INTERNAL CONFIGURATION OF THE HEART

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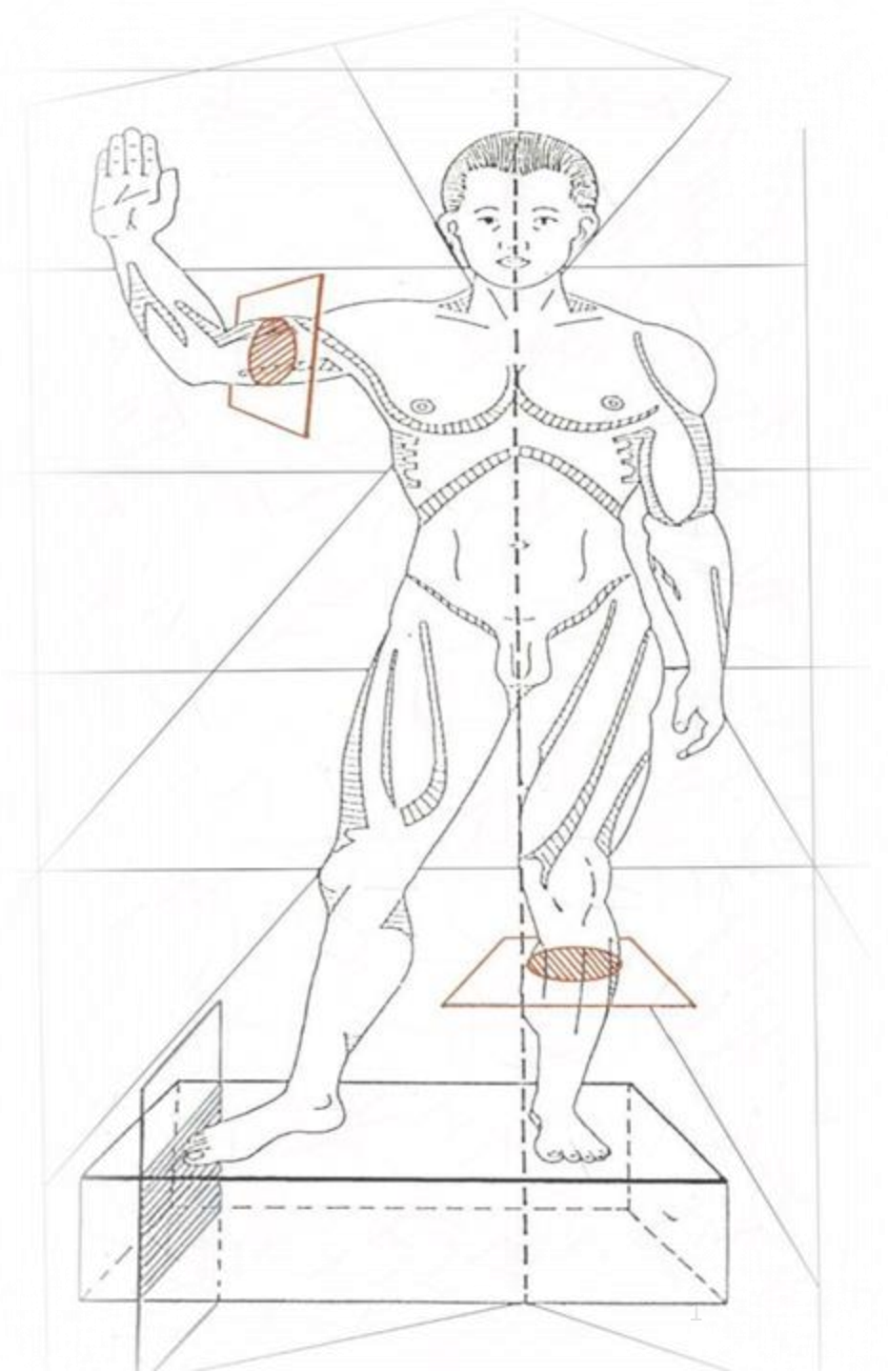
Dr.Chaima KASSI



PLAN

I. THE INTERVENTRICULAR SEPTUM

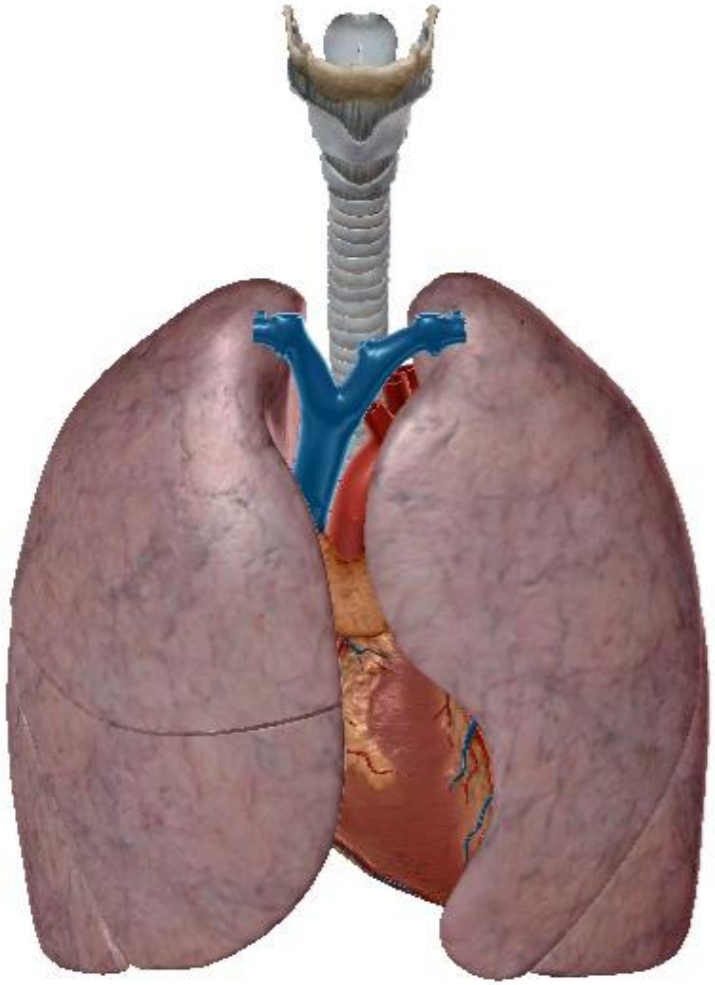
II. THE INTERATRIAL SEPTUM

III. THE ORIFICES AT THE BASE OF THE HEART

IV. THE CARDIAC CHAMBERS

V. CLINICAL APPLICATIONS

VI. CONCLUSION

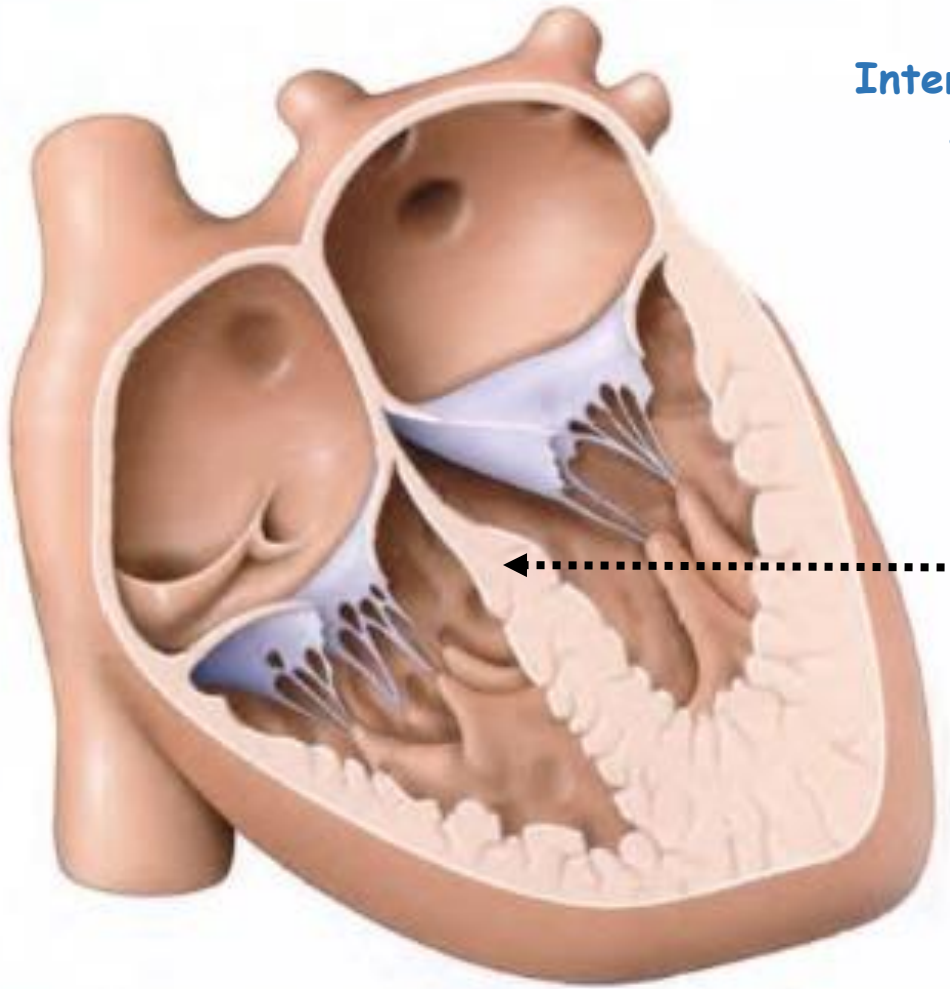


I-THE INTERVENTRICULAR SEPTUM

A. ORIENTATION

B. STRUCTURE

According to KAMINA



Heart septa (longitudinal and oblique schematic section)

A-ORIENTATION

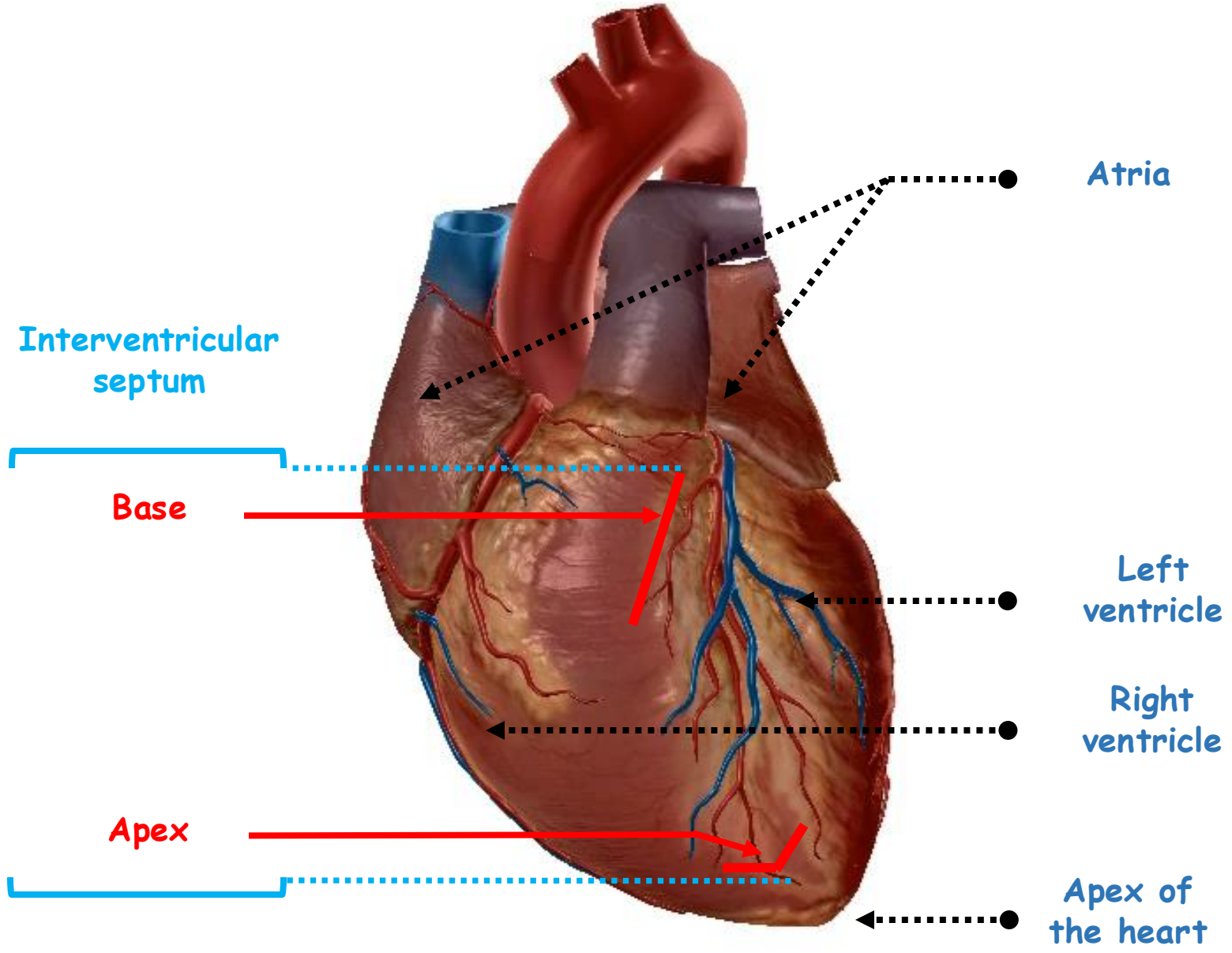
It is triangular in shape:

- Its base faces the atria, where it continues with the interatrial septum.

- Its apex corresponds to the apex of the heart.

- Its right surface belongs to the right ventricle.

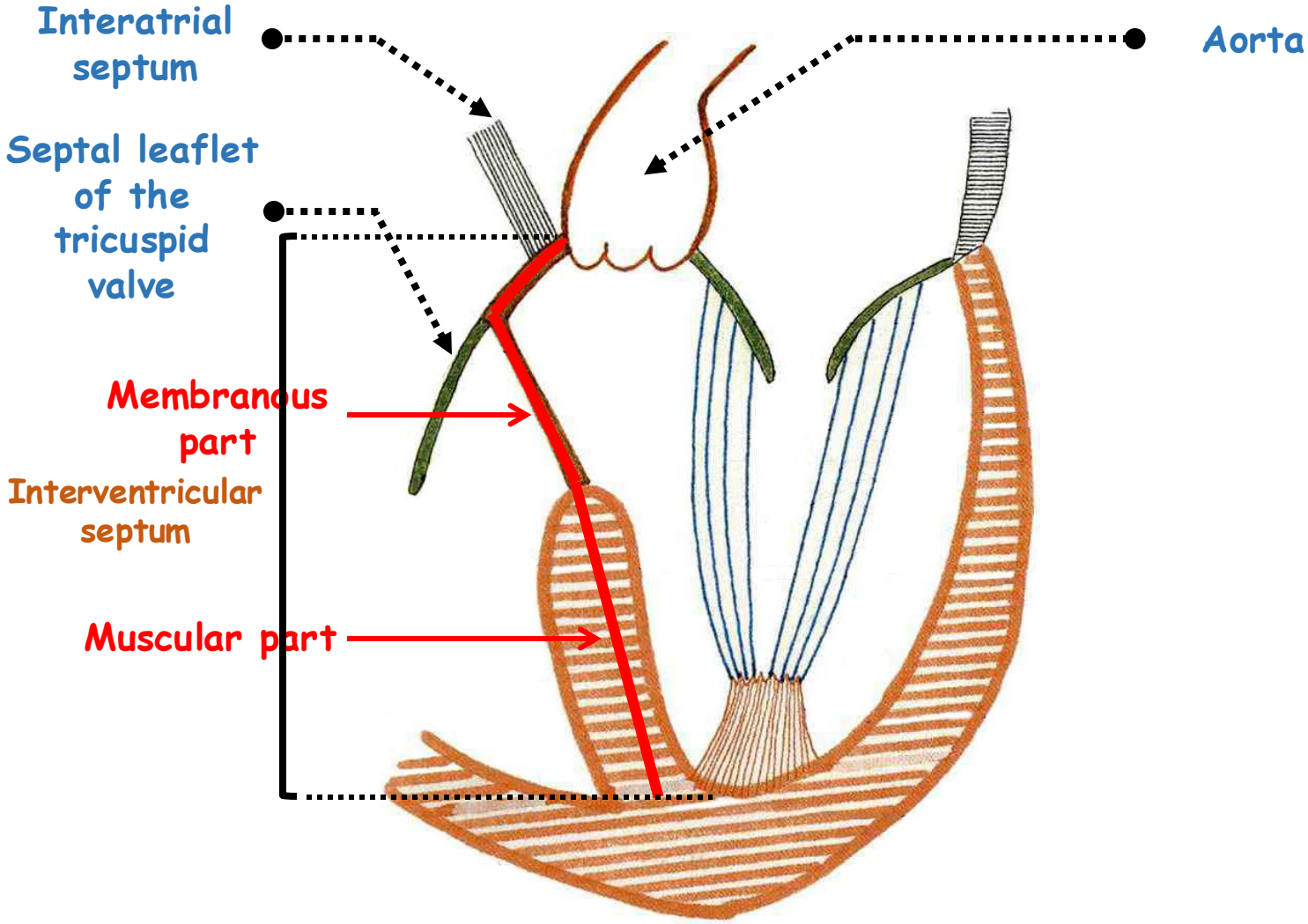
- Its left surface is concave, facing left and downward.



B-STRUCTURE

- A thick muscular part that gives rise on the right to the pillars of the septal leaflet of the tricuspid valve.

- A thin membranous part : the pars membranacea.



Longitudinal section of the left ventricle

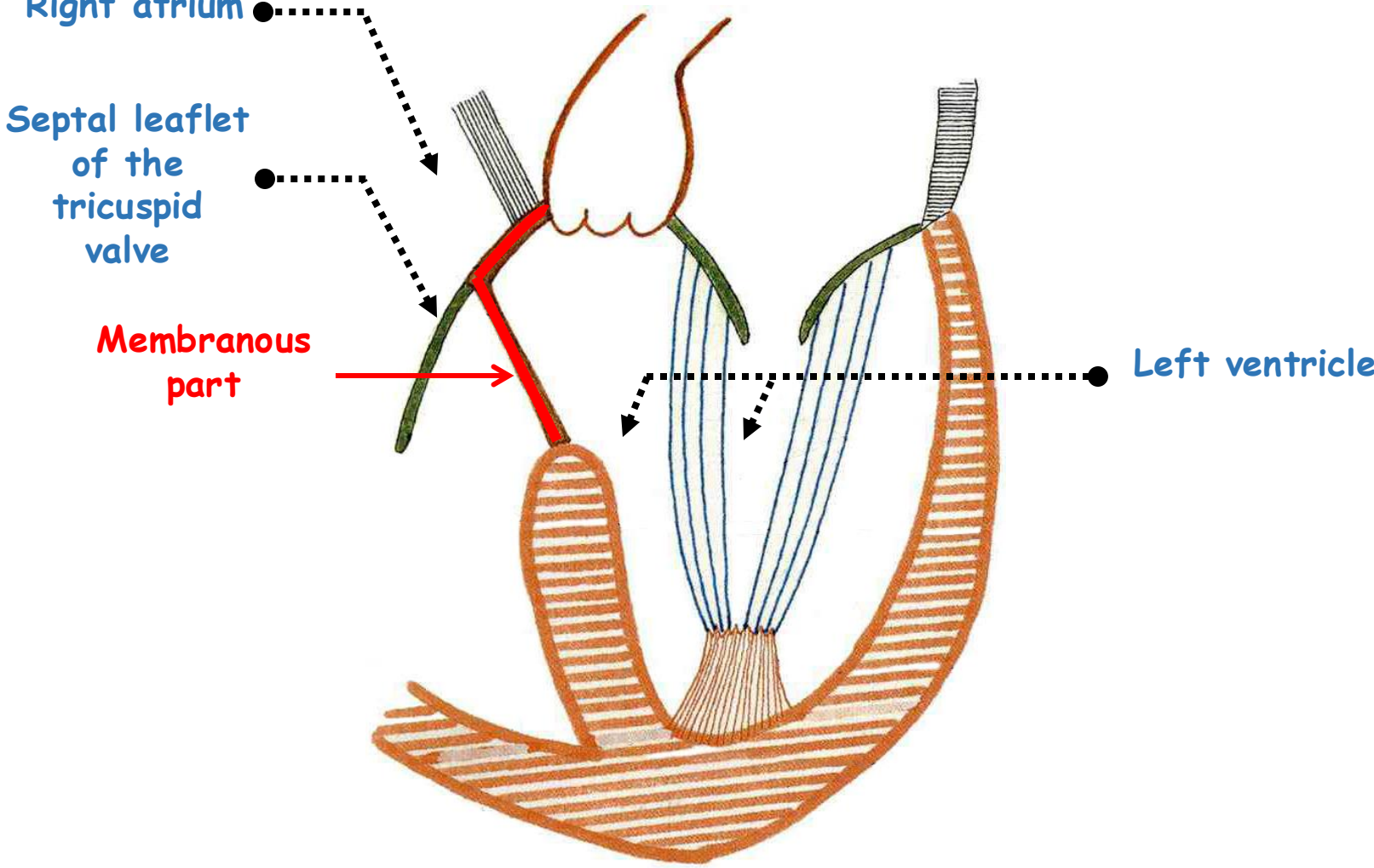
B-STRUCTURE

- A thick muscular part that gives rise on the right to the pillars of the medial leaflet of the tricuspid valve.

