Middle Mediastinum and Heart

Lab 5

October 4, 2023 - Dr. Oyedele (olusegun.oyedele@ubc.ca)

Dissector

Note: *students in alternate (non-dissecting) group - please use videos and digital resources in this manual to achieve objectives of this lab.*

Welcome to this lab on the anatomy of the middle mediastinum and heart. The objectives of this lab (details in each section) are as follows:

- Identify and describe the pericardium (with its layers), the pericardial cavity and the surface features of the heart.
- Describe the four chambers of the adult heart, their function and the anatomy of the valves that separate them.
- Describe the major incoming and outgoing vessels of the heart and the valves associated with them, as well as coronary vasculature.
- Describe the remnants of the fetal heart that are visible in the adult heart, including the foramen ovale, ligamentum arteriosum and atrial appendages.

Heart Anatomy (Module) | Mediastinum (Module) | Heart Dissection (Video)

These are the relevant Ackland videos covering the lab objectives:

Volume 5 - The Internal Organs

The Thoracic Organs

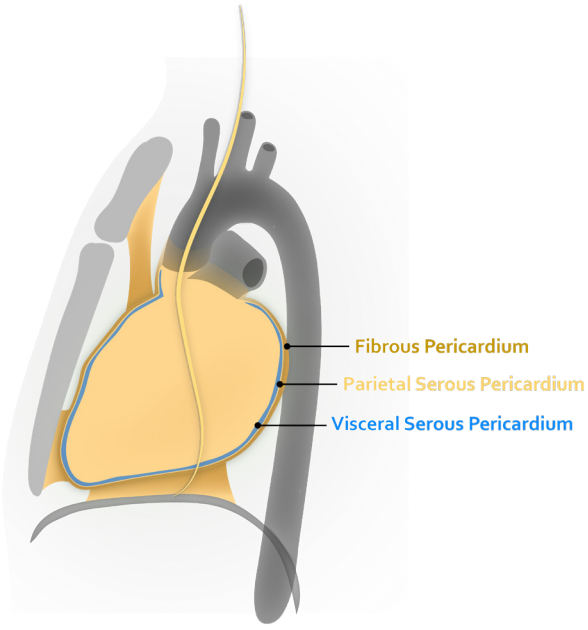
5.1.1 Heart: introduction and orientation
5.1.2 Right and left atrium
5.1.3 Ventricles: introduction
5.1.4 Right ventricle
5.1.5 Left ventricle
5.1.6 Ventricles: outflow pathways
5.1.7 Coronary vessels
5.1.8 Heart: overview of external features
5.1.9 Pericardial sac, great vessels
5.1.10 Review of heart

Acland Atlas (Videos)

(requires CWL login)

Be able to identify and distinguish the gross anatomical features of the pericardium:

- ◯ Fibrous pericardium
- ◯ Parietal serous pericardium ('serous pericardium')
- ◯ Visceral serous pericardium ('epicardium')



Mediastinum (sagittal view)

External Cardiac Surface

Be able to describe the surface projections of the heart and pericardium: (photos & 3D models)

Cardiac Surface Anatomy:

- ◯ Base of the heart
- ◯ Apex
- ◯ Atrioventricular groove (coronary sulcus)
- ◯ Posterior interventricular groove
- ◯ Anterior interventricular groove

Borders of Cardiac Chambers: (3D models)

- ◯ Right atrium and right atrial appendage (auricle)
- ◯ Right ventricle
- ◯ Left atrium and left atrial appendage (auricle)
- ◯ Left ventricle

Heart (3D)

