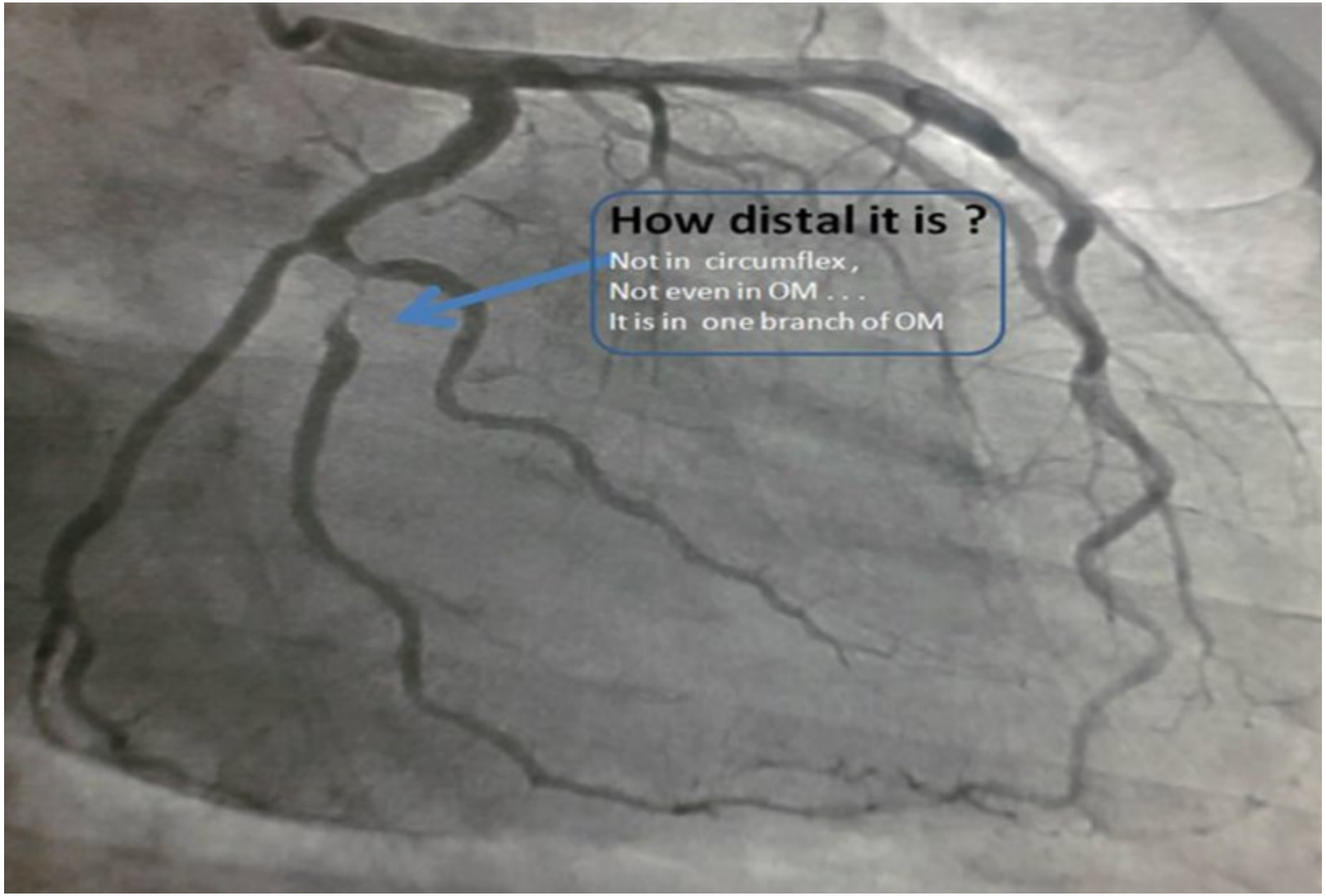


On angiography one sees typically a systolic compression with diameter reduction which varies from mild (less than 50% diameter reduction) to severe (more than 75% diameter reduction)