- A thin membranous part : the pars mambranacea.

- Its left surface corresponds to the ventricle.

- Its right surface provides the insertion for the septal leaflet of the tricuspid valve.



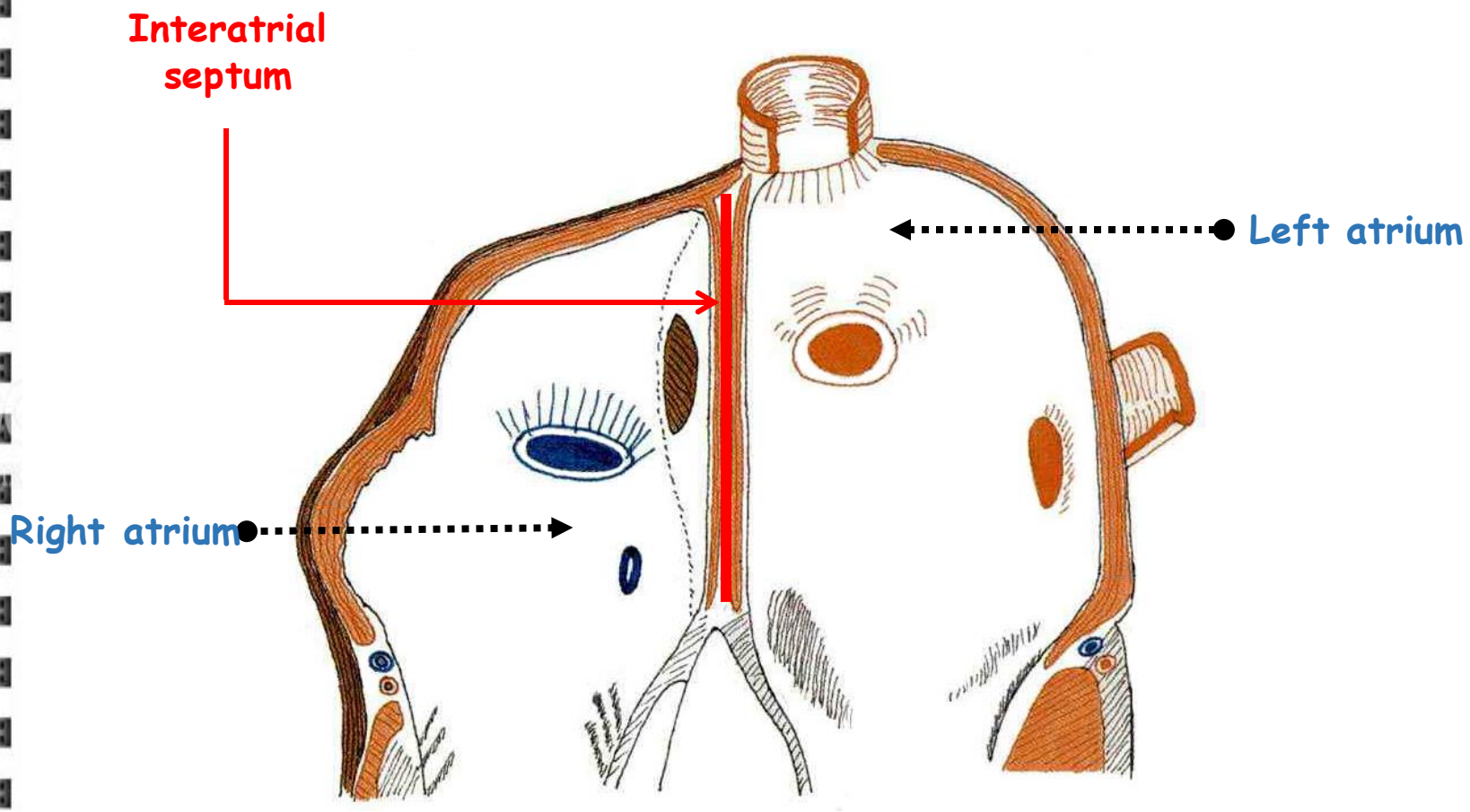
Longitudinal section of the left ventricle

II-THE INTERATRIAL SEPTUM

It is a **thin membrane** that separates the two **atria** from each other and has two surfaces :

- A right surface.

- A left surface.



Frontal section of the atria showing the arrangement of the interatrial septum

III-THE ORIFICES AT THE BASE OF THE HEART

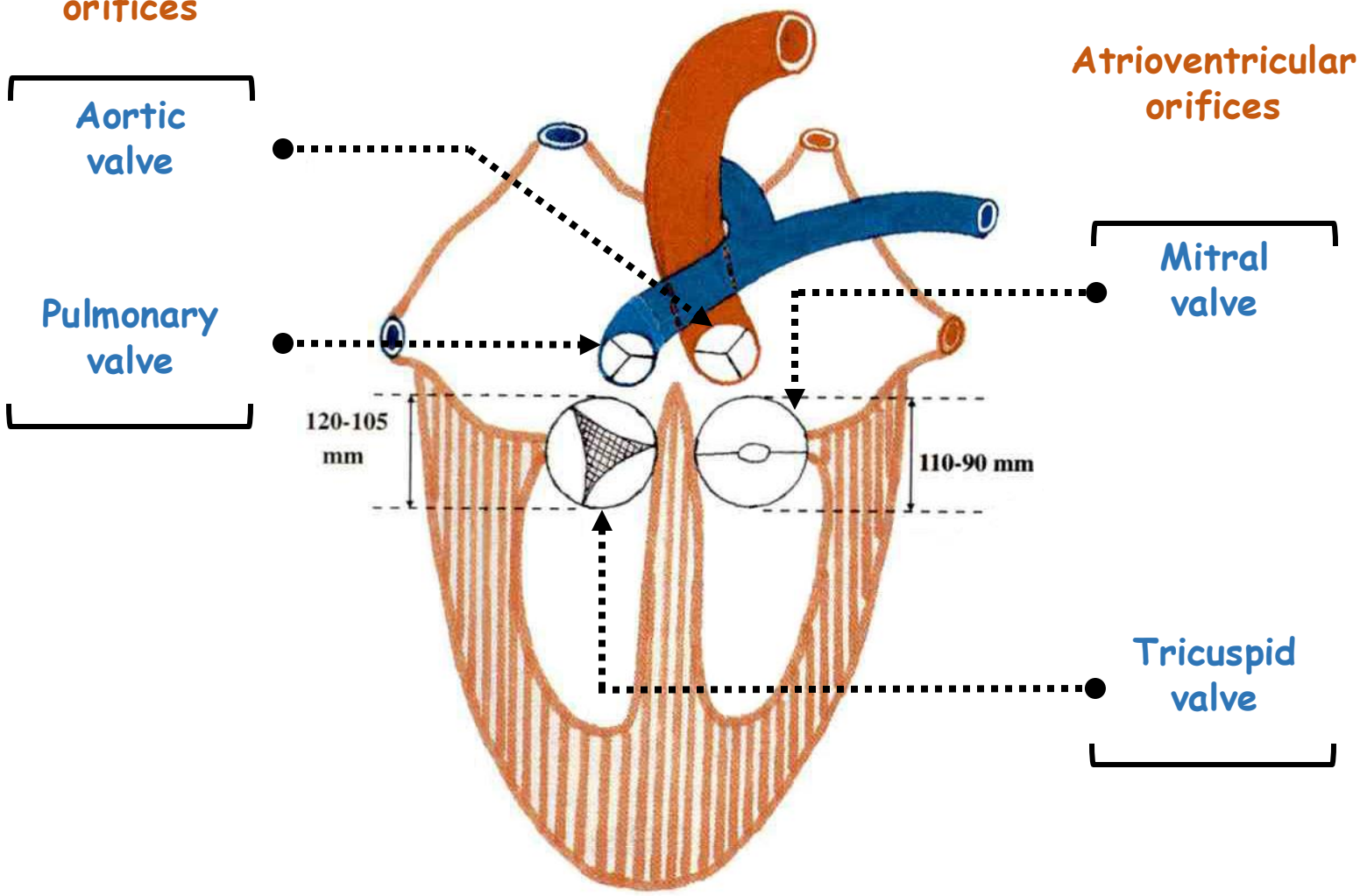
A. ATRIOVENTRICULAR ORIFICES

1. The left atrioventricular orifice (bicuspid or mitral valve)
2. The right atrioventricular orifice (tricuspid valve)

B. ARTERIAL ORIFICES

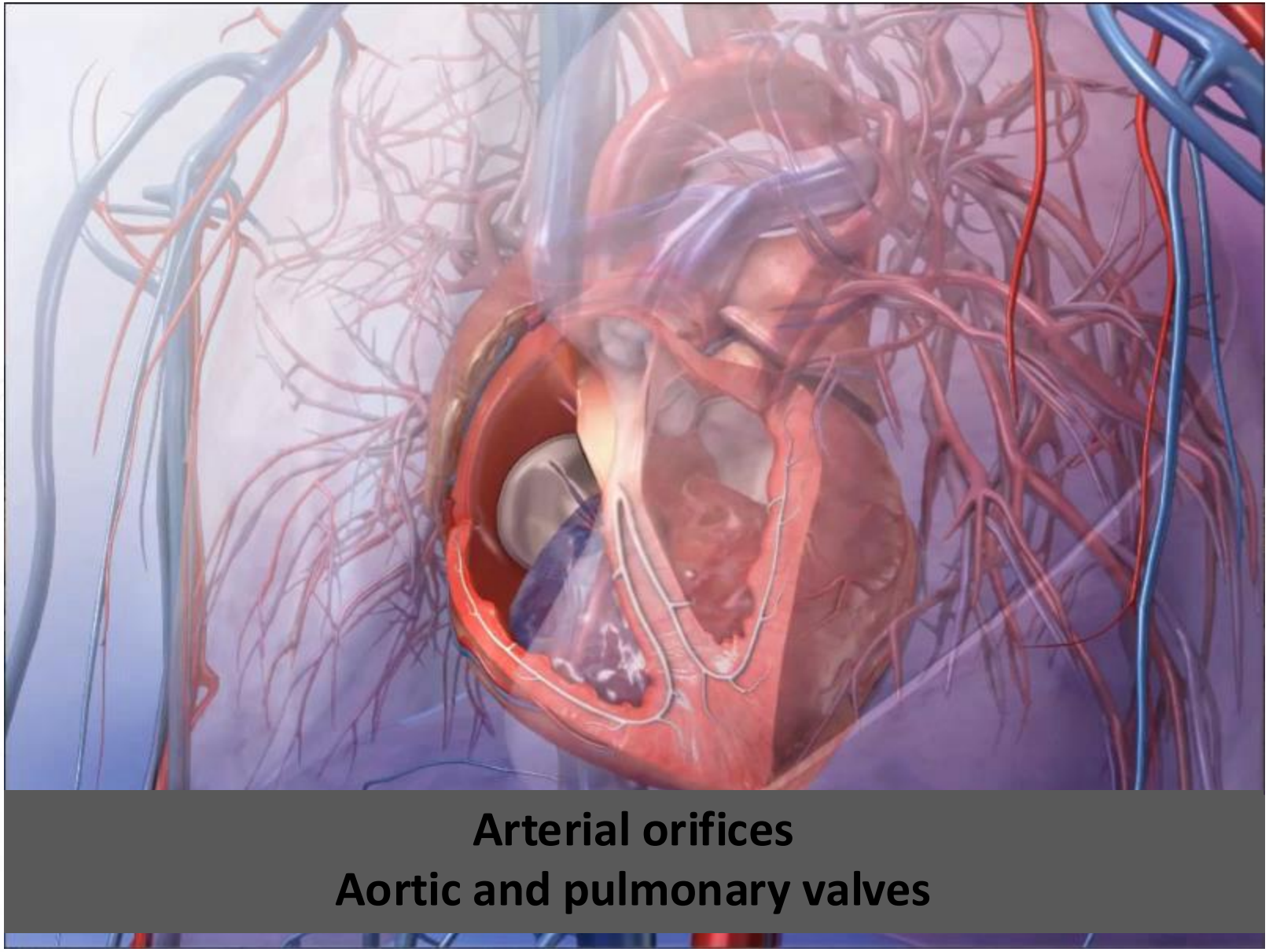
1. The aortic orifice
2. The pulmonary orifice

C. PROJECTION OF THE ORIFICES AT THE BASE OF THE HEART ON THE ANTERIOR THORACIC WALL



Schematic frontal section showing the arrangement of arterial and ventricular orifices.

III-THE ORIFICES AT THE BASE OF THE HEART



Arterial orifices
Aortic and pulmonary valves

A-ATRIOVENTRICULAR ORIFICES

- They are divided into several leaflets by deep indentations.

- Each leaflet has :

- A smooth axial surface.
- A parietal surface made uneven by the attachement to the chordae tendineae.
- An adherent border joined to the border of the atrioventricular orifice.
- A notched free border.