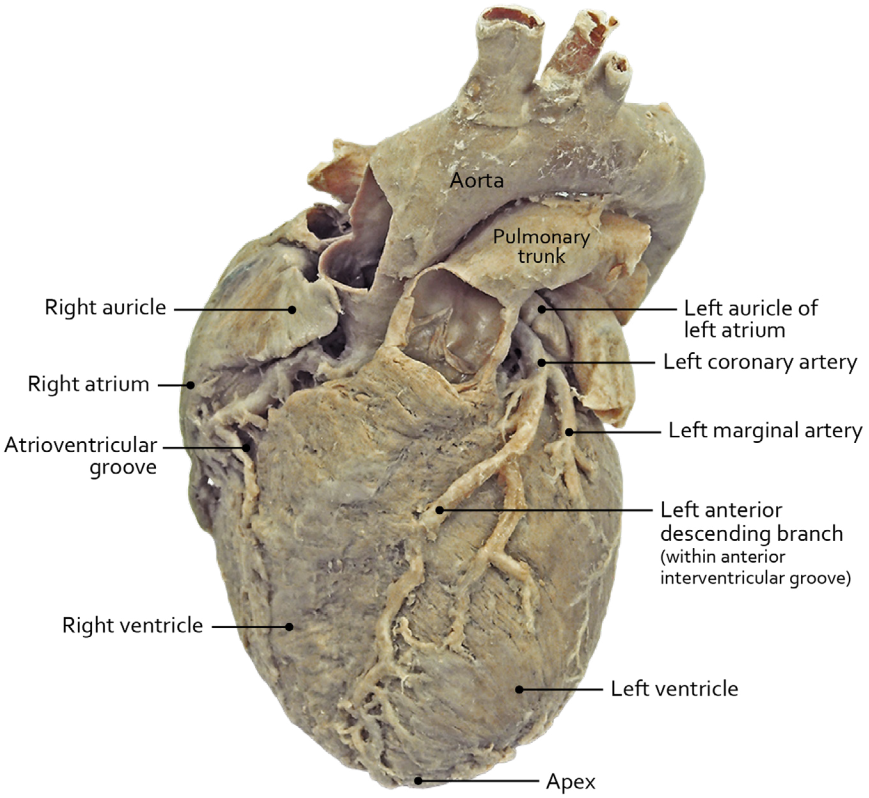
Anterior Heart (Atlas)

Heart & Aorta (3D)

Postero-inferior Heart (Atlas)

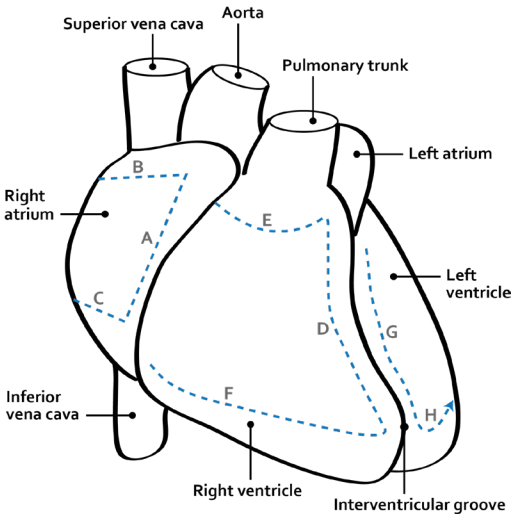
Enlarged Heart (3D)

October 4, 2023 - Dr. Oyedele (olusegun.oyedele@ubc.ca)



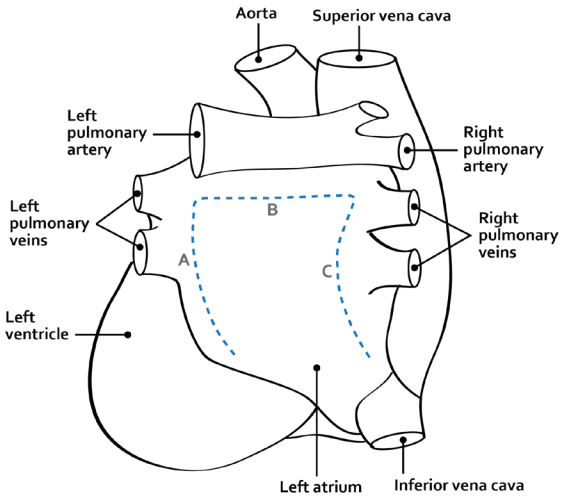
Anterior Heart

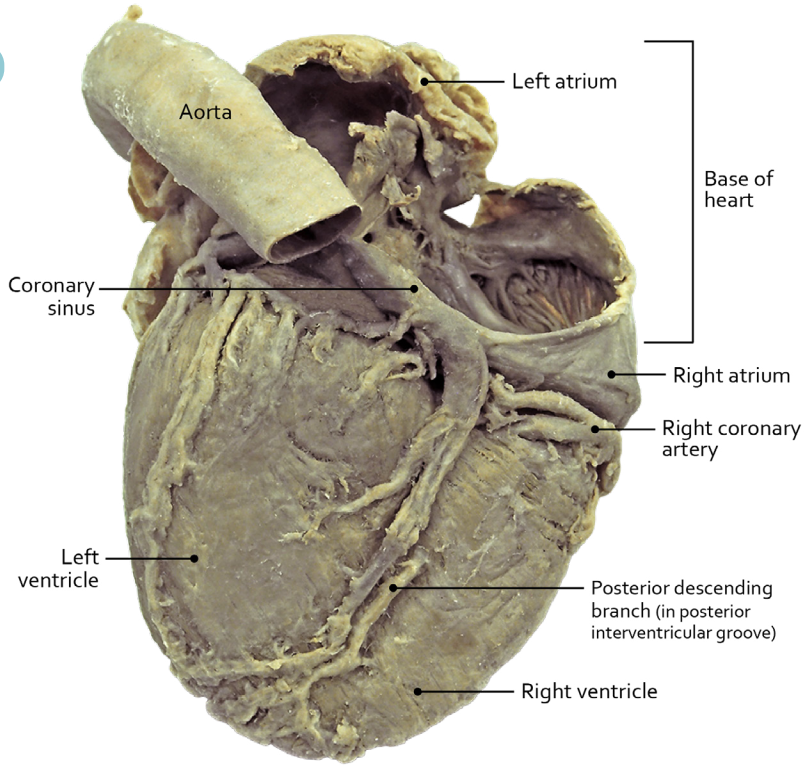
Hide Labels



The illustrations show where cuts would be made when dissecting the heart.