Myocardial bridge

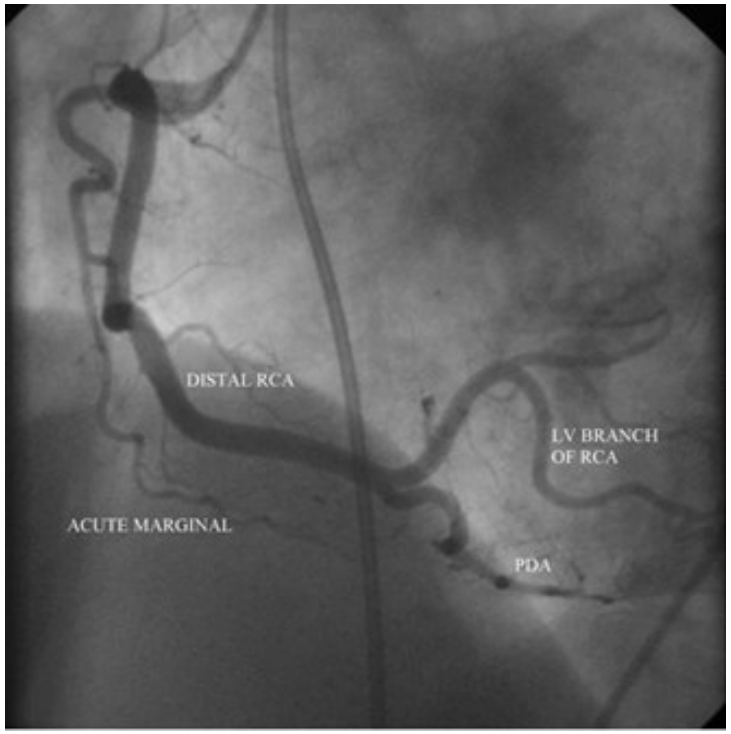
Anatomical specimens

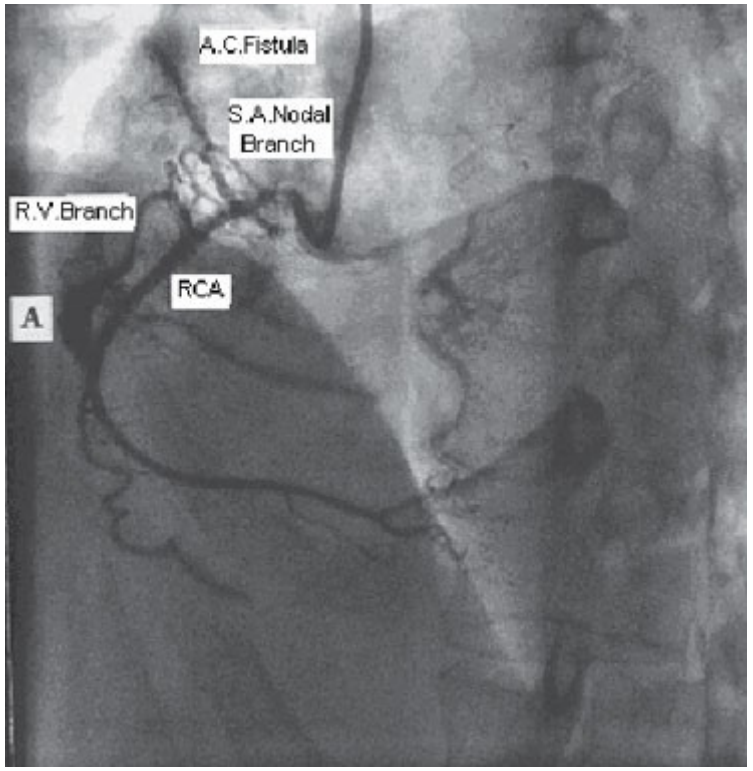
Coronary arteries



Coronary arteries

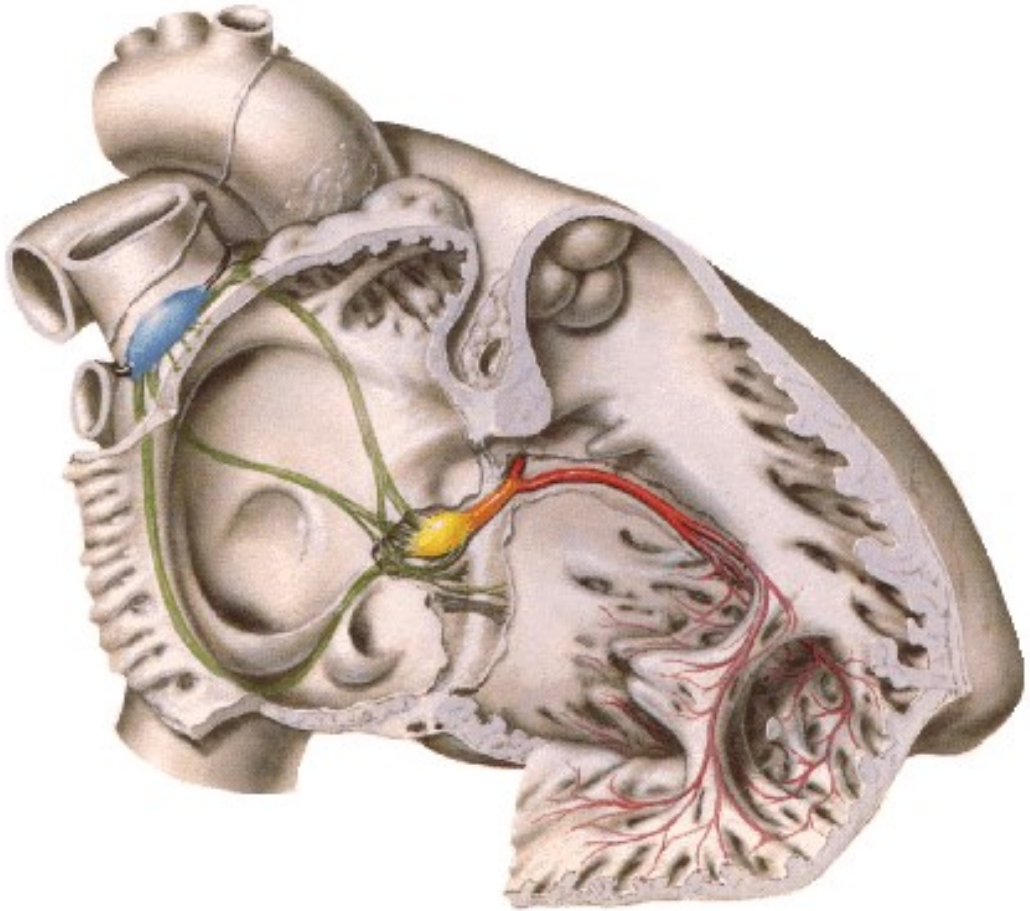
Coronary arteries





10. Conduction system of the heart