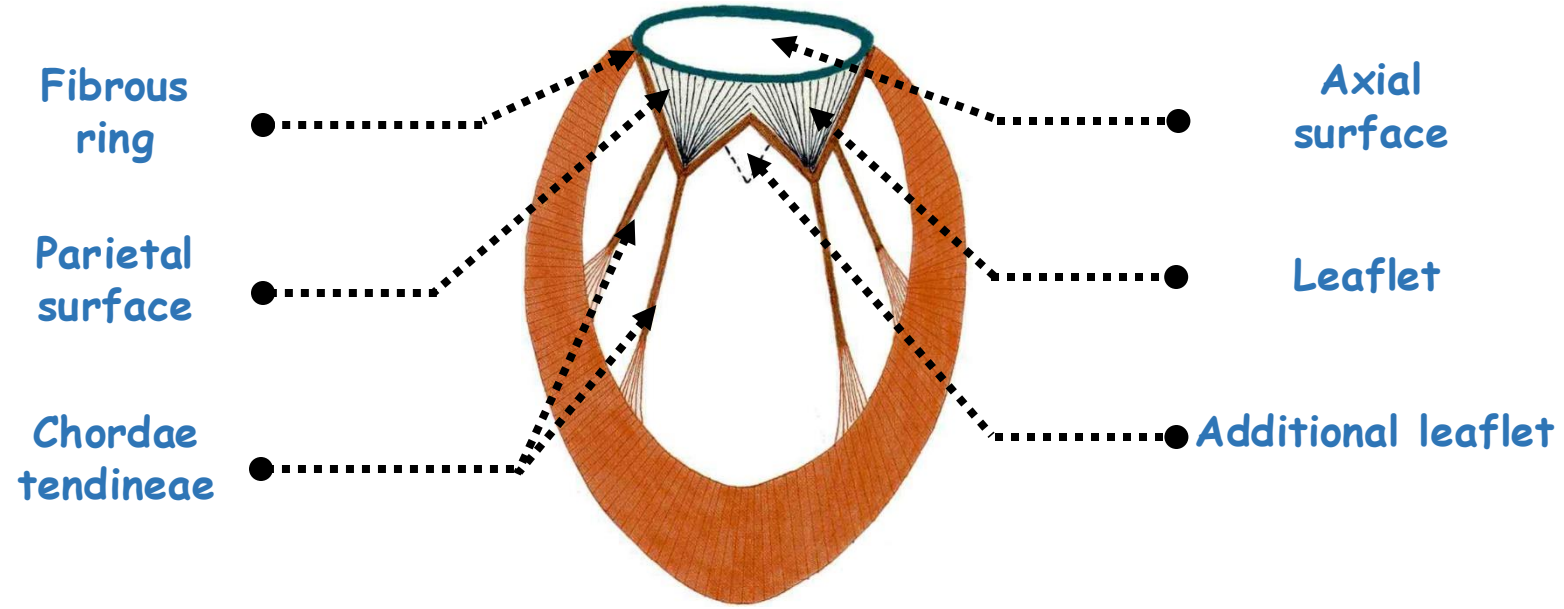


Diagram of an atrioventricular valvular apparatus

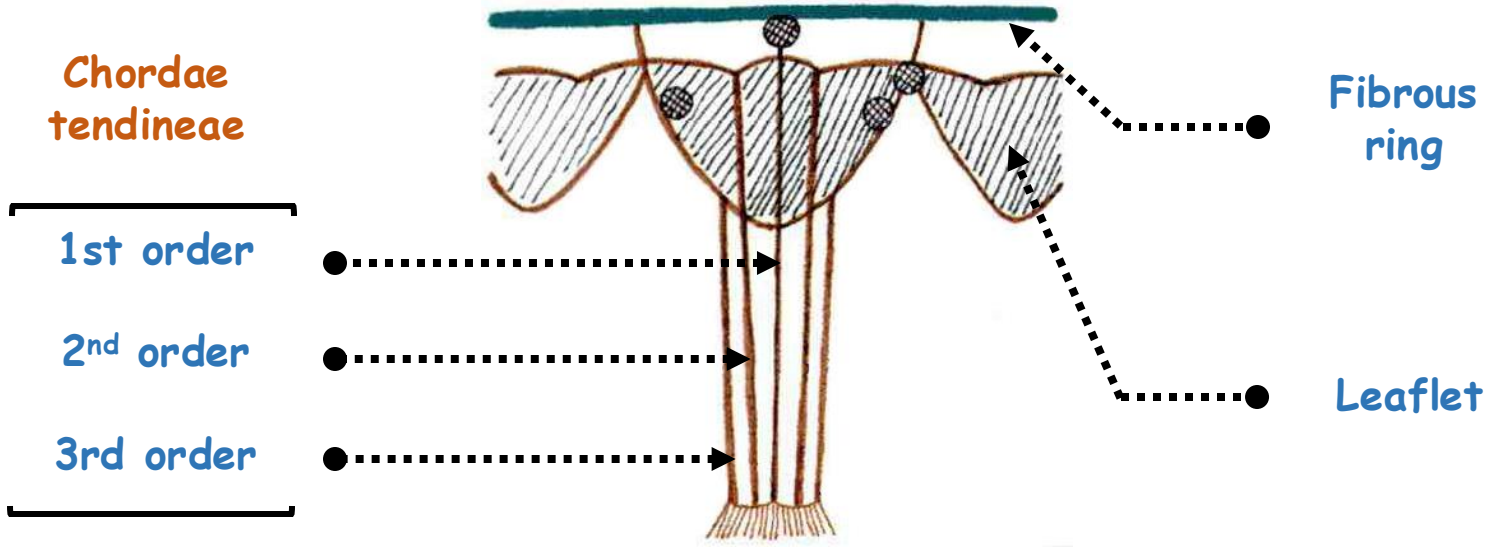
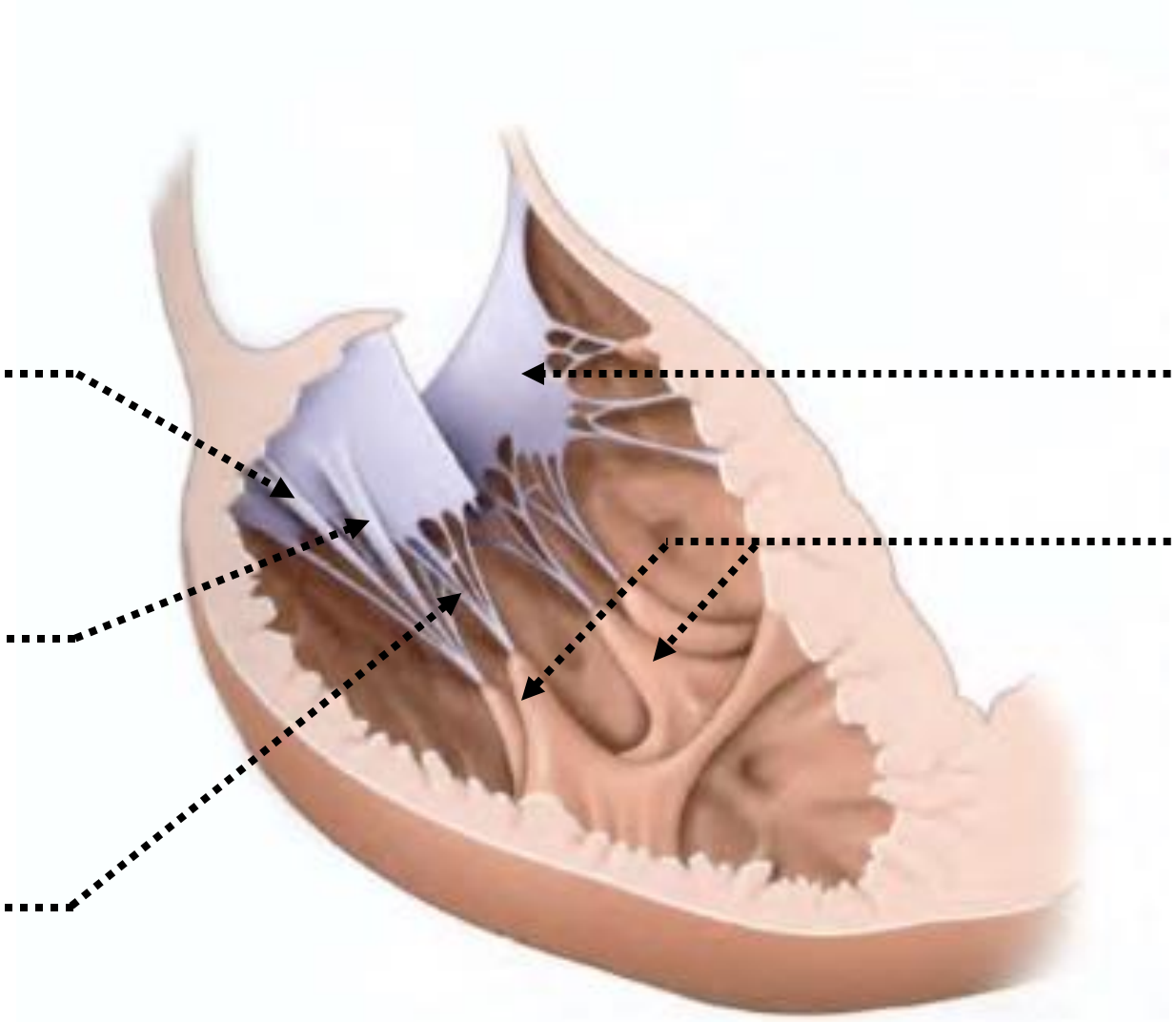


Diagram of an atrioventricular valve showing the insertion of the chordae tendineae

According to KAMINA



Tendinous and muscular structures of the heart (schematic)

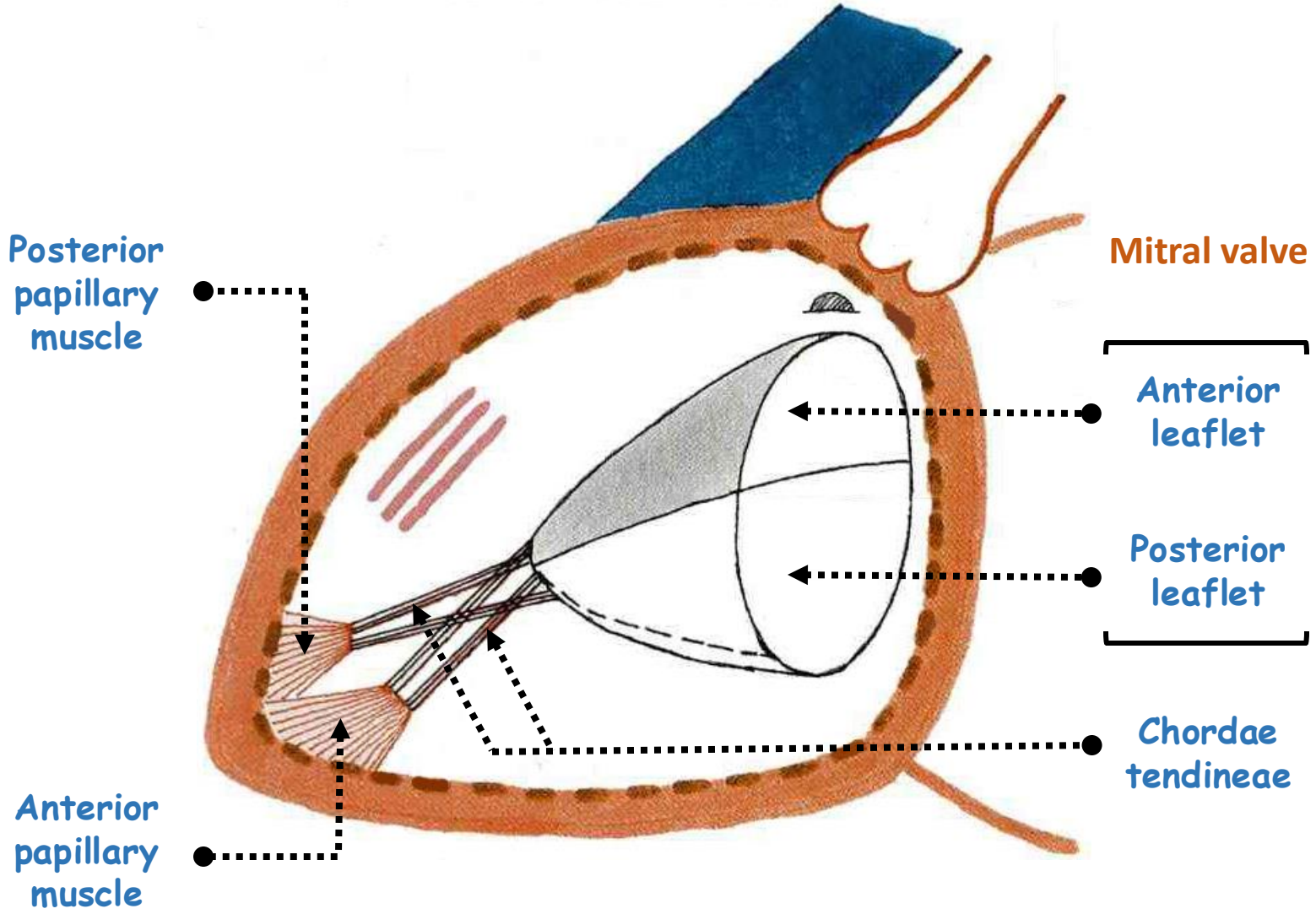
1-THE LEFT ATRIOVENTRICULAR ORIFICE : BICUSPID OR MITRAL VALVE

- It has two cusps or leaflets, a right large leaflet and a left small leaflet.

- The mitral leaflets are connected to the papillary muscles of the left ventricle:

- The chordae tendineae from the anterior papillary muscles attach to the upper halves of both leaflets.

- The chordae tendineae from the posterior papillary muscles attach to the lower halves of both leaflets.



Left lateral view after opening of the wall, showing the interior of the left ventricle

1-THE LEFT ATRIOVENTRICULAR ORIFICE : BICUSPID OR MITRAL VALVE

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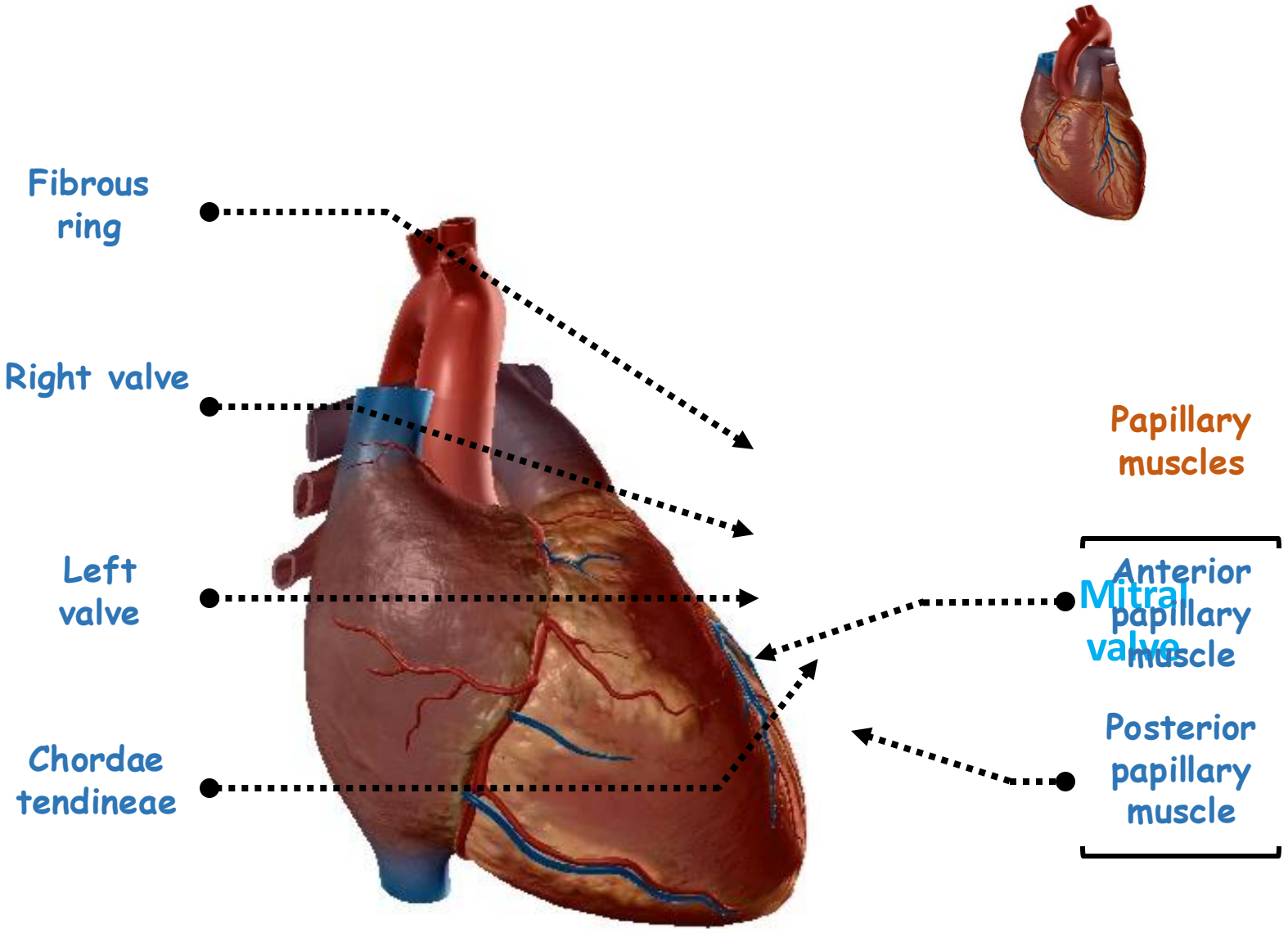
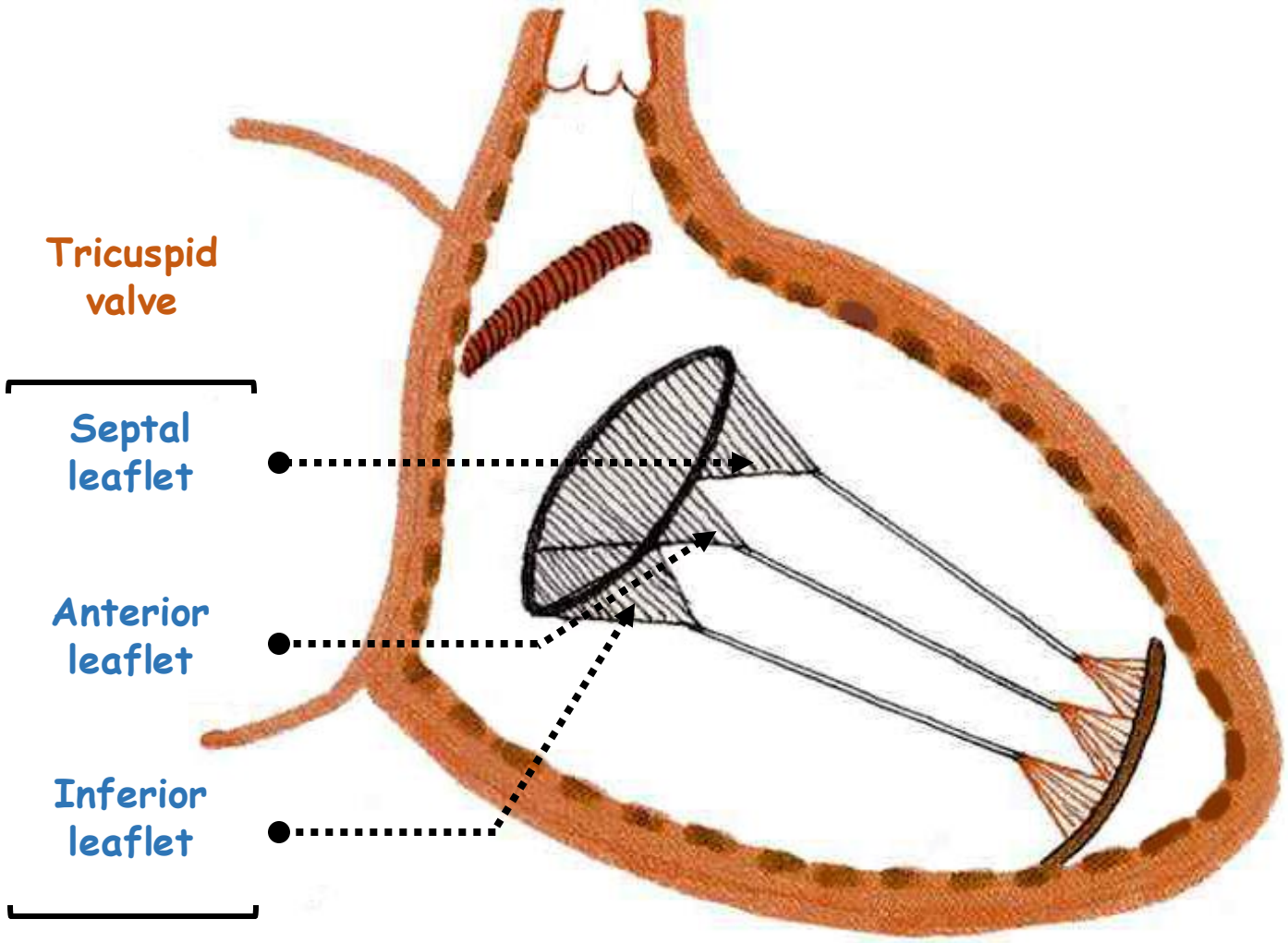


2-THE RIGHT ATRIOVENTRICULAR ORIFICE : TRICUSPID VALVE

- The tricuspid valve is divided by three notches into three cusps or triangular leaflets : anterior, septal and inferior.



Right lateral view of the heart after opening of the right ventricle

2-THE RIGHT ATRIOVENTRICULAR VALVE : TRICUSPID VALVE

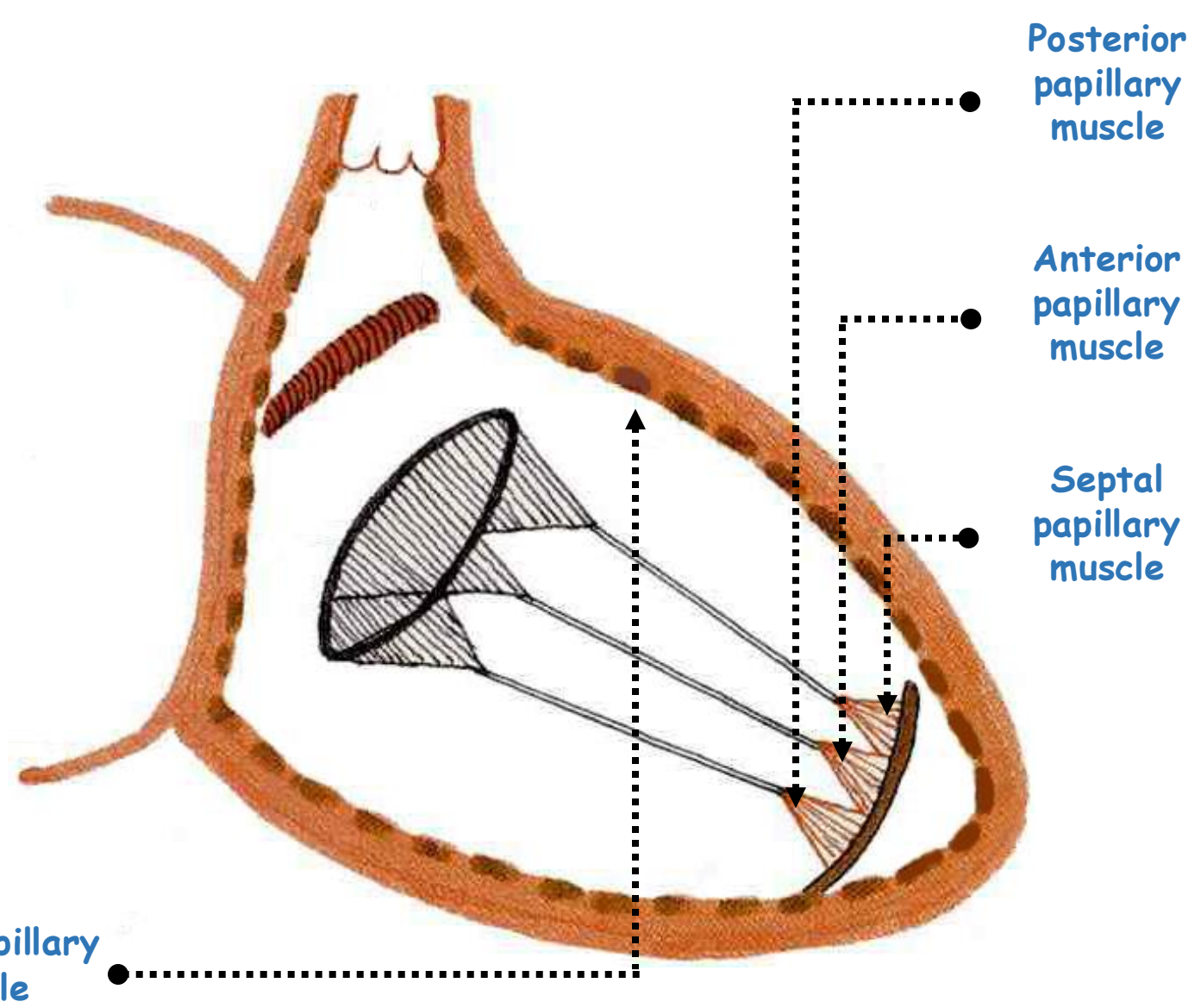
- The tricuspid valve is divided by three notches into three cusps or triangular leaflets : anterior, septal and inferior.