Hide Labels





Postero-inferior Heart

October 4, 2023 - Dr. Oyedele (olusegun.oyedele@ubc.ca)

Coronary Vessels: (heart module & 3D models)

- ◯ Right coronary artery
  - Posterior descending branch
- ◯ Left coronary artery
  - Circumflex branch
  - Anterior interventricular branch (often called the **left anterior descending** or **LAD**)
- ◯ Coronary sinus

Internal Cardiac Surface

Be able to describe:

- Position of the coronary ostia and arrangement and major branches of the coronary arteries
- Structure and characteristic internal and external features of each of the four cardiac chambers
- General structures of the tricuspid, mitral, aortic and pulmonary valves
- Pattern of blood flow through the heart with regard to arrangement of cardiac chambers and their valves
- Remnants of the fetal circulation visible in the adult heart, i.e. fossa ovalis (foramen ovale) and ligamentum arteriousum (ductus arteriosus)

Right Atrium:

Right Atrium (Atlas)

Tricuspid Valve (Atlas)

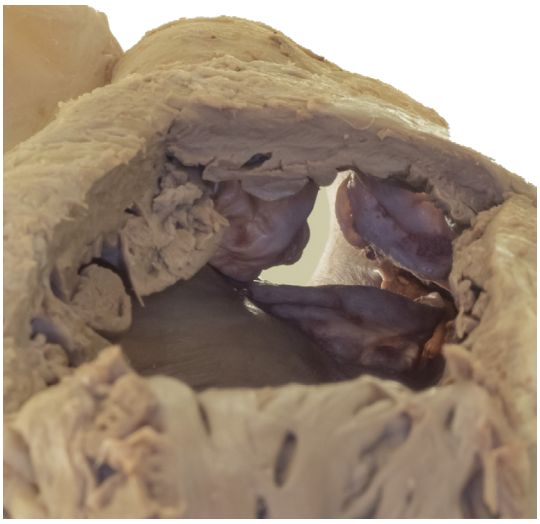
Ventricles (Atlas)

Heart (3D)

- ◯ Right atrial appendage and musculi pectinati
- ◯ Opening of tricuspid valve (right atrioventricular orifice)
- ◯ Opening of superior vena cava
- ◯ Opening of inferior vena cava
- ◯ Opening of coronary sinus
- ◯ Interatrial septum
- ◯ Fossa ovalis

Right Ventricle: *(you do NOT need to know the names of individual valve cusps or papillary muscles)*

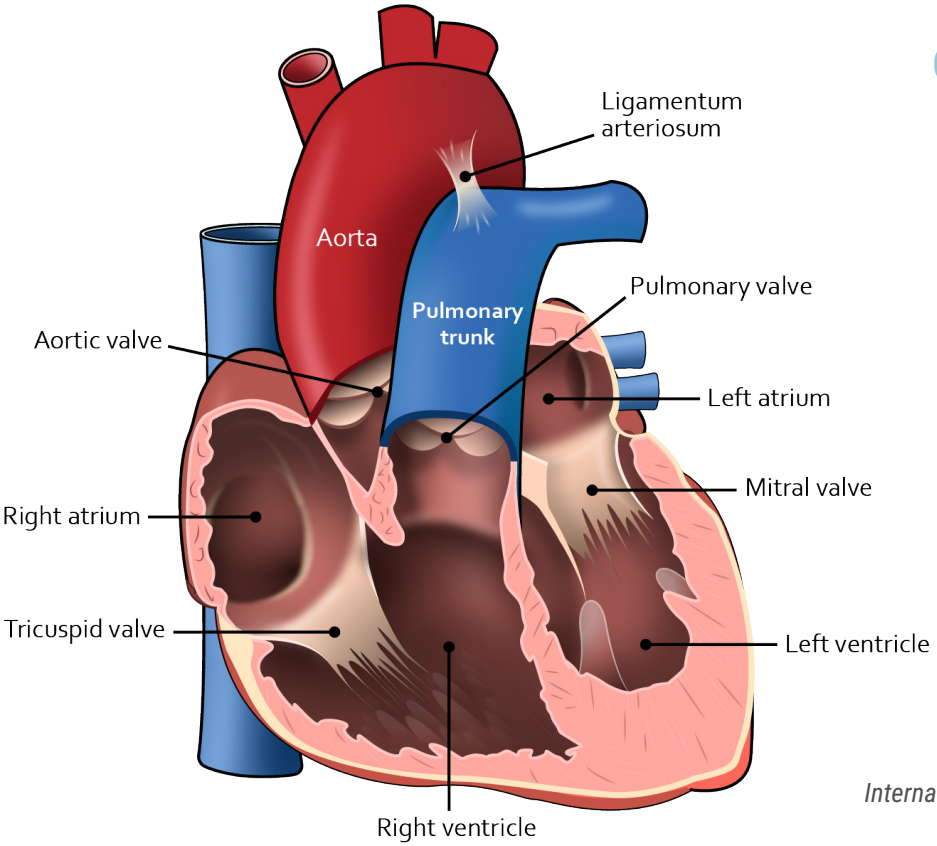
- ◯ Cusps of the tricuspid valve
- ◯ Chordae tendinae
- ◯ Trabeculae carnae
- ◯ Interventricular septum
- ◯ Papillary muscles
- ◯ Septomarginal trabeculum (moderator band)
- ◯ Pulmonary valve with its cusps