Conduction system of the heart

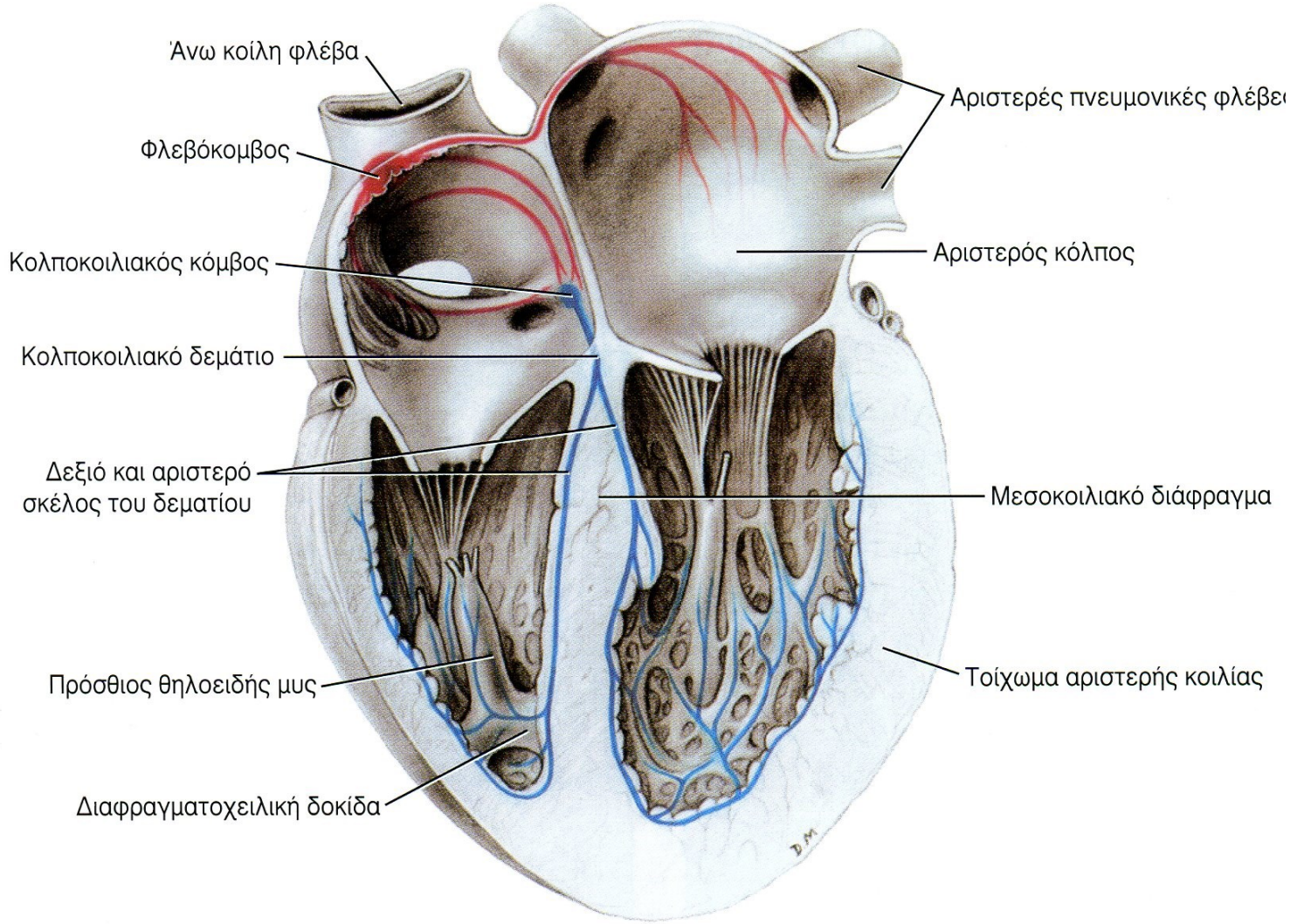


- **Sinus Location**

Internodal bundles Central sinus artery

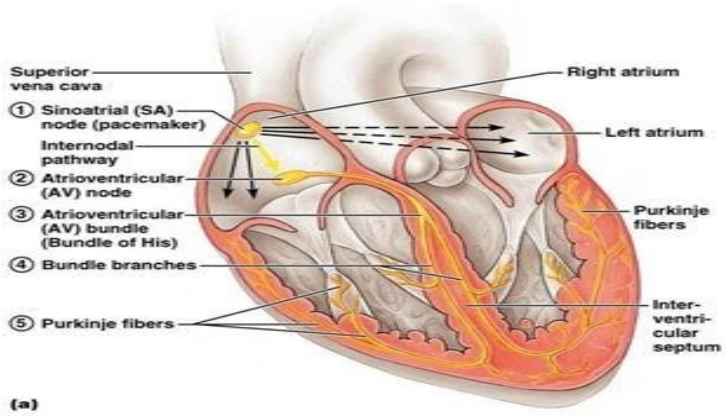
- **AV node (Triangle of Koch)**
- **AV bundle (trunk of AV bundle)**

Conduction system of the heart



Conduction system of the heart

- **The beating of the heart is regulated by the intrinsic conduction (nodal) system**
- **Its function is to ensure that the chambers of the heart contract in the proper rhythm and sequence:**