- Attached to these leaflets are the papillary muscles of the right ventricle :

- The septal leaflet recieves chordae tendineae from the conal papillary muscle and the posterior papillary muscle.

- The anterior leaflet recieves chordae tendineae from the anterior papillary muscle and the conal papillary muscle.

- The inferior leaflet recieves chordae tendineae from the inferior papillary muscle and the anterior papillary muscle.



Right lateral view of the heart after opening of the right ventricle

2-THE RIGHT ATRIOVENTRICULAR VALVE : TRICUSPID VALVE

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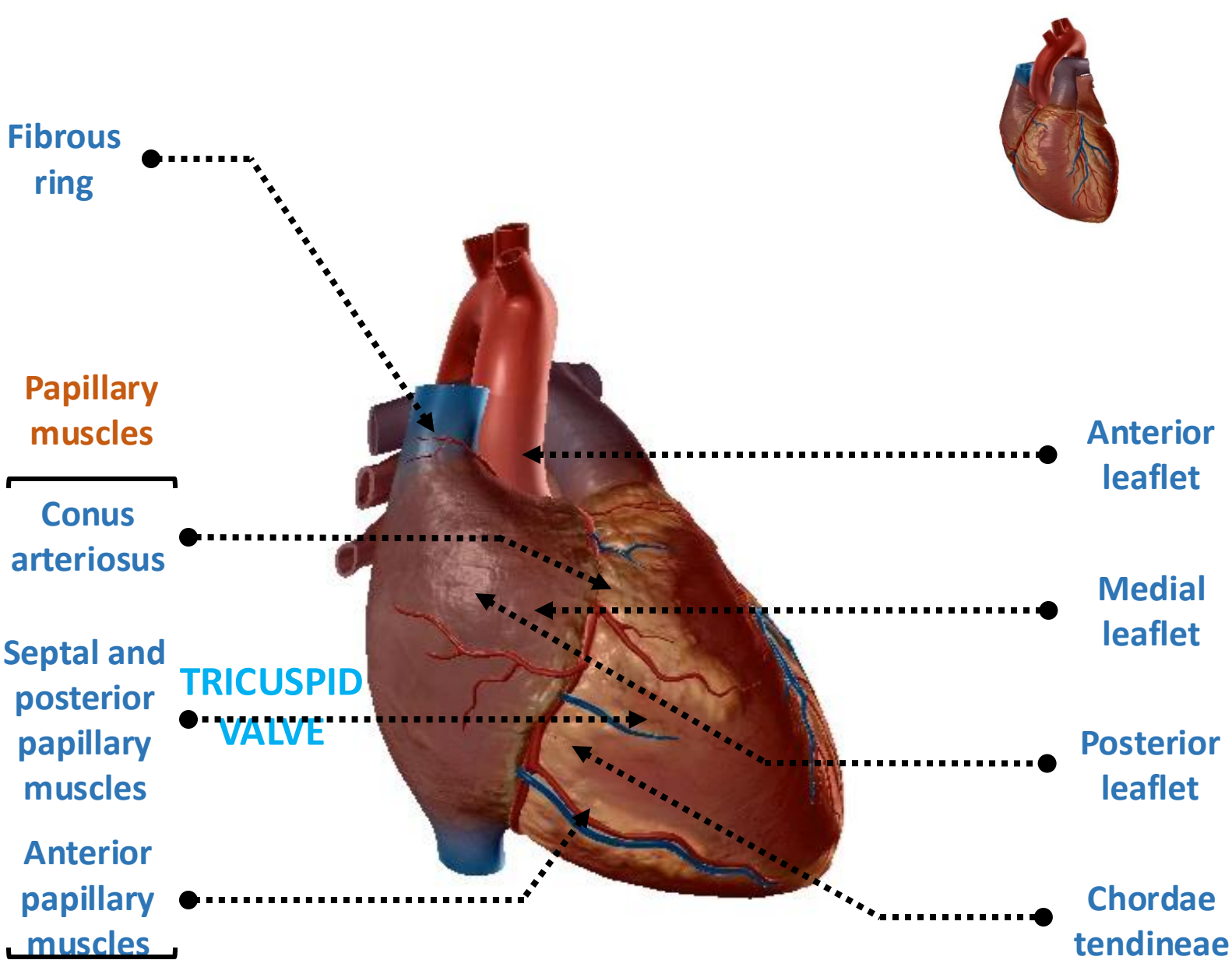
- Attached to these leaflets are the papillary muscles of the right ventricle :

- The septal leaflet recieves chordae tendineae from the conal papillary muscle and the posterior papillary muscle.
- The anterior leaflet recieves chordae tendineae from the anterior papillary muscle and the conal papillary muscle.
- The inferior leaflet recieves chordae tendineae from the inferior papillary muscle and the anterior papillary muscle.



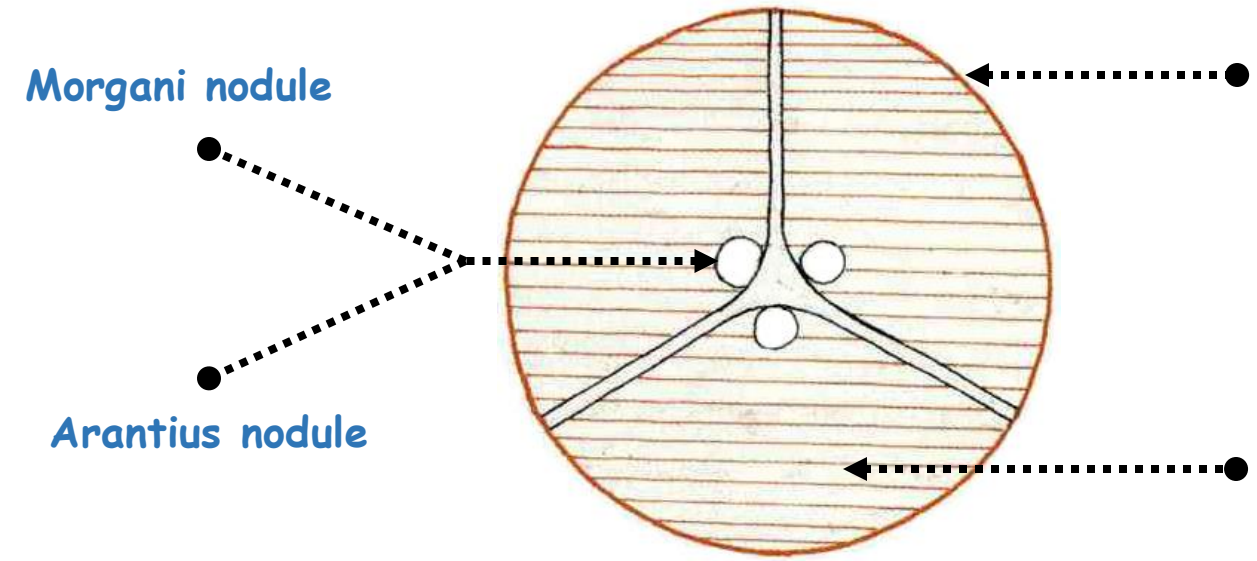
B-ARTERIAL ORIFICES

- Each of them has three leaflets known as the semilunar valves.

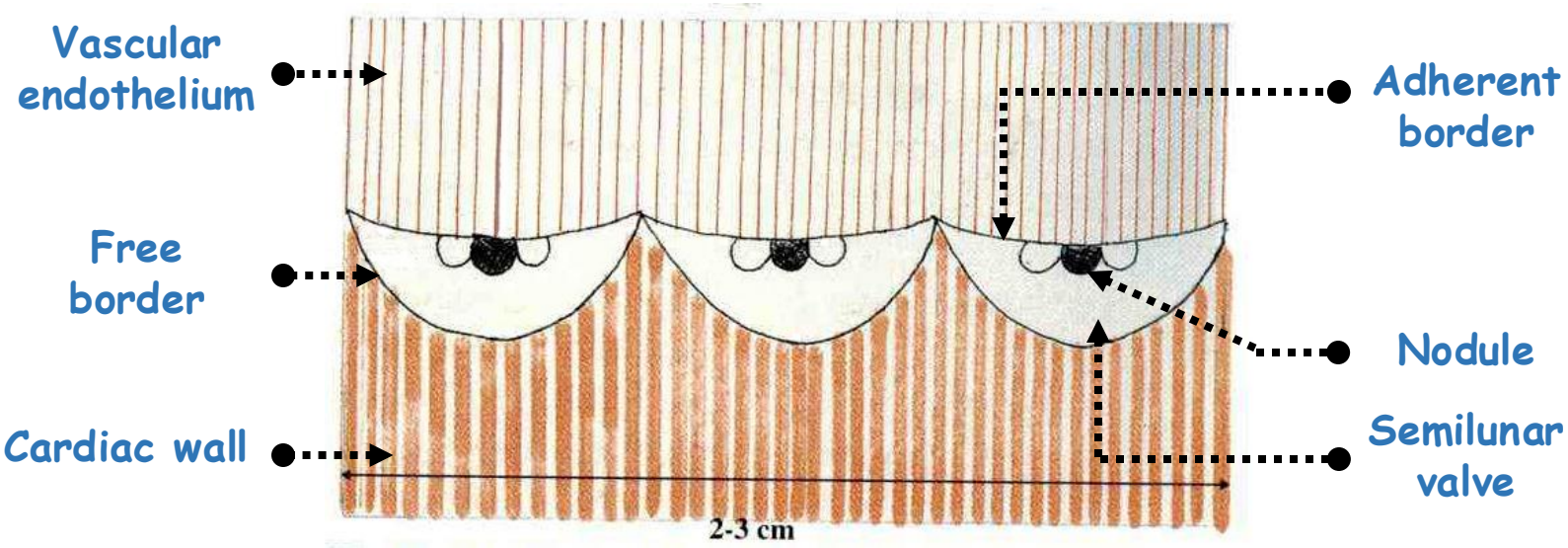
- Each leaflet can be recognized by :

- A superior or parietal surface, which is concave.
- An inferior or axial surface, which is convex.
- An adherent concave border, by which the valve attaches to the cardiac wall.
- A free horizontal border.

- There are no chordae tendineae for the semilunar valves.



Superior view of an arterial orifice at the level of the heart

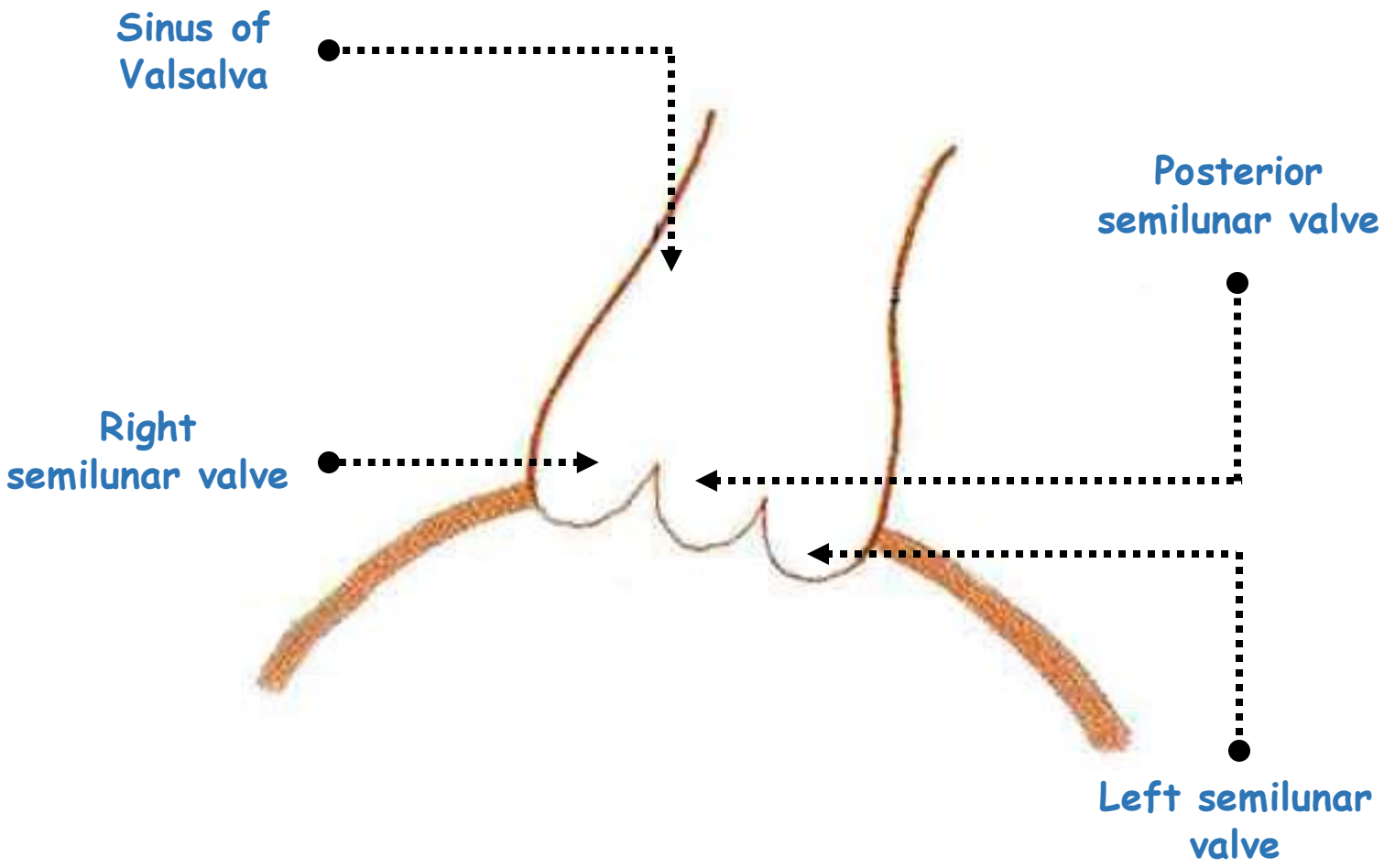


Anterior view of an open arterial orifice

1-AORTIC ORIFICE OR AORTIC VALVE

Around its borders are attached three semilunar valves :

- Posterior.
- Left anterior.
- Right anterior.



Longitudinal section of the sinus of Valsalva

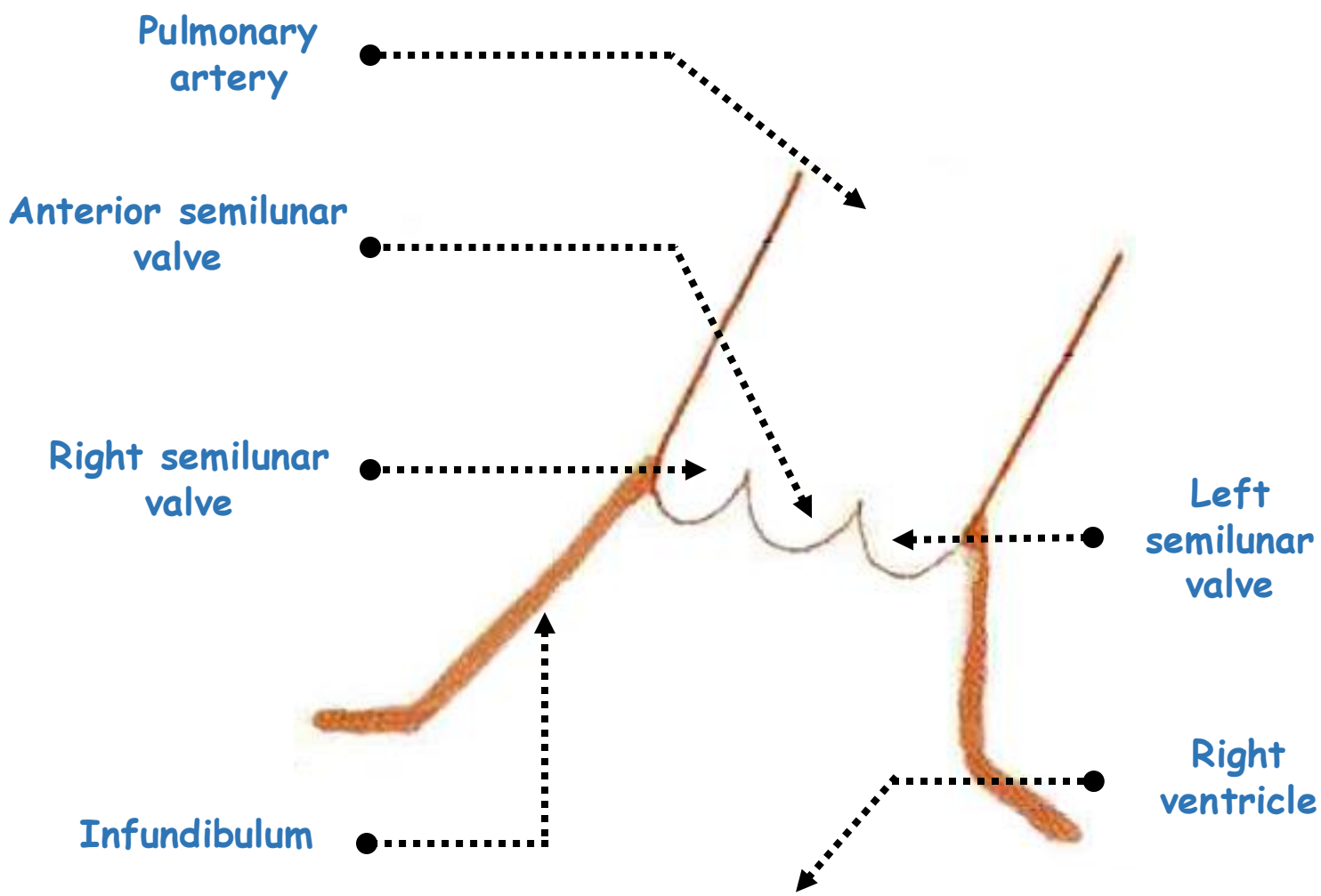
2-THE PULMONARY ORIFICE OR THE PULMONARY VALVE

- It has three semilunar leaflets :

- Anterior.
- Right posterior.
- Left posterior.

- The semilunar valves have these characteristics :

- A superior surface, which is concave.
- An inferior surface, which is convex.
- A concave adherent border.
- A free border, which features a small central nodule known as the nodule of Morgani.