Cusps of Pulmonary Valve Inside Right Ventricle

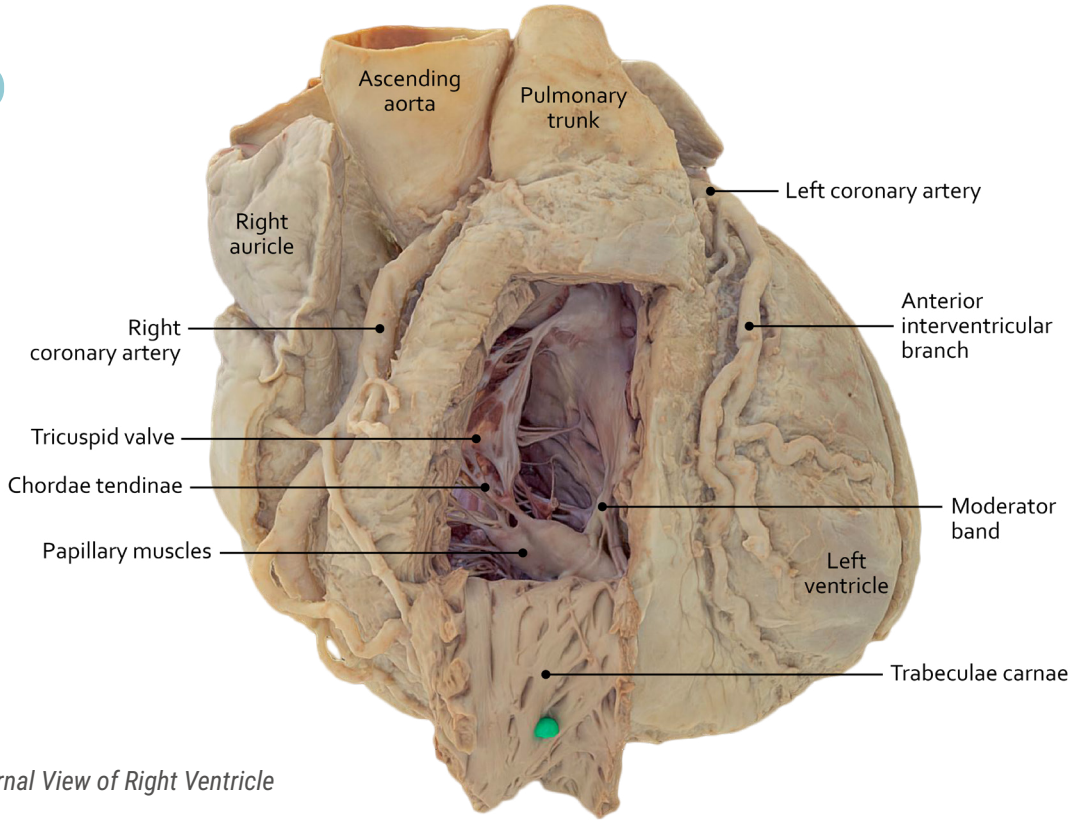
October 4, 2023 - Dr. Oyedele (olusegun.oyedele@ubc.ca)

Hide Labels



Internal View of Anterior Heart

Hide Labels



Internal View of Right Ventricle

October 4, 2023 - Dr. Oyedele (olusegun.oyedele@ubc.ca)

Left Atrium:

- ◯ Interatrial septum
- ◯ Left atrial appendage
- ◯ Openings for the pulmonary veins
- ◯ Opening of the mitral valve (left atrioventricular orifice)

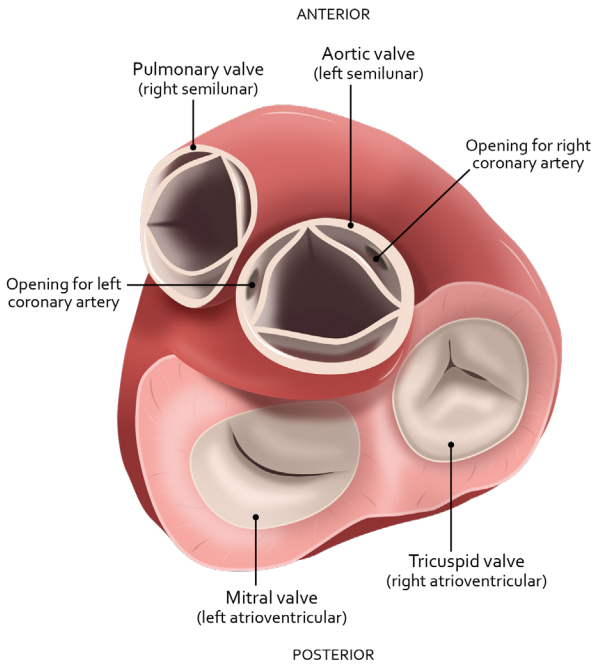
Left Ventricle: *(you do NOT need to know the names of individual valve cusps or papillary muscles)*

- ◯ Cusps of the mitral valve
- ◯ Chordae tendinae
- ◯ Papillary muscles
- ◯ Trabeculae carnae
- ◯ Cusps of the aortic valve

Ascending Aorta:

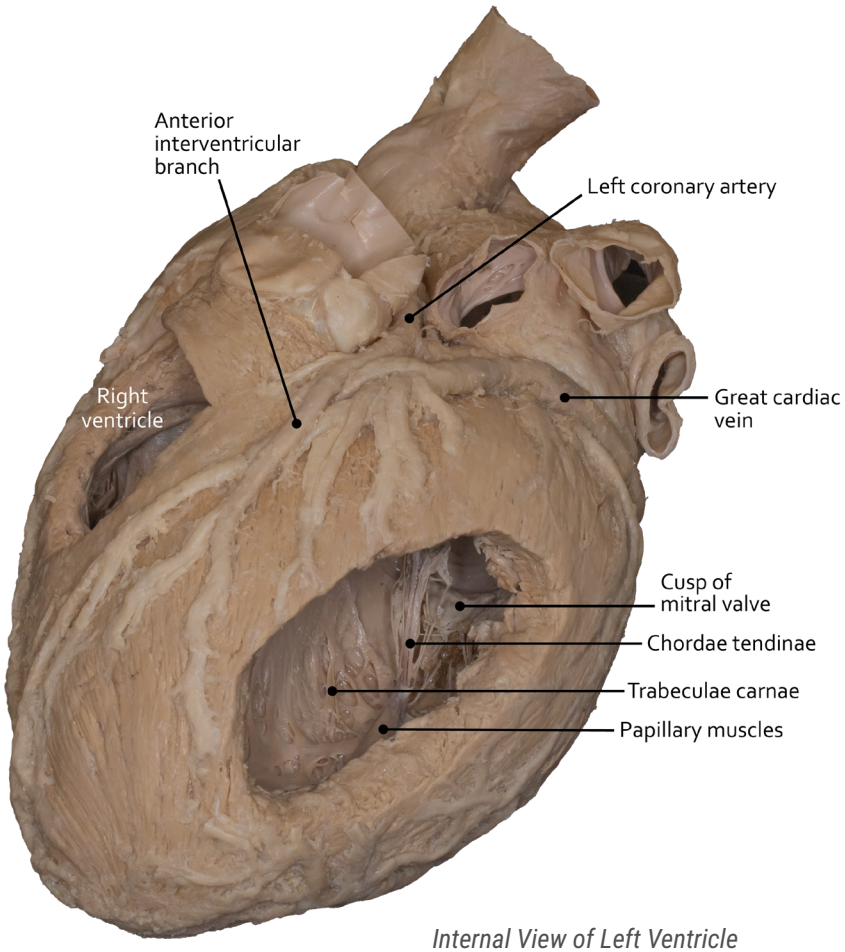
- ◯ Ostia (openings) for the right and left coronary arteries