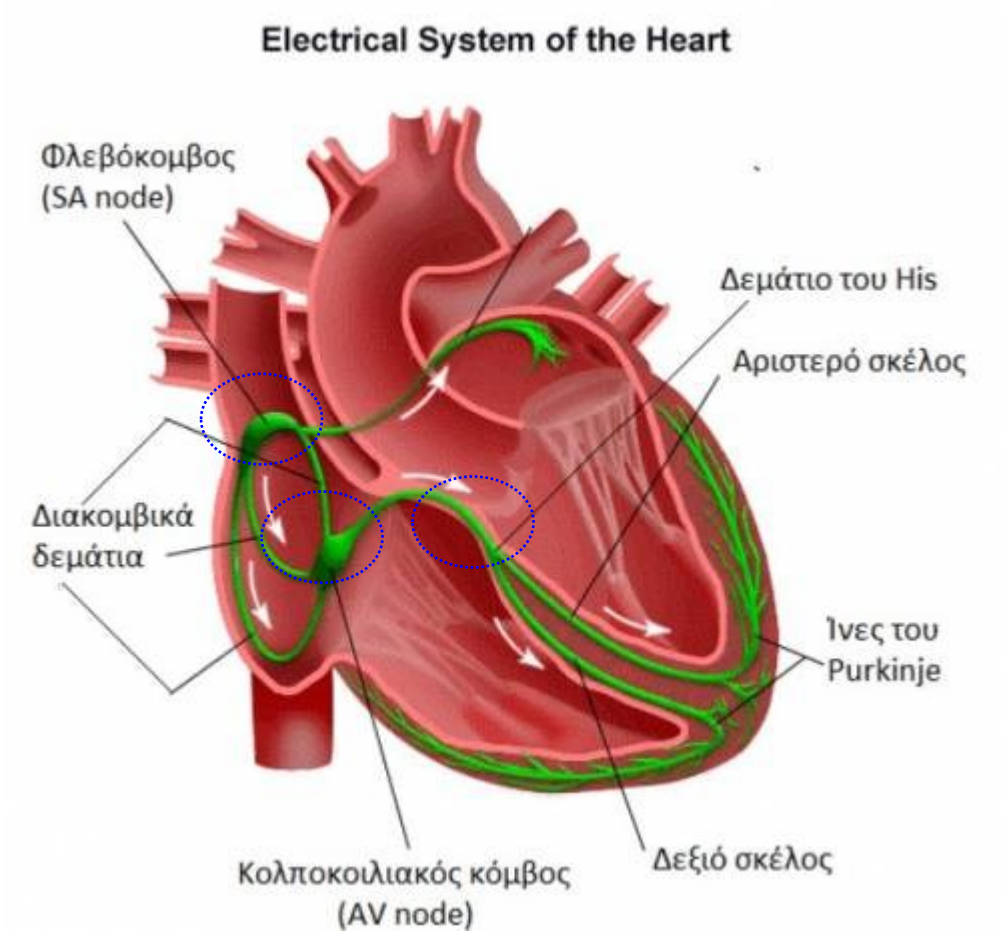
sinoatrial (SA) node: is the main center ,located in the right atrium. Also, is called the **pacemaker** of the heart, because it generates the impulse.

atrioventricular(AV) node: is located at the junction of the atria and the ventricles

atrioventricular (AV) bundle (bundle of His) :is located in the interventricular septum

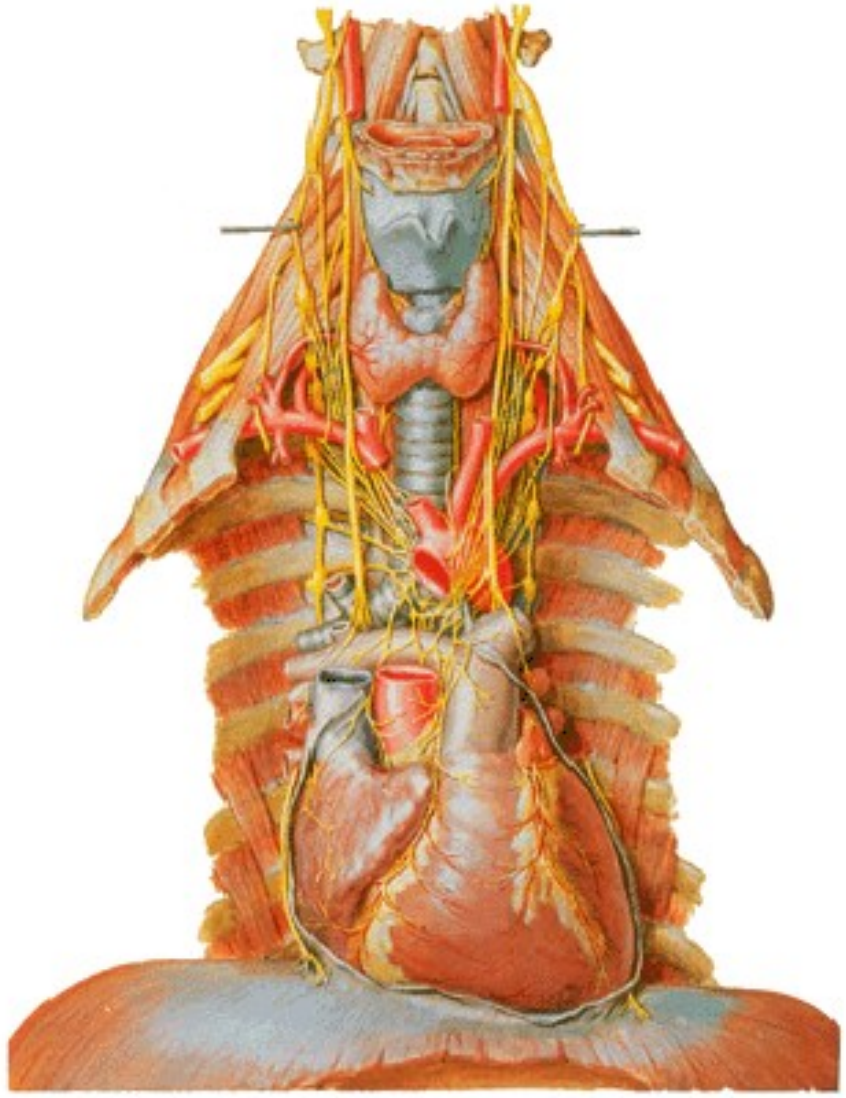
Purkinje fibers : are located inside the walls of the ventricles