Schematic longitudinal section of the infundibulum

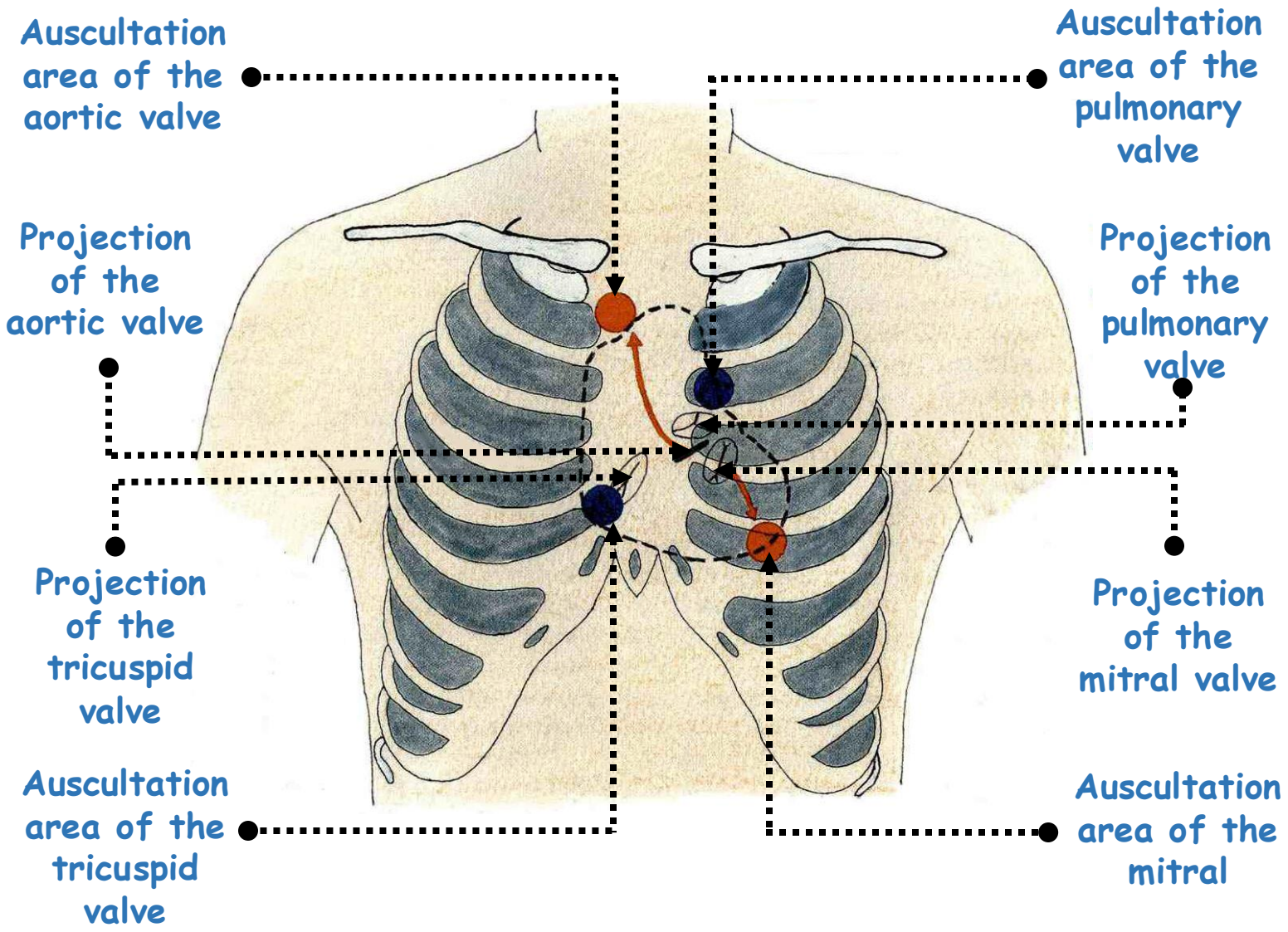
C-THE PROJECTION OF THE ORIFICES AT THE BASE OF THE HEART ON THE ANTERIOR THORACIC WALL

- The aortic valve is best heard at the level of the second right chondro-sternal junction.

- The pulmonary valve is best heard at the level of the left sternal border of the second intercostal space.

- The mitral valve is best heard at the level of the fifth left intercostal space, within the midclavicular line.

- The tricuspid valve is best heard at the level of the fifth right chondro-sternal junction.



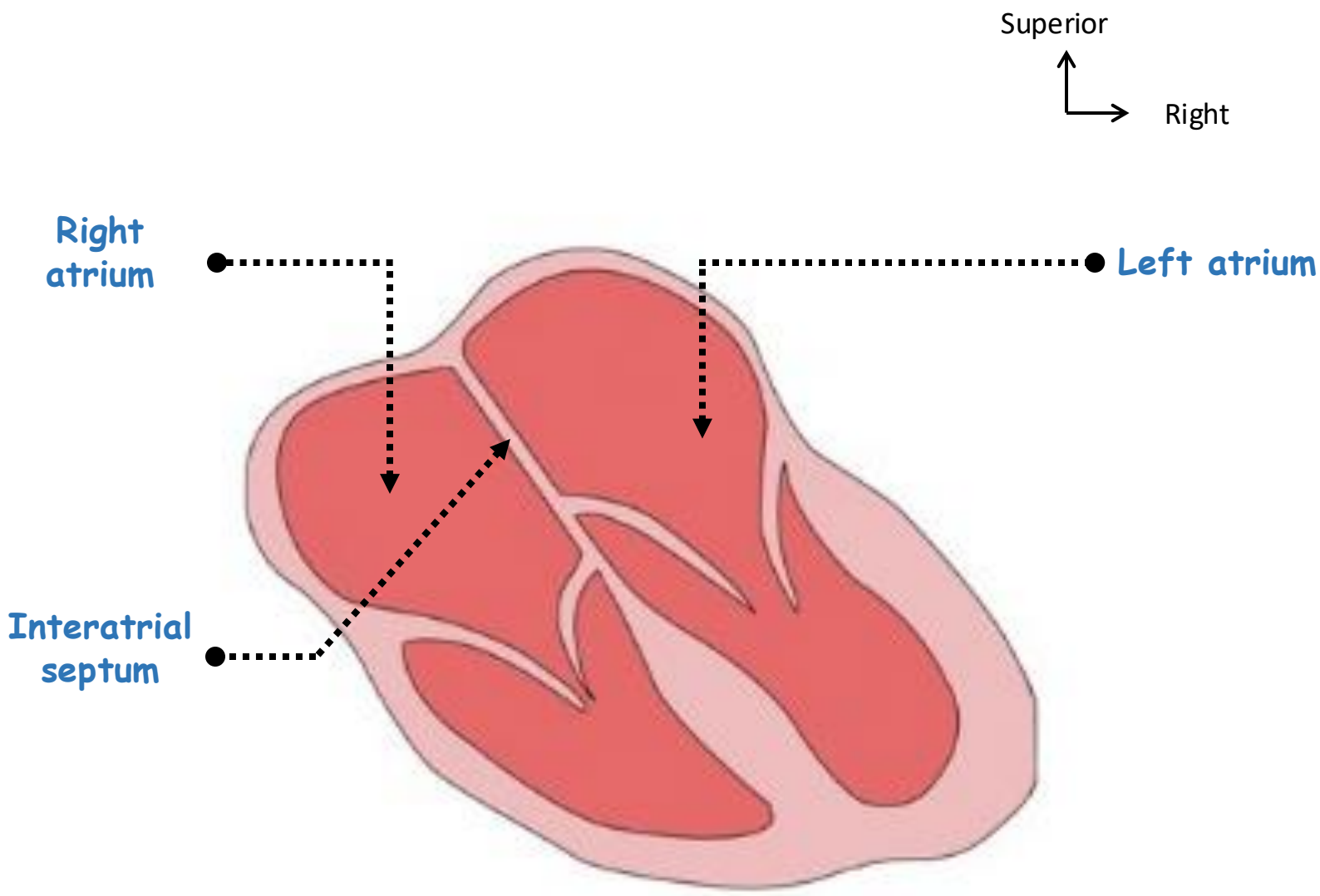
Anterior view of the thorax showing the projection of the heart valves on the anterior thoracic wall

IV-THE CARDIAC CHAMBERS

IV-THE CARDIAC CHAMBERS

A. The atria

1. Right atrium
2. Left atrium



Horizontal section of the heart

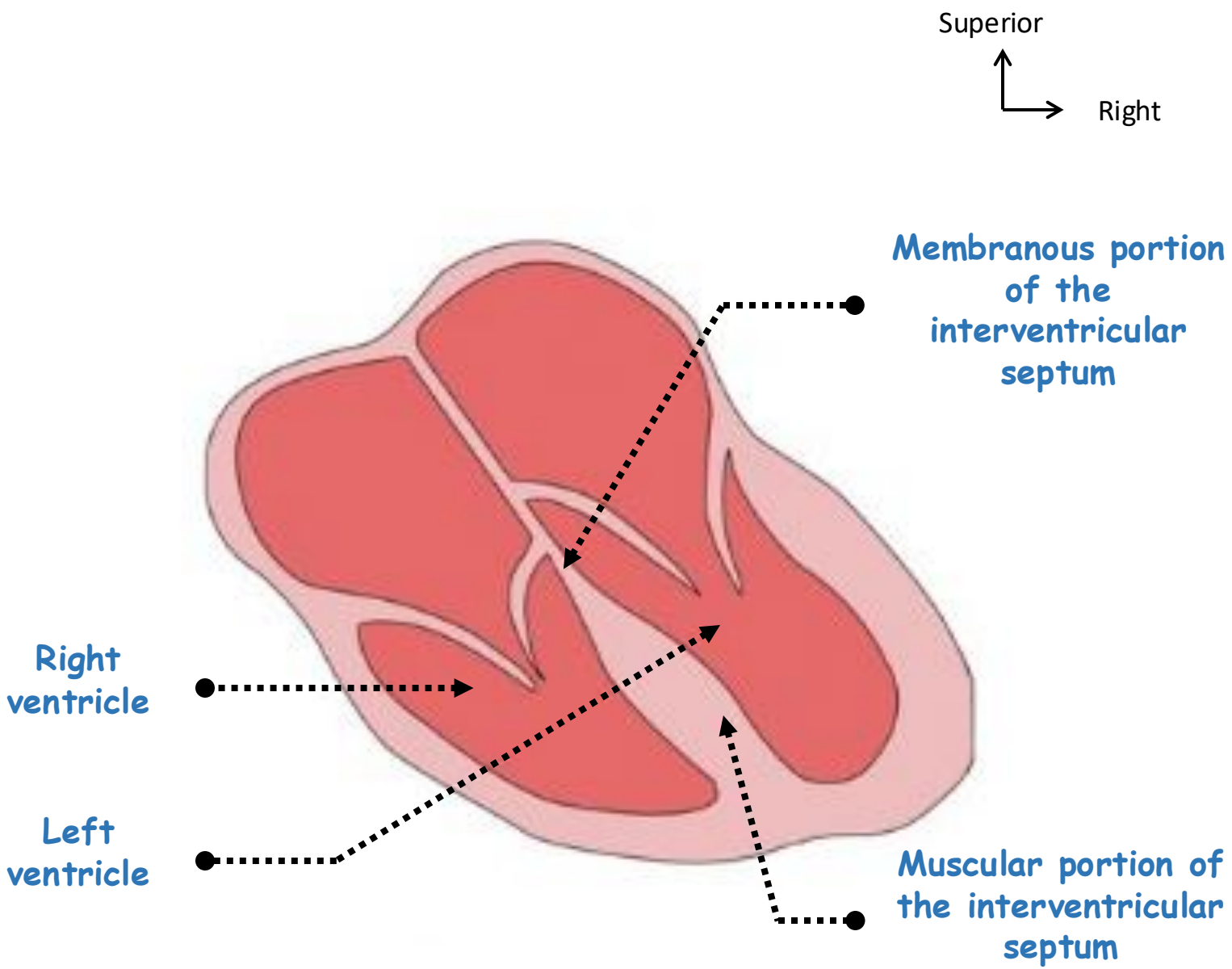
IV-THE CARDIAC CHAMBERS

A. The atria

1. Right atrium
2. Left atrium

B. The ventricles

1. Right ventricle
2. Left ventricle

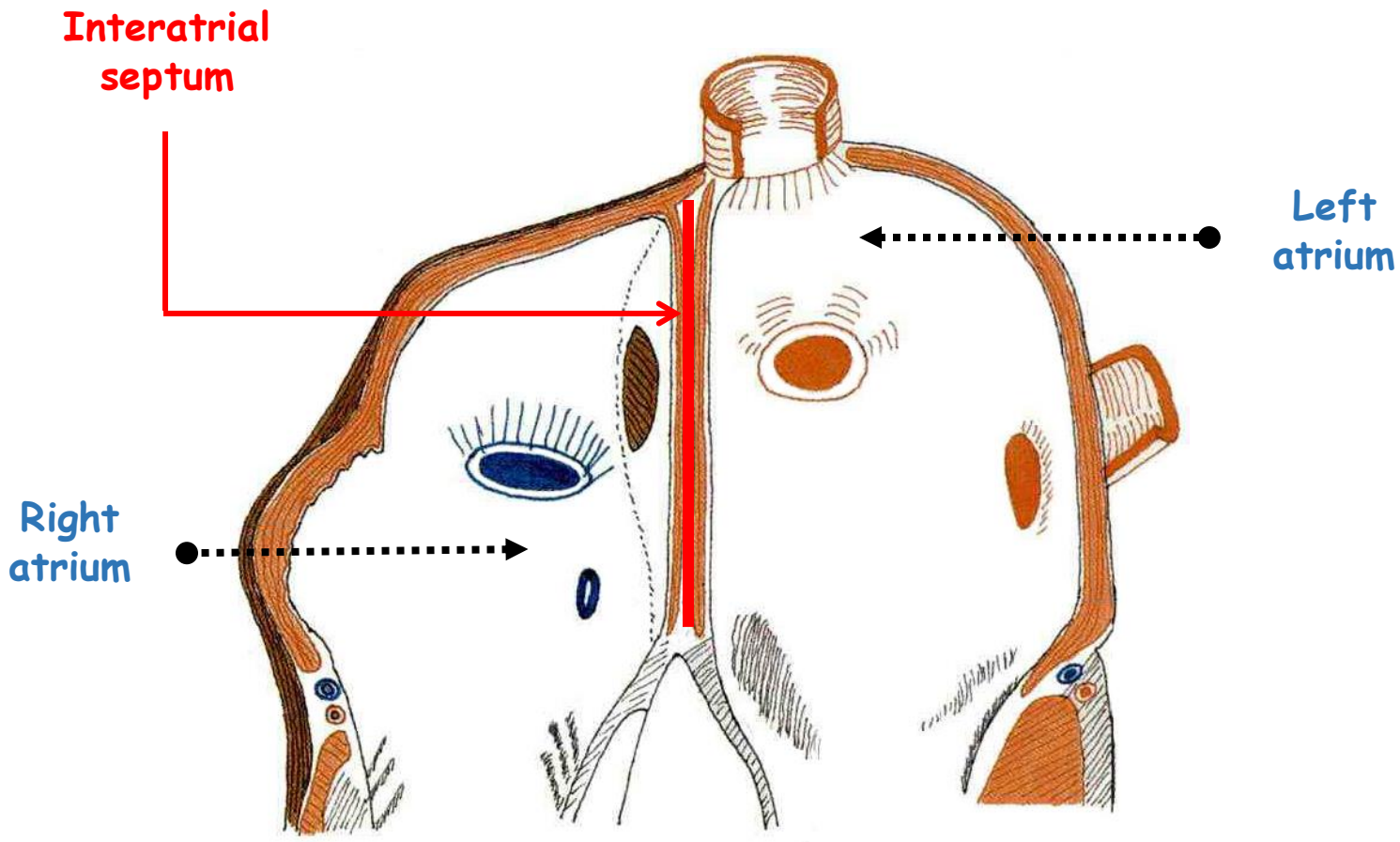


Horizontal section of the heart

A-THE ATRIA

1. RIGHT ATRIA

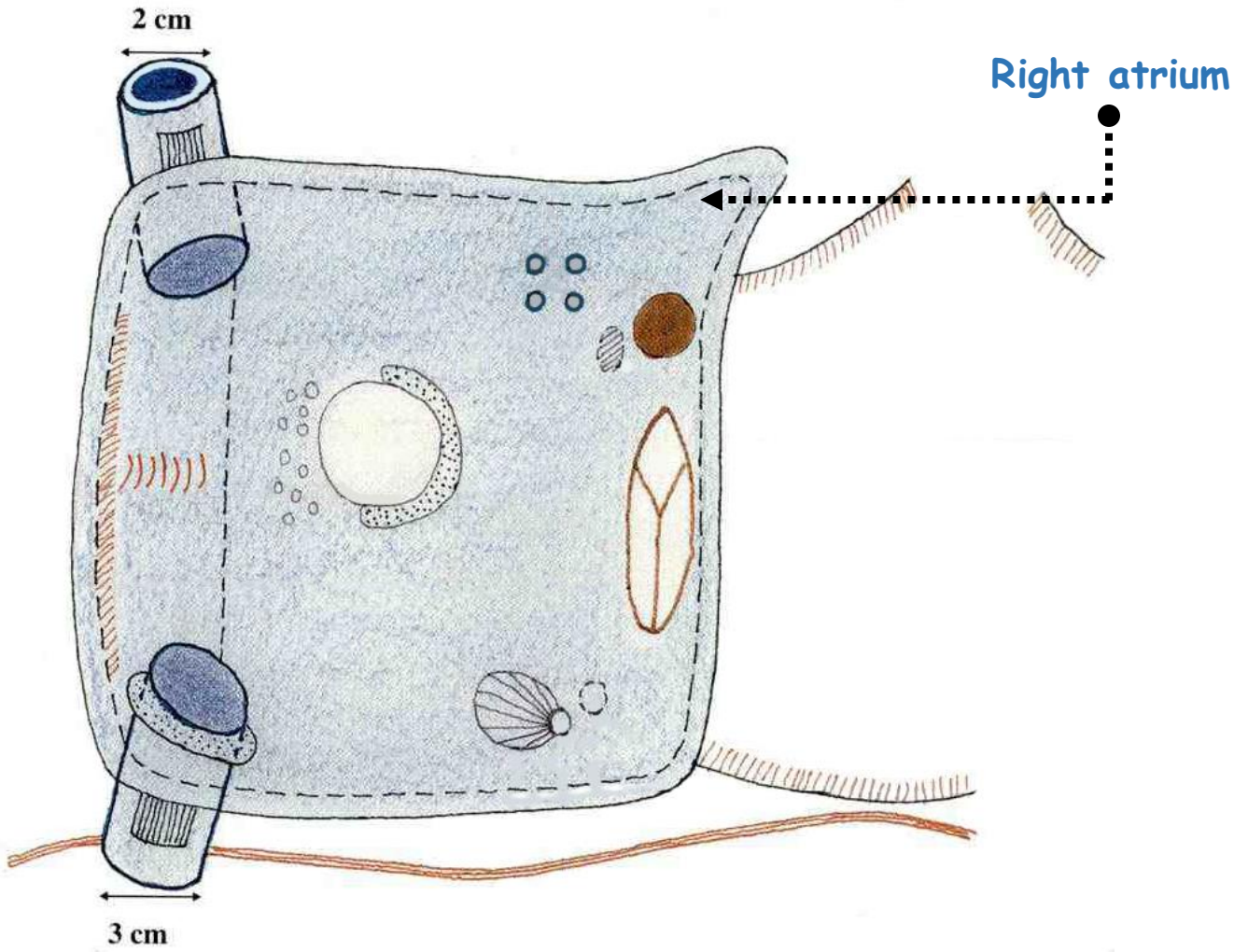
2. LEFT ATRIA



Frontal section of the atria showing the arrangement of the interatrial septum

1-RIGHT ATRIA

- The lateral wall : the orifice of the right atrium.