Hide Labels

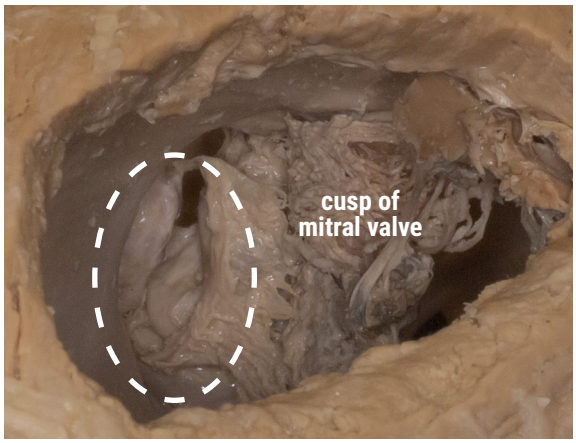


Transverse Heart Section Showing Valves

Hide Labels



Internal View of Left Ventricle

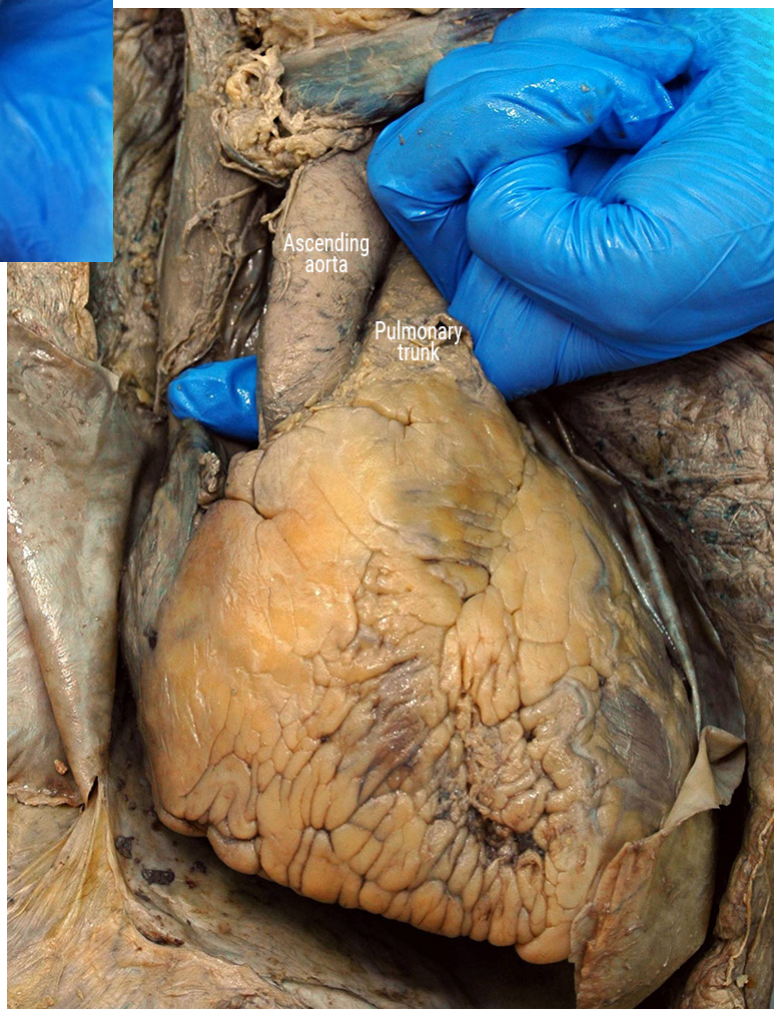


Cusps of Aortic Valve Inside Left Ventricle

October 4, 2023 - Dr. Oyedele (olusegun.oyedele@ubc.ca)