Conduction system of the heart



The potential areas of injury in the various cardiac **surgeries**

Nerves of the heart



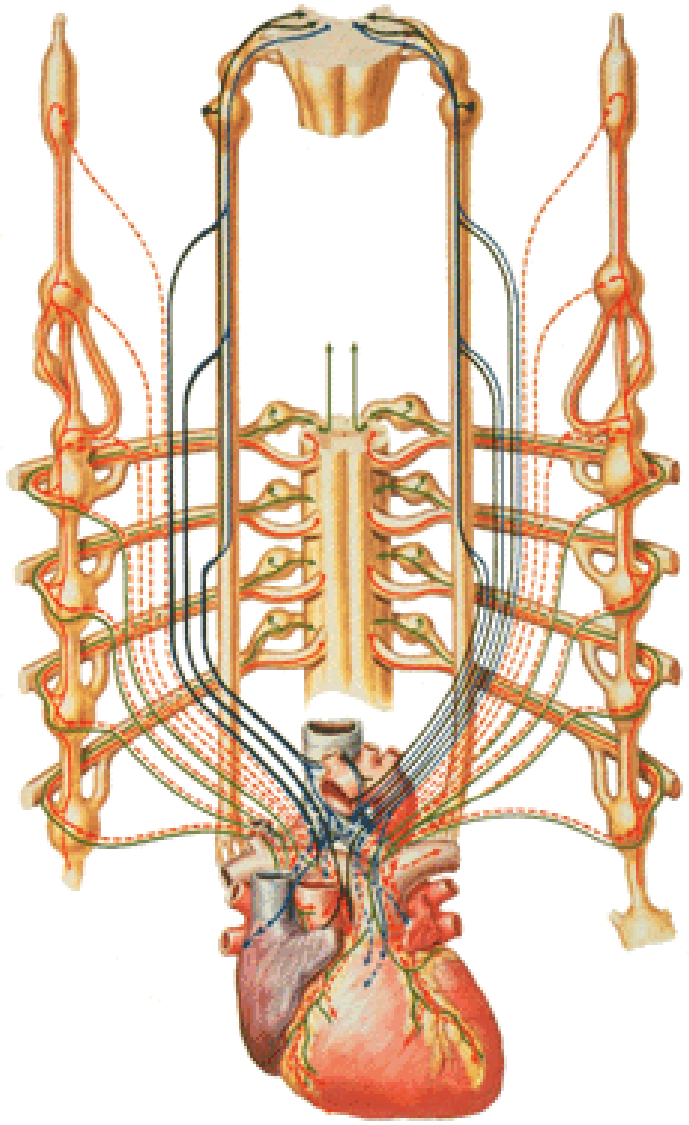
- **Parasympathetic fibers**

(via the cardiac branches of the vagus nerve) Afferents and efferents (dense network in atria, sinus node and AV node)