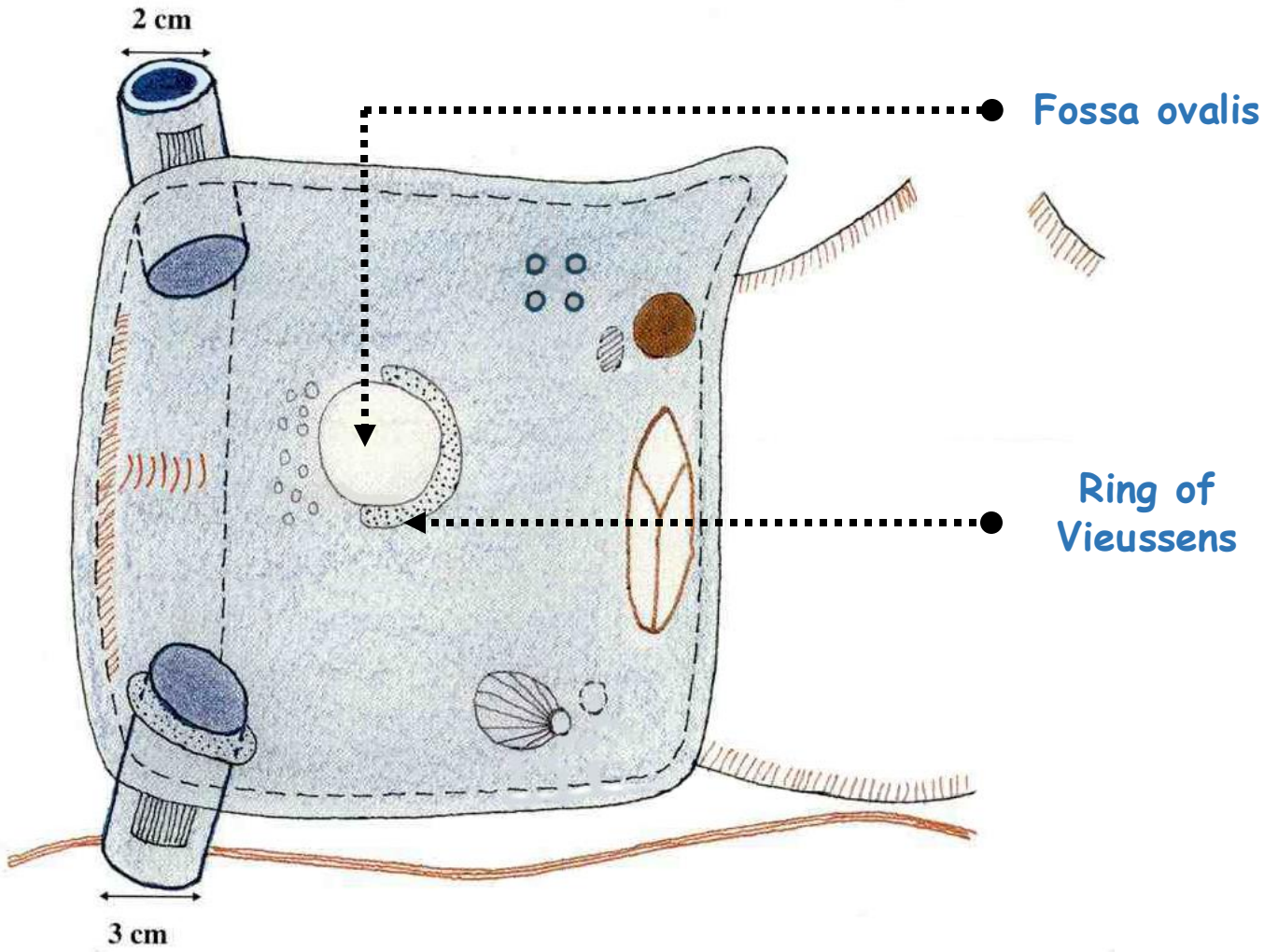


Right lateral view after opening the wall, showing the interior of the right atrium.

1-RIGHT ATRIA

- The lateral wall : the orifice of the right atrium.

- The septal wall : the interatrial septum.



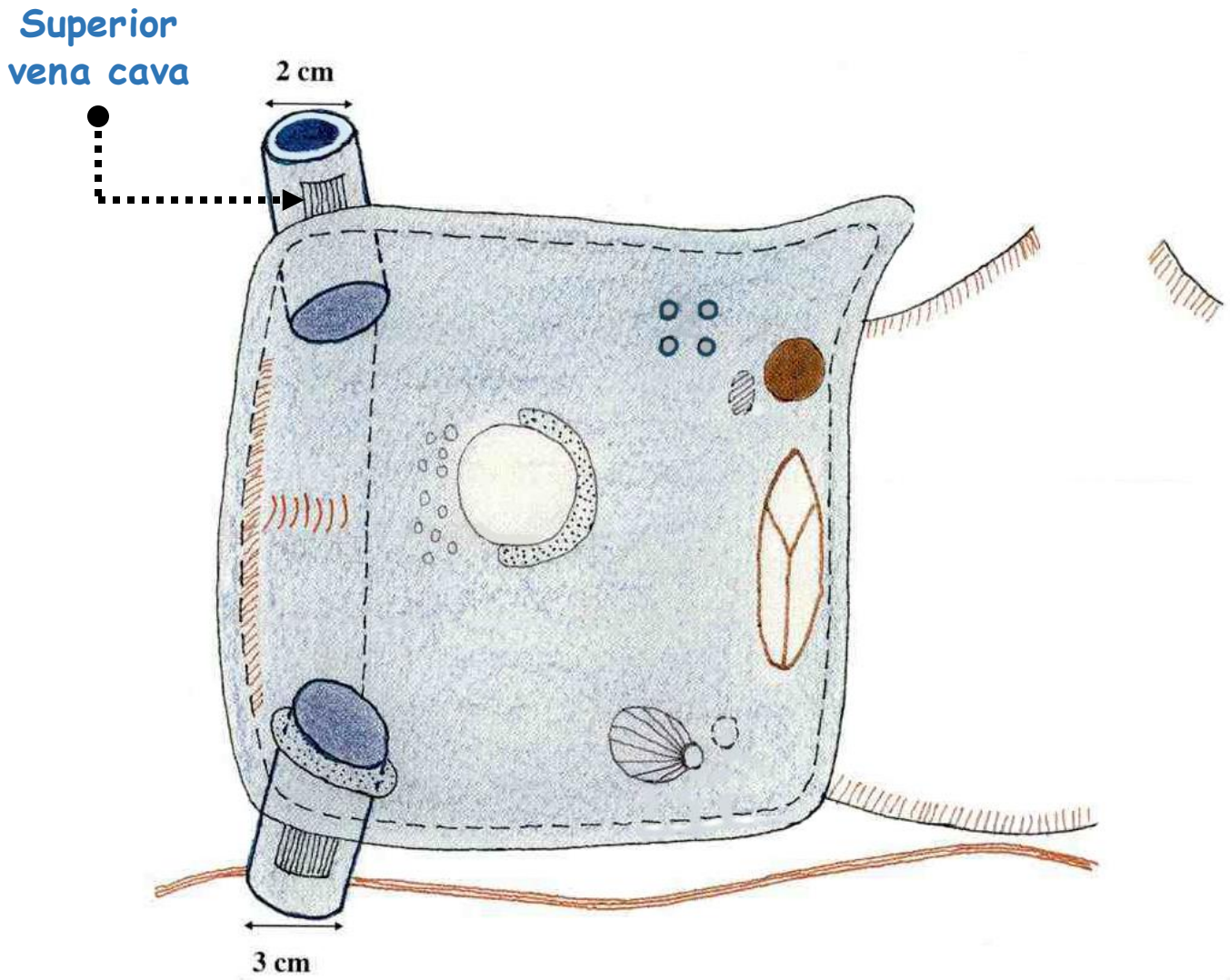
Right lateral view after opening the wall, showing the interior of the right atrium.

1-RIGHT ATRIA

- The lateral wall : the orifice of the right atrium.

- The septal wall : the interatrial septum.

- The superior wall : the orifice of the superior vena cava.



Right lateral view after opening the wall, showing the interior of the right atrium.

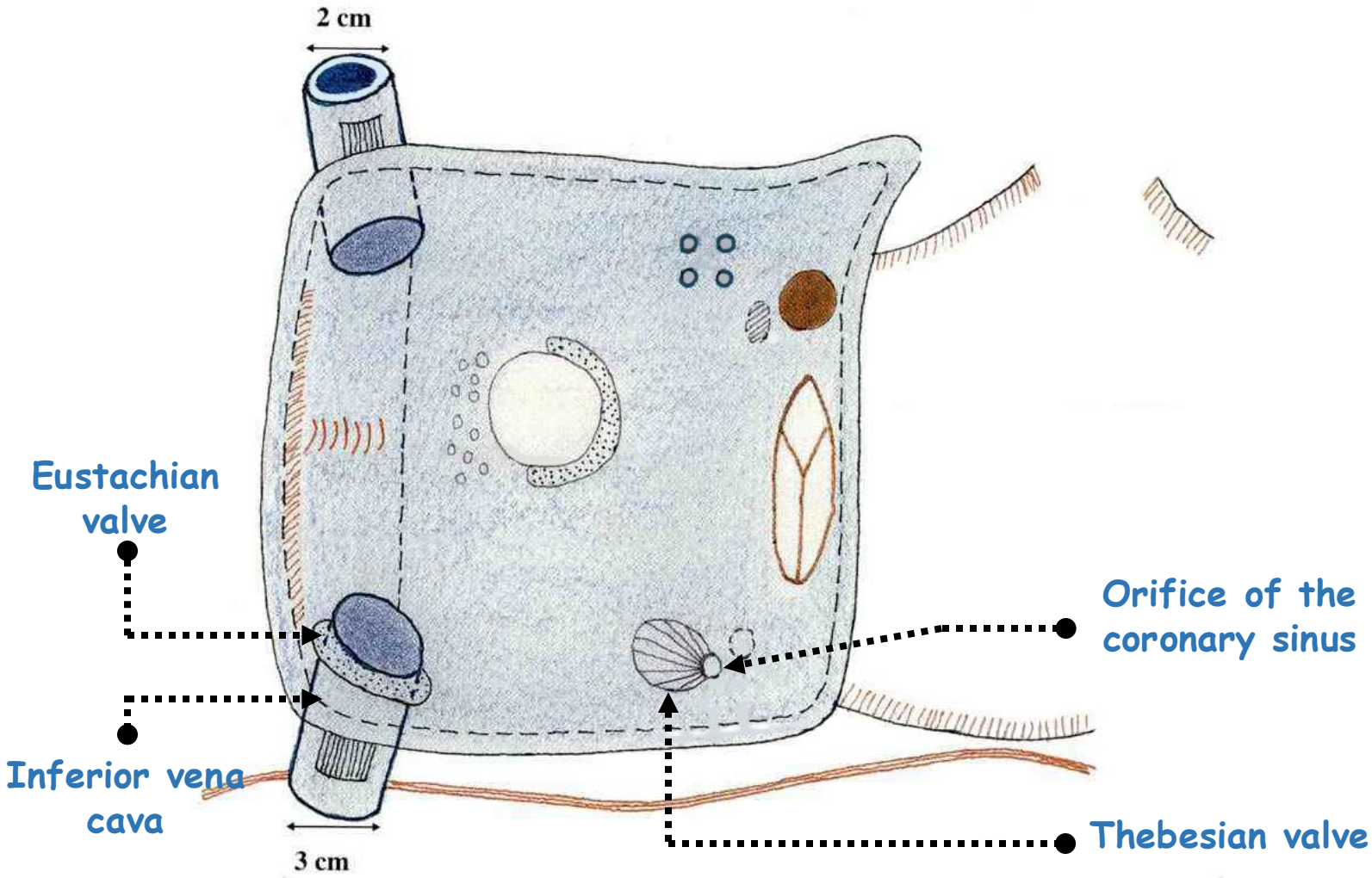
1-RIGHT ATRIUM

- The lateral wall : the orifice of the right atrium.

- The medial wall : the interatrial septum.

- The superior wall : the orifice of the superior vena cava.

- The inferior wall is excavated with two orifices :
  - The orifice of the inferior vena cava.
  - The orifice of the coronary sinus.



Right lateral view after opening the wall, showing the interior of the right atrium.

1-RIGHT ATRIA

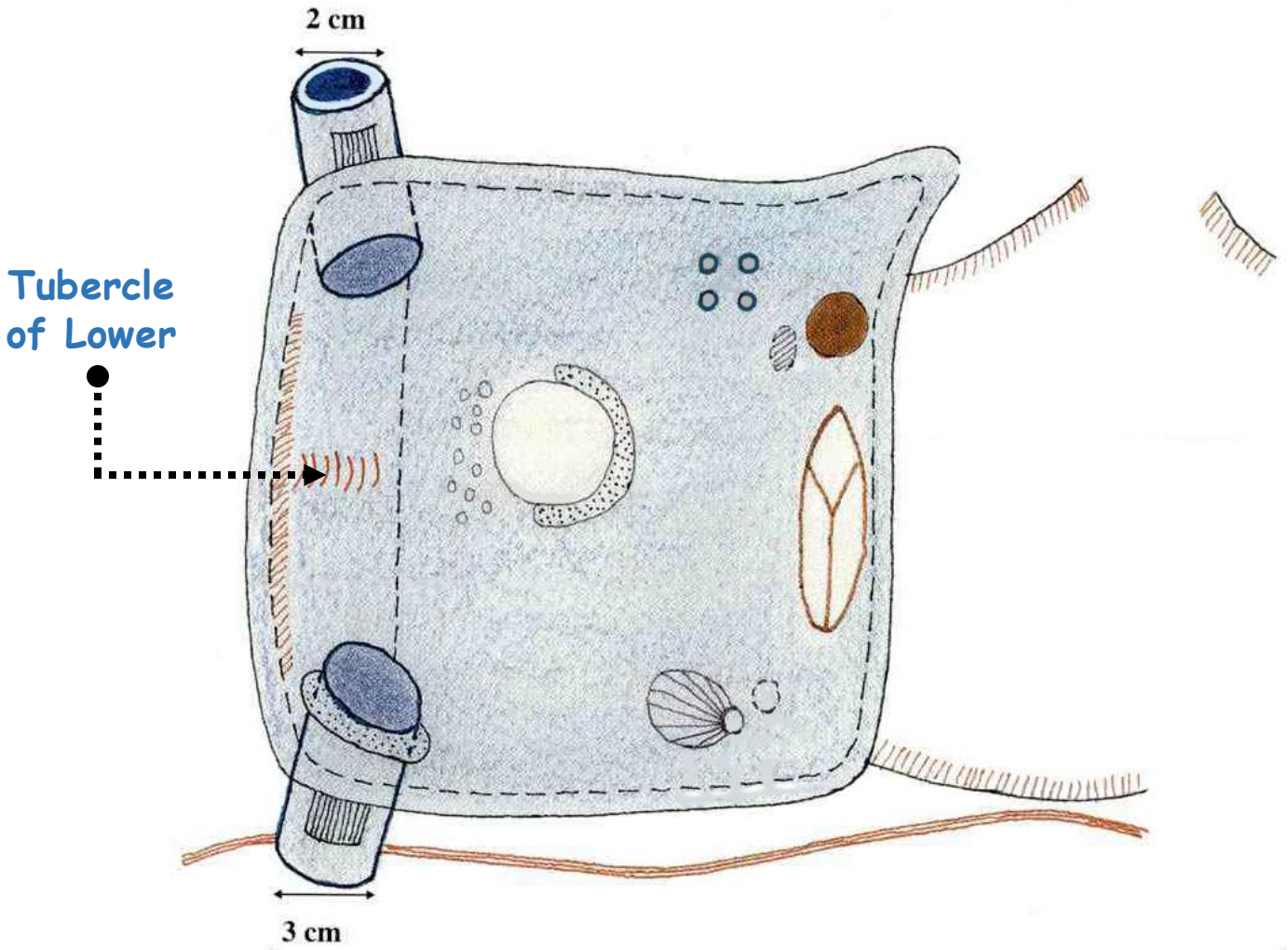
- The lateral wall : the orifice of the right atrium.

- The medial wall : the interatrial septum.

- The superior wall : the orifice of the superior vena cava.

- The inferior wall is excavated with two orifices :
  - The orifice of the inferior vena cava.
  - The orifice of the coronary sinus.

- The posterior wall : the tubercle of Lower.



Right lateral view after opening the wall, showing the interior of the right atrium.

1-RIGHT ATRIA

- The lateral wall : the orifice of the right atrium.

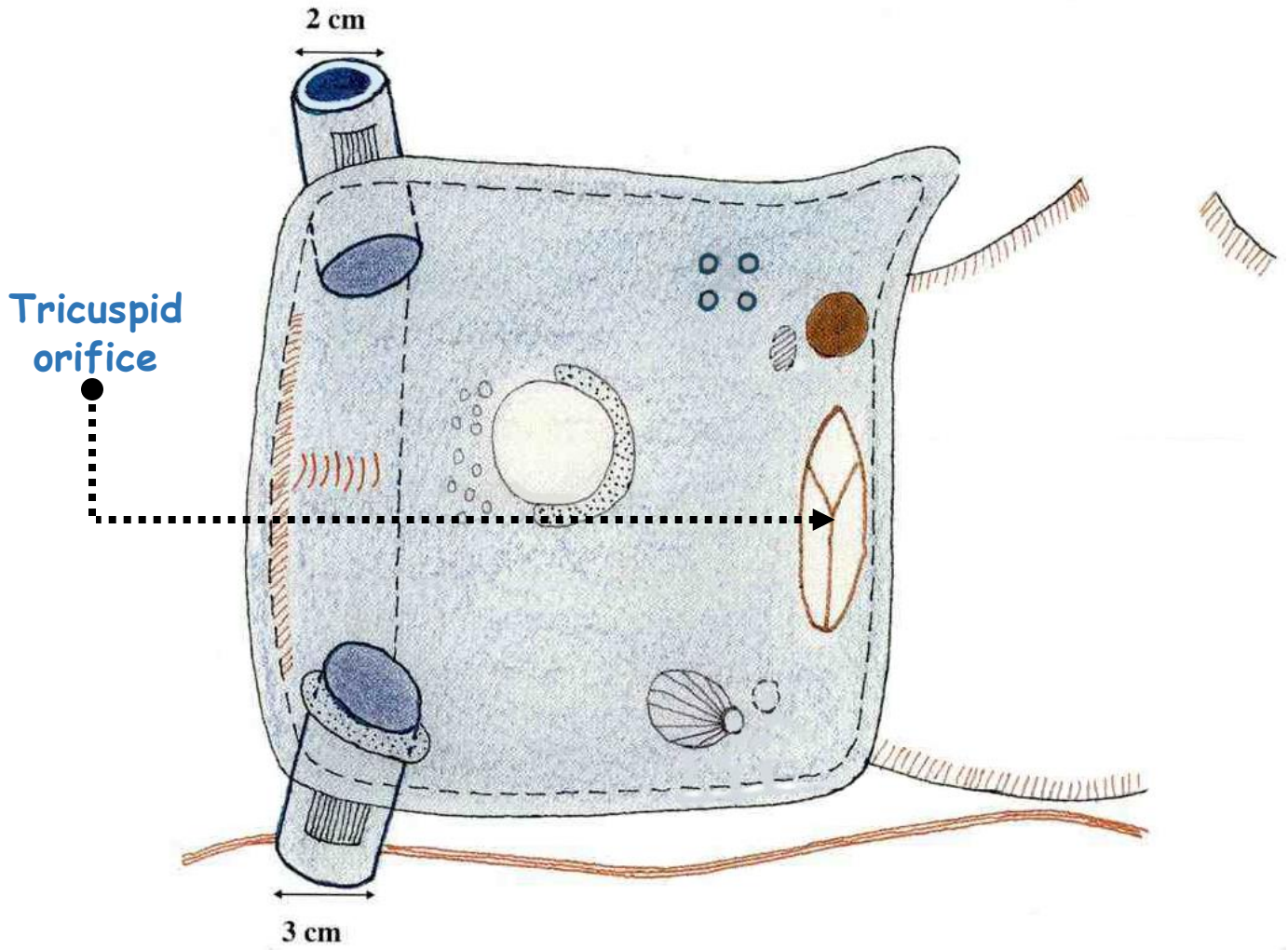
- The medial wall : the interatrial septum.

- The superior wall : the orifice of the superior vena cava.

- The inferior wall is excavated with two orifices :
  - The orifice of the inferior vena cava.
  - The orifice of the coronary sinus.

- The posterior wall : the tubercle of Lower.

- The anterior wall : the tricuspid valve.



Right lateral view after opening the wall, showing the interior of the right atrium.

2-LEFT ATRIUM

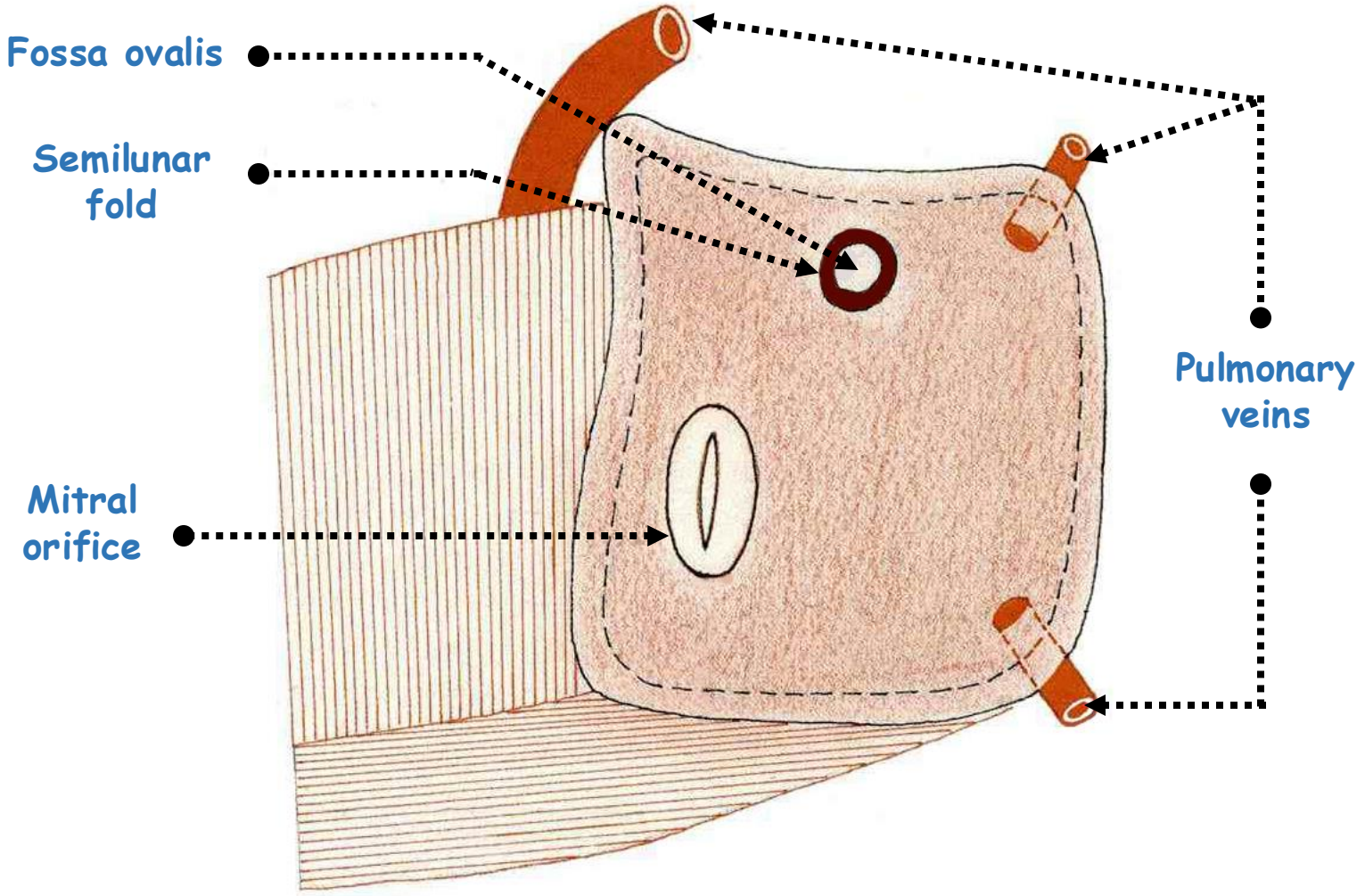
- The lateral wall presents, in front, at the junction with the anterior wall the orifice of the left auricle.

- The medial wall is formed by the interatrial septum.

- The anterior wall contains the opening to the left atrioventricular orifice.

- The posterior wall is perforated by the four rounded ostia of the pulmonary veins.

- The superior and inferior walls are smooth and narrow.

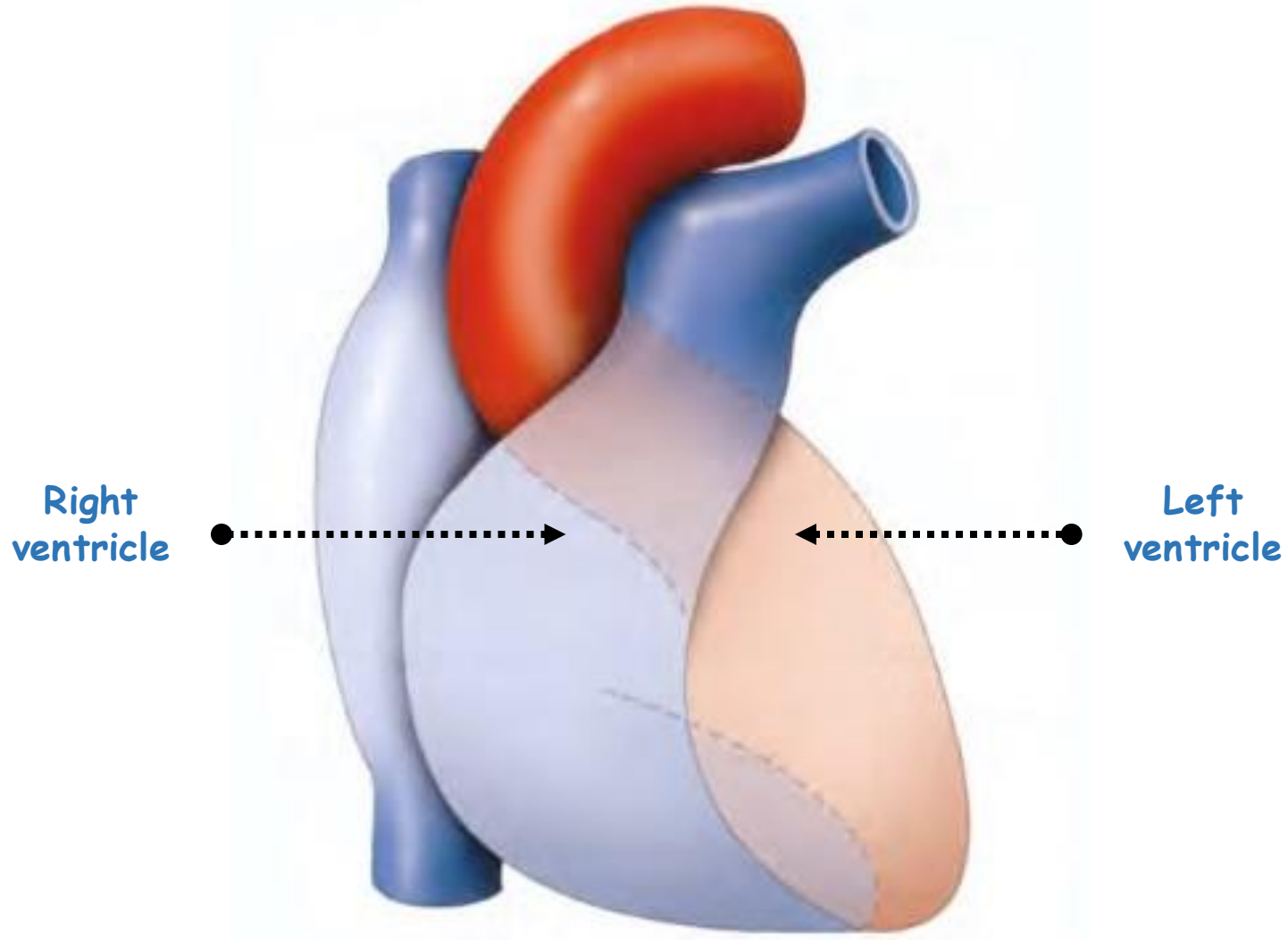


Left lateral view after opening the wall, showing the interior of the left atrium

B-THE VENTRICLES

1. THE RIGHT VENTRICLE
2. THE LEFT VENTRICLE

According to KAMINA



Leftward torsion of the heart (schematic)

1-RIGHT VENTRICLE

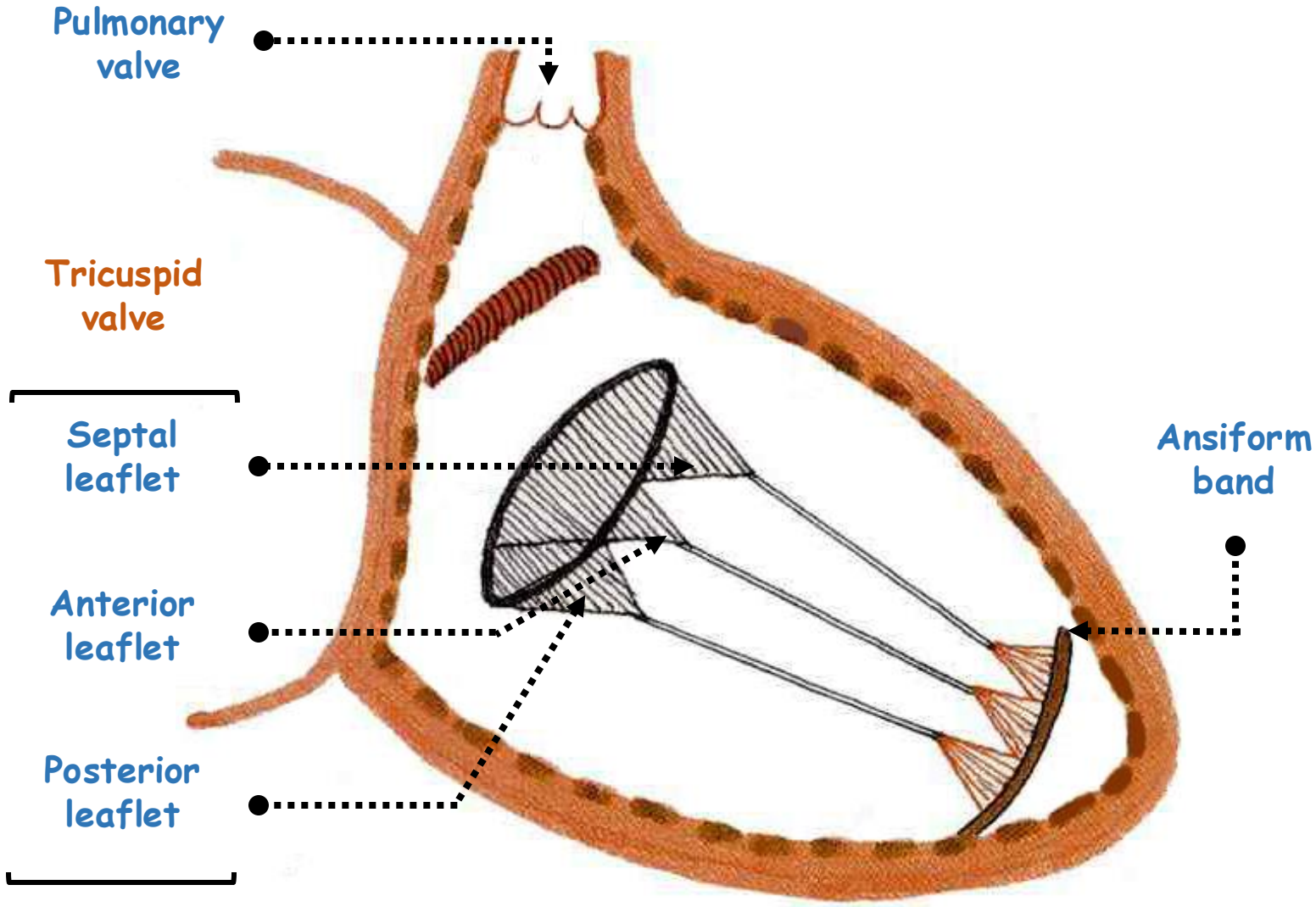
It has the shape of a triangular pyramid with three walls, a base and an apex :

- The anterior wall corresponds to the sternocostal surface of the heart.

- The inferior wall corresponds to the diaphragmatic surface.

- The septal wall is represented by the interventricular septum.

- The base contains the right atrioventricular orifice and the pulmonary artery orifice.

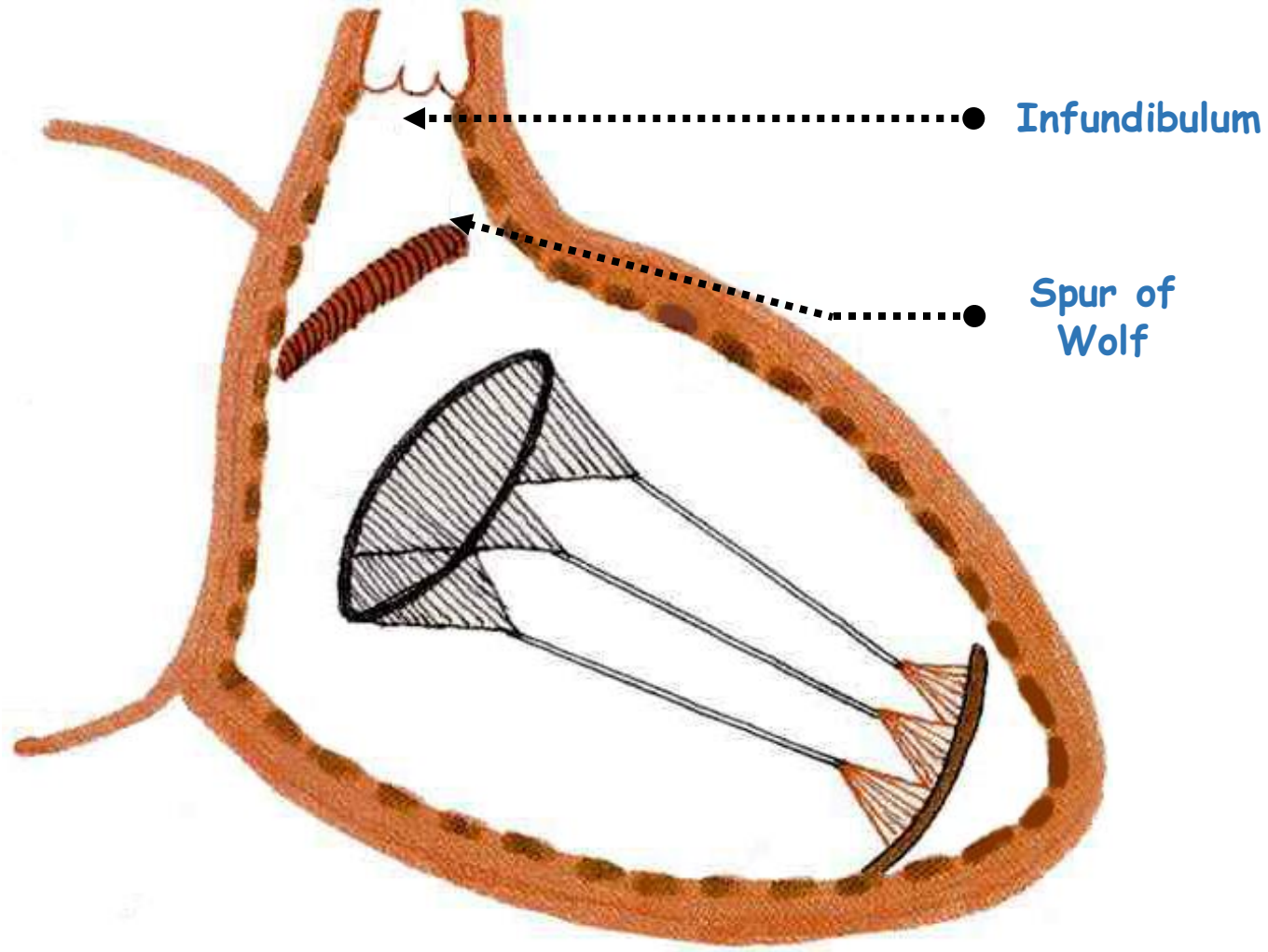


Right lateral view of the heart after opening of the right ventricle

1-RIGHT VENTRICLE

The right ventricular cavity extends upwards and to the left in the form of a funnel, whose truncated segment corresponding to the pulmonary orifice.

This extension, called the infundibulum, shows on its medial wall an oval shaped ridge called the spur of Wolf.



Right lateral view of the heart after opening the right ventricle

2-LEFT VENTRICLE

It can be distinguished by: a medial or septal wall, a base, and an apex.