- **Sympathetic fibers**

(via cardiac sympathetic nerves) Afferents

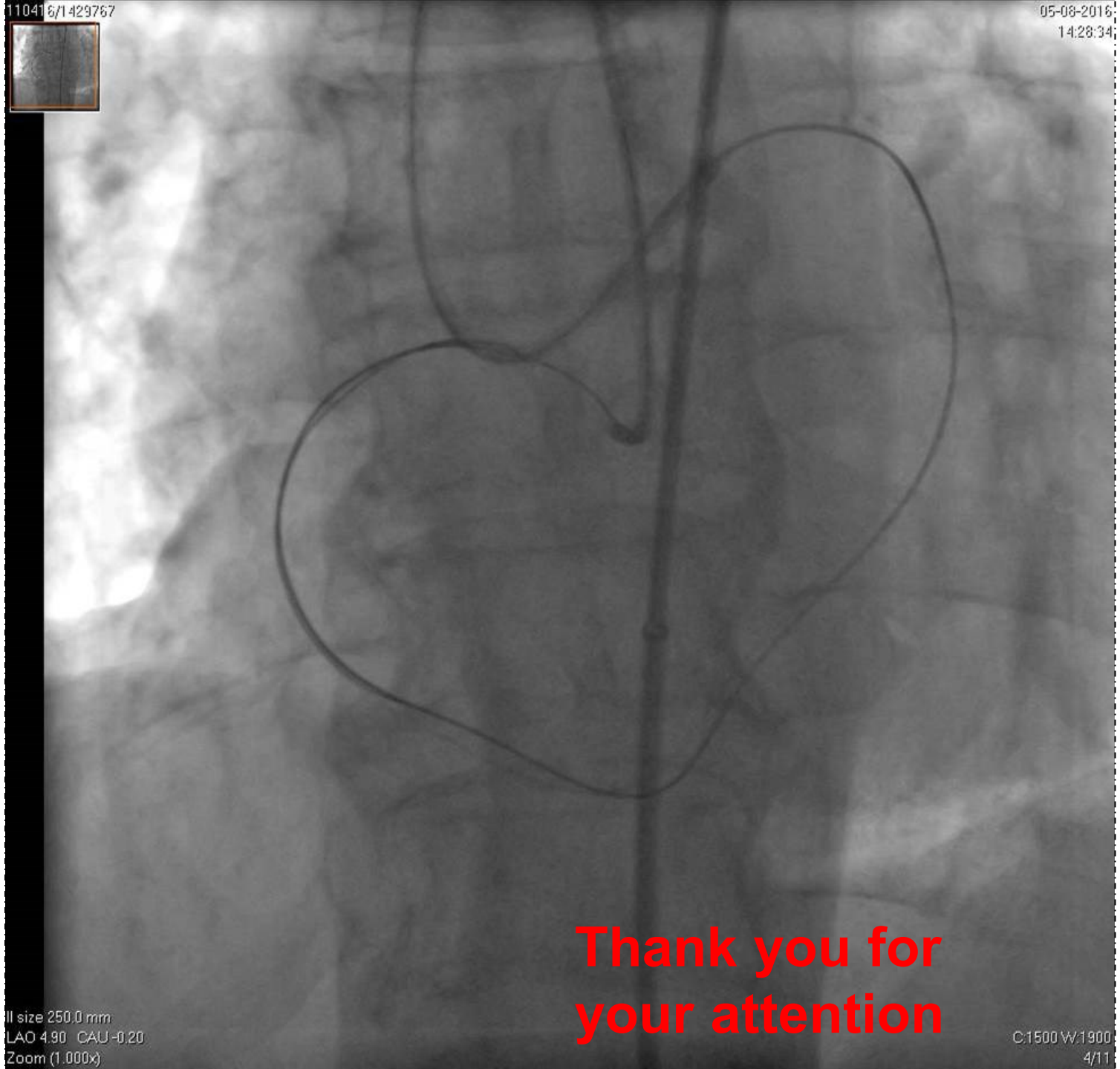
Nerves of the heart



- Parasympathetic fibers
- The afferent fibers

they inhibit the production of the heart rate, the speed of conduction of stimulation and the strength of contraction, and on the other hand, contraction of the coronary vessels.

- The efferent fibers In reflex regulation of cardiac function
- Sympathetic fibers
- The introductions
- Opposite action from the parasympathetic
- The kidnappings
- Pain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Zoom (1.000x)
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