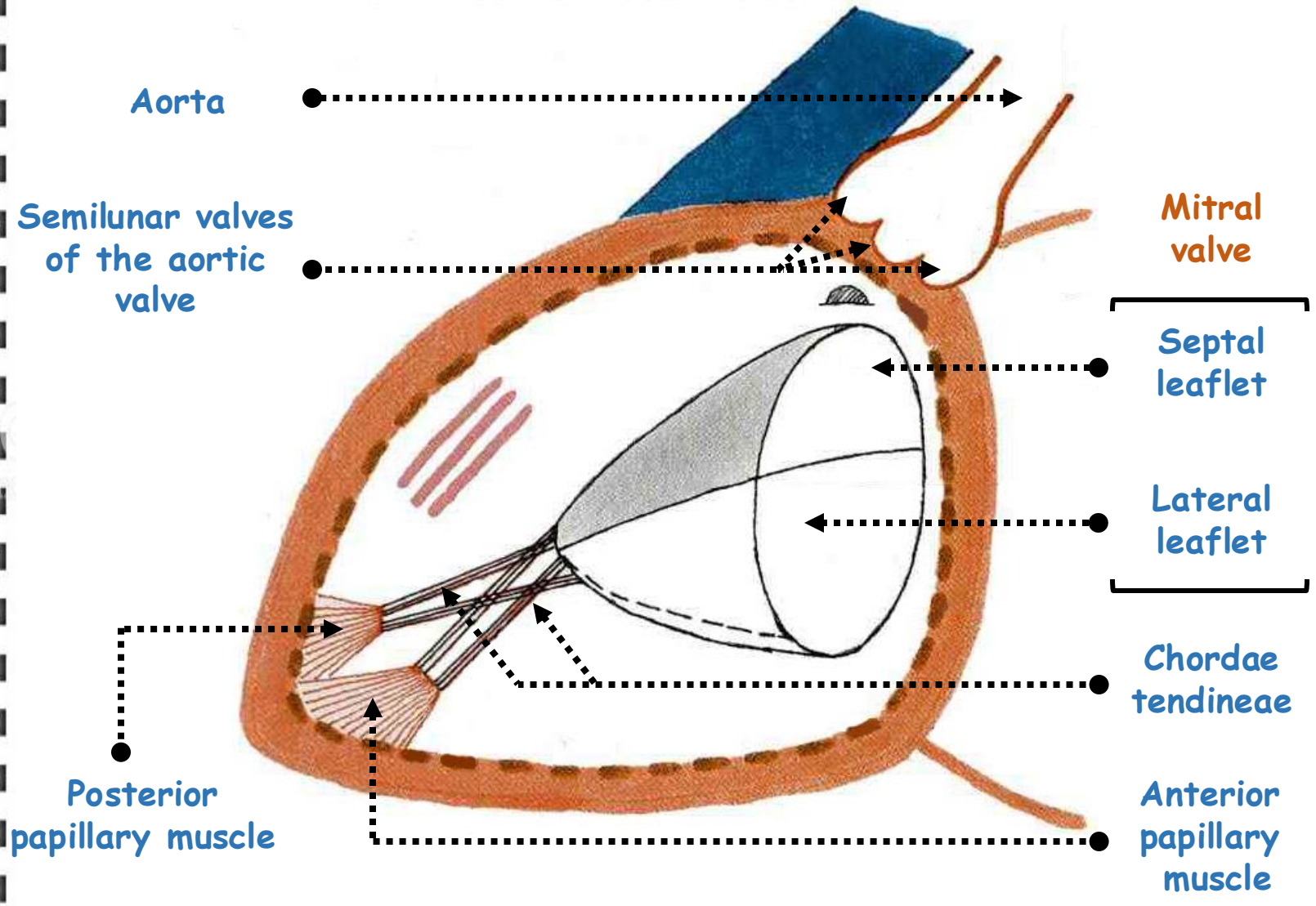
The base of the ventricle has two openings:

- The left atrioventricular orifice.

On its two leaflets terminate the tendinous cords:

- The anterior papillary muscle.
- The posterior papillary muscle.

- The aortic orifice.



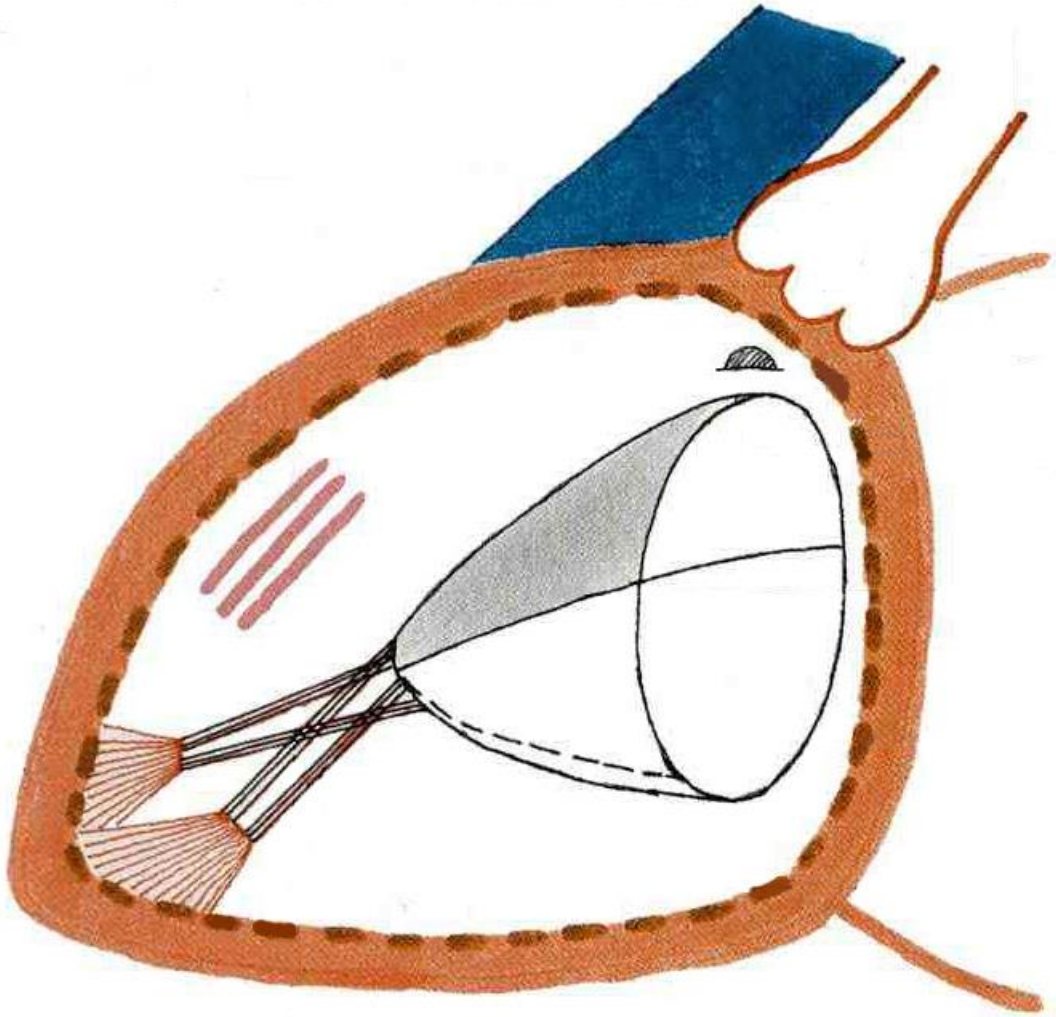
Lateral left view after opening the wall, showing the interior of the left ventricle.

2-LEFT VENTRICLE

The septal leaflet of the mitral orifice, the muscular pillars, and the tendinous cords form a partition that divides the left ventricle into two parts:

- **Left side** : Forms the venous or inflow chamber and corresponds to the mitral orifice.

- **Right side** : Forms the arterial or outflow chamber. This extends into a conical structure that leads to the aortic orifice.



Lateral left view after opening the wall, showing the interior of the left ventricle.

THE WALLS OF THE VENTRICLES

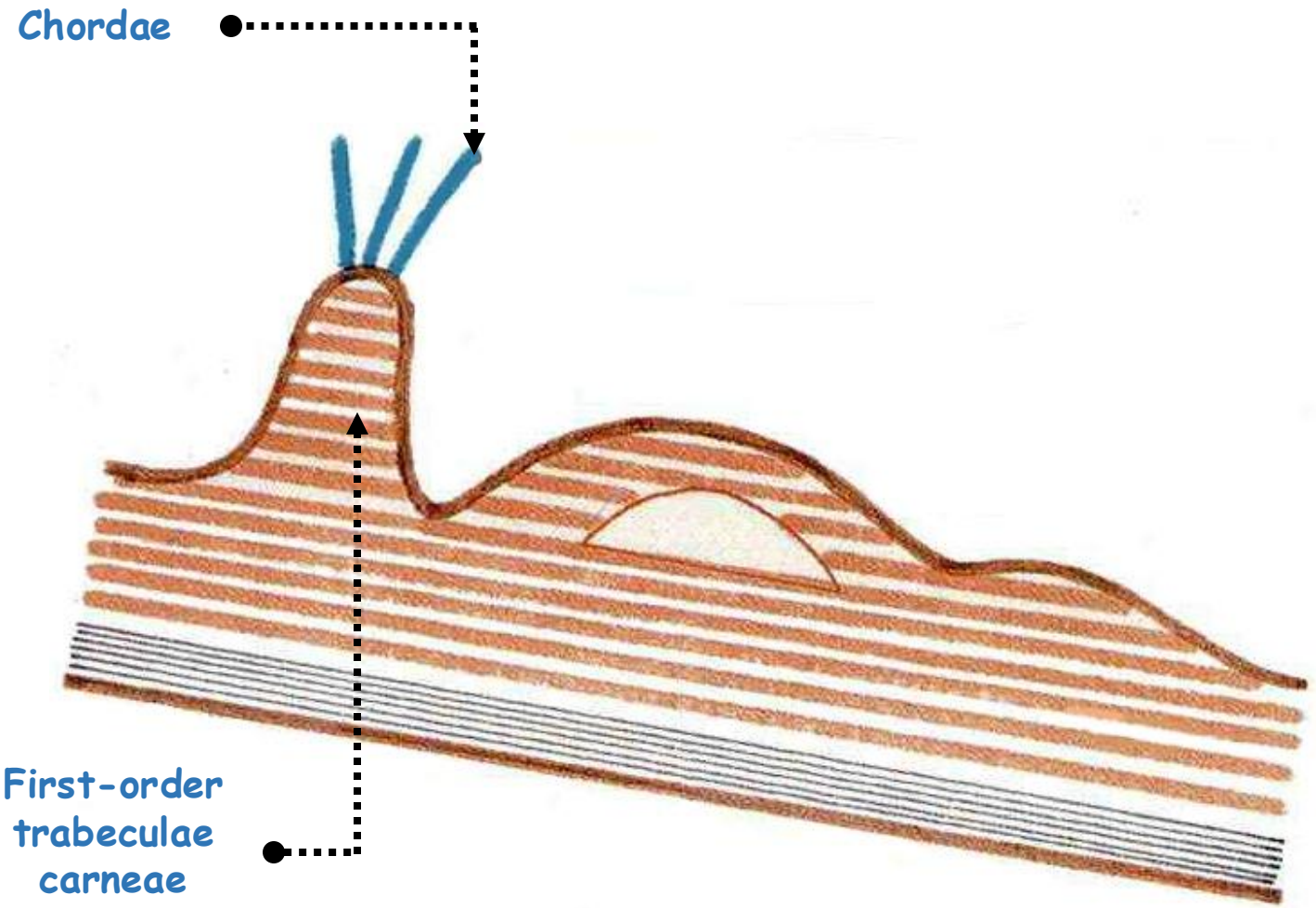
They are lined with muscular projections called **trabeculae carneae**, which are classified into **three types**:

- First-order trabeculae :

From their apex arise small **tendinous cords**. Based on their insertion points, the **chordae tendineae** are divided into **three categories**:

:

- First order tendinous chordae : attach to the **adherent margin** of the valve,
- Second-order chordae : insert on the **parietal surface**,
- Third-order chordae : fix onto the **free border**.

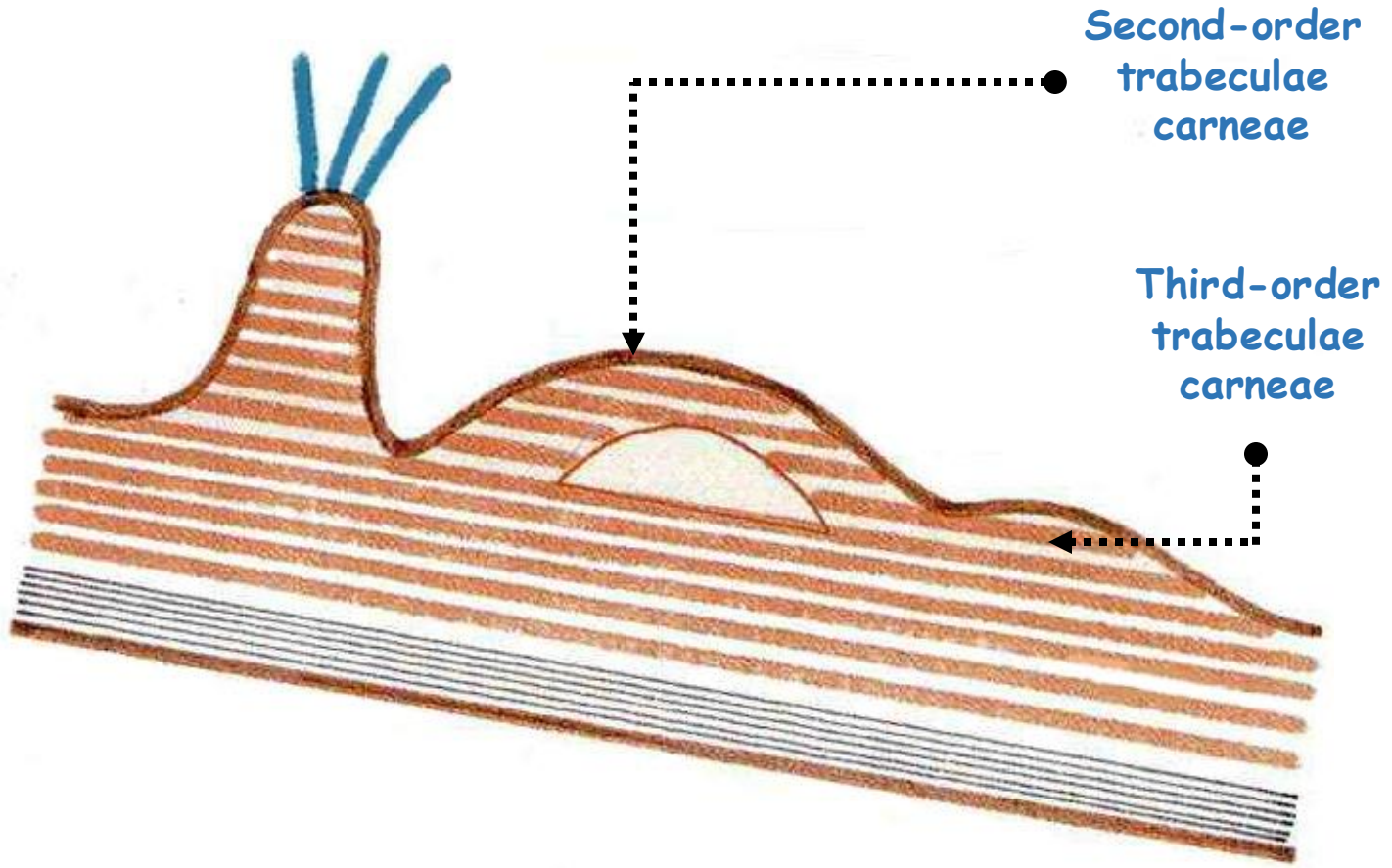


Longitudinal section through the ventricular cardiac muscle.

THE WALLS OF THE VENTRICLES

- Second-order trabeculae carneae are anchored to the ventricular wall at both ends and remain free along the rest of their length.

- Third-order trabeculae carneae are fully attached to the wall along their entire length.



Longitudinal section through the ventricular cardiac muscle.

V-CLINICAL APPLICATIONS

Mitral valve prolapse.

- The chordae tendinear prevent valve eversion during ventricular contraction.

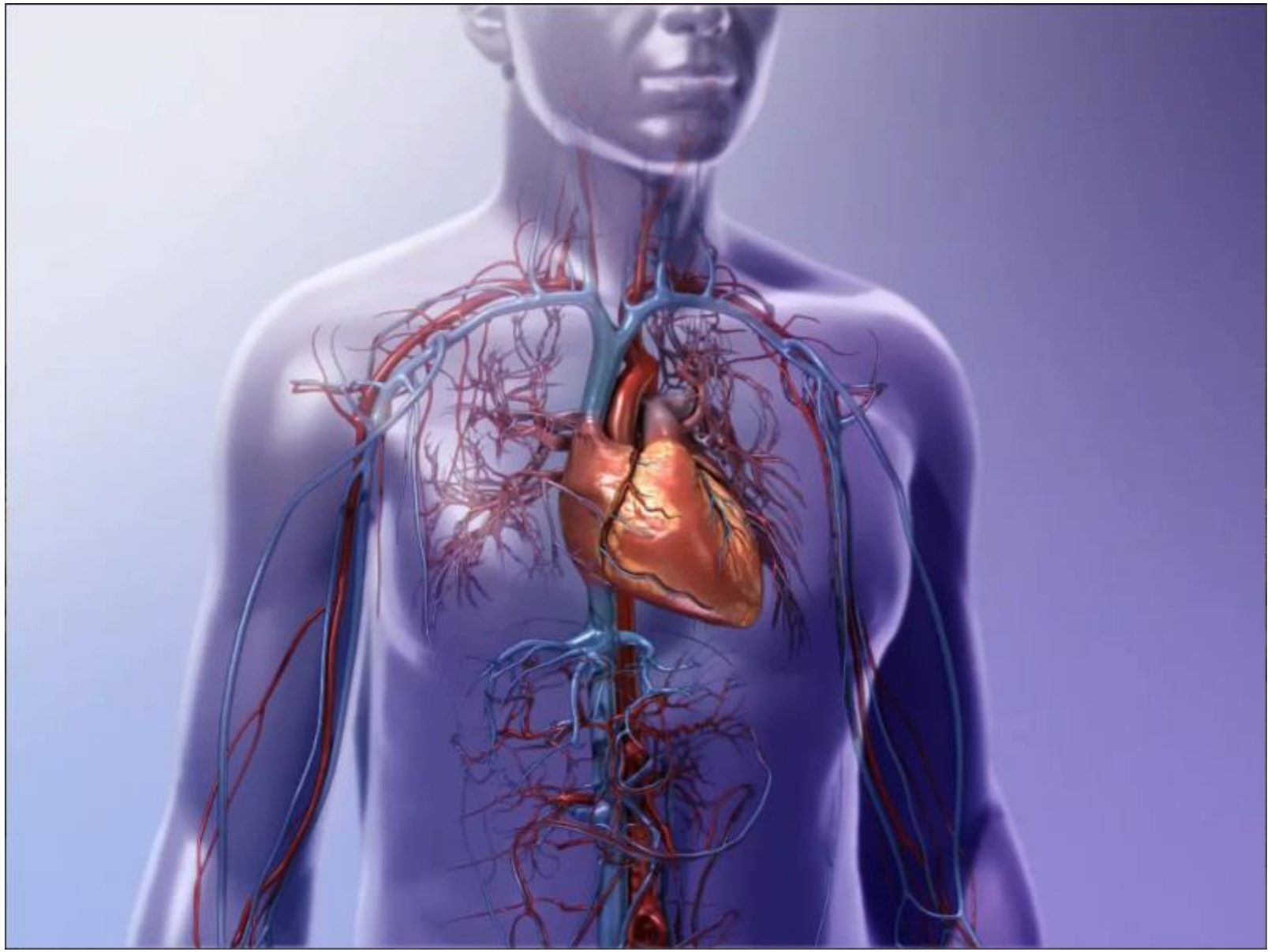
- Chordae rupture leads to mitral or tricuspid regurgitation.

Aortic stenosis.

The calcification of the aortic valve leaflets prevents their complete opening, leading to an obstruction of normal blood flow from the heart.

Cardiac output.

Cardiac output refers to the volume of blood ejected by the ventricle per minute.



Blood pressure measurement

• Blood pressure corresponds to the force exerted on blood vessels.

• It results from the blood flow generated by the heart contractions and the resistance encountered as blood moves through a closed vessel. Blood pressure is used to assess normal cardiovascular function.

• The average systolic pressure is 120 mmHg.

• The average diastolic pressure ranges from 70 to 80 mmHg.

VI-CONCLUSION

The heart's internal configuration reflects its complex yet highly organised structure, ensuring efficient unidirectional blood flow.