Hand in Oblique Pericardial Sinus

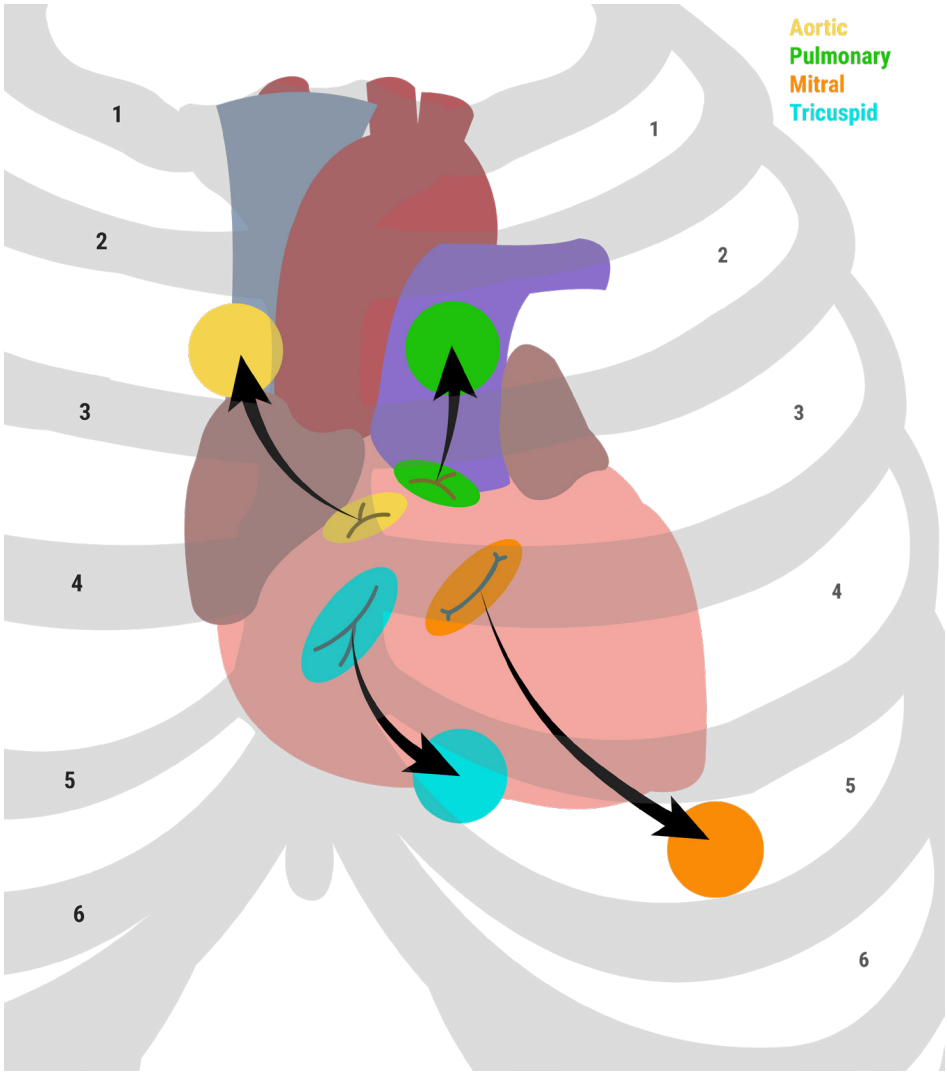
Finger in Transverse Pericardial Sinus



Images courtesy of:

(B. Kathleen Alsup & Glenn M. Fox, University of Michigan Medical School, BlueLink)

October 4, 2023 - Dr. Oyedele (olusegun.oyedele@ubc.ca)

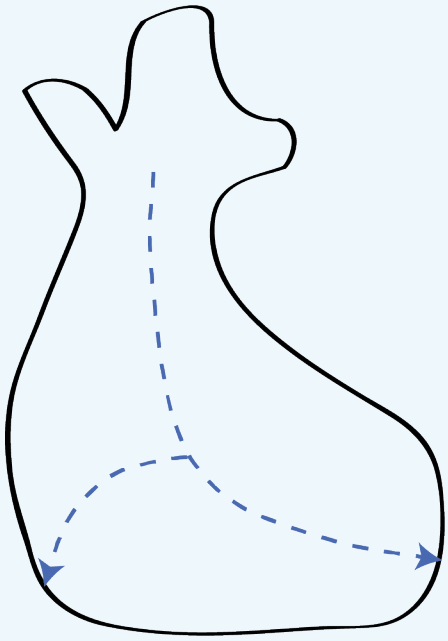


Ausculation Points:

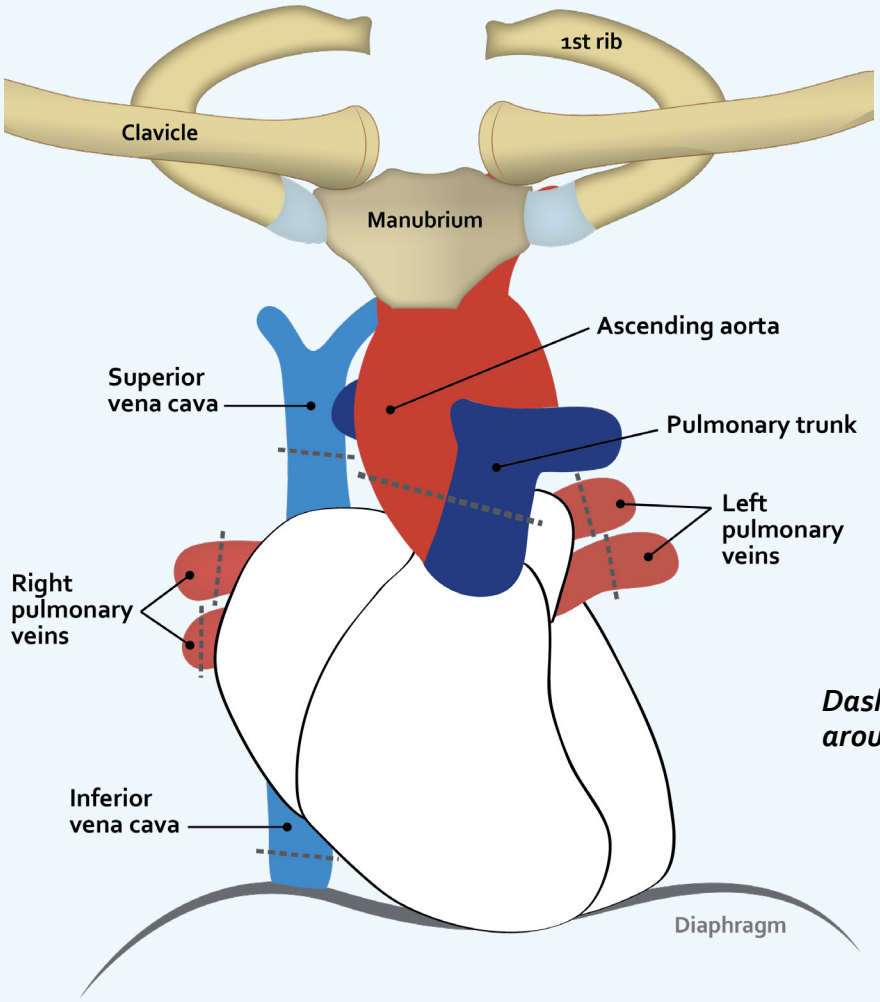
How does the anatomy and function of the heart valves relate to the location of the auscultation points on the chest wall?

October 4, 2023 - Dr. Oyedele (olusegun.oyedele@ubc.ca)

1. *Identify and preserve the phrenic nerves (which pass anterior to the roots of the lungs).*
2. *Identify the pericardial sac and cut through the fibrous pericardium (lined with parietal layer of serous pericardium) as indicated to gain access to the pericardial cavity.*
3. *Reflect the flaps to expose the heart which is covered with visceral layer of serous pericardium (epicardium).*
4. *Using a scalpel, cut through the following structures within the pericardial sac **(see figure below)**:*
   - Ascending aorta and pulmonary trunk (just superior to the valves) and, importantly, inferior to ligamentum arteriosum
   - Superior vena cava (just superior to its entrance into the heart)
   - Inferior vena cava (just inferior to heart and superior to diaphragm)
   - Right and left pulmonary veins
5. *Identify (refer to checklist):*
   - Cardiac surface markings
   - Borders of the cardiac chambers



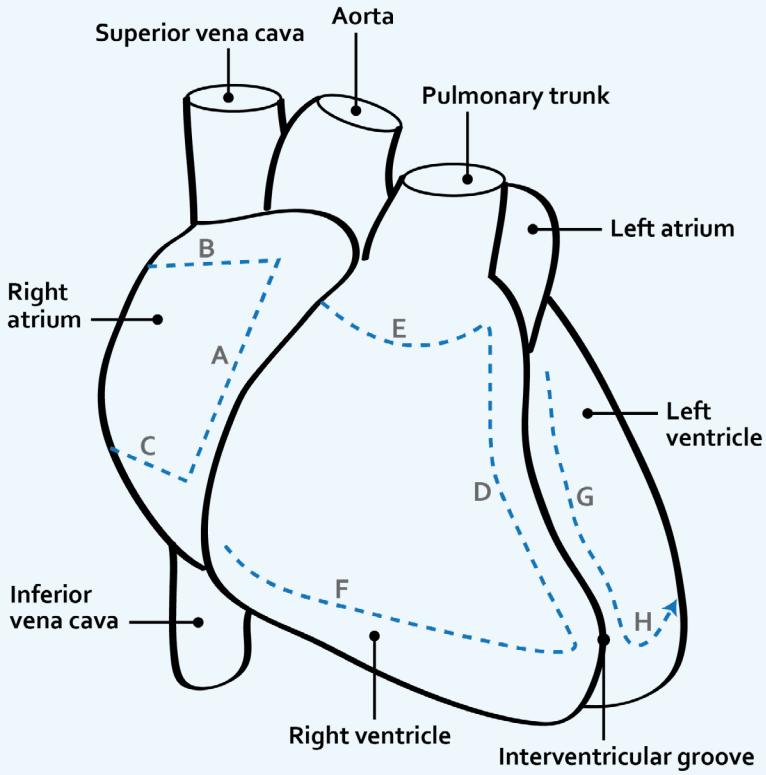
Pericardial sac (the dashed lines indicate the incisions you should make to open the sac - step 2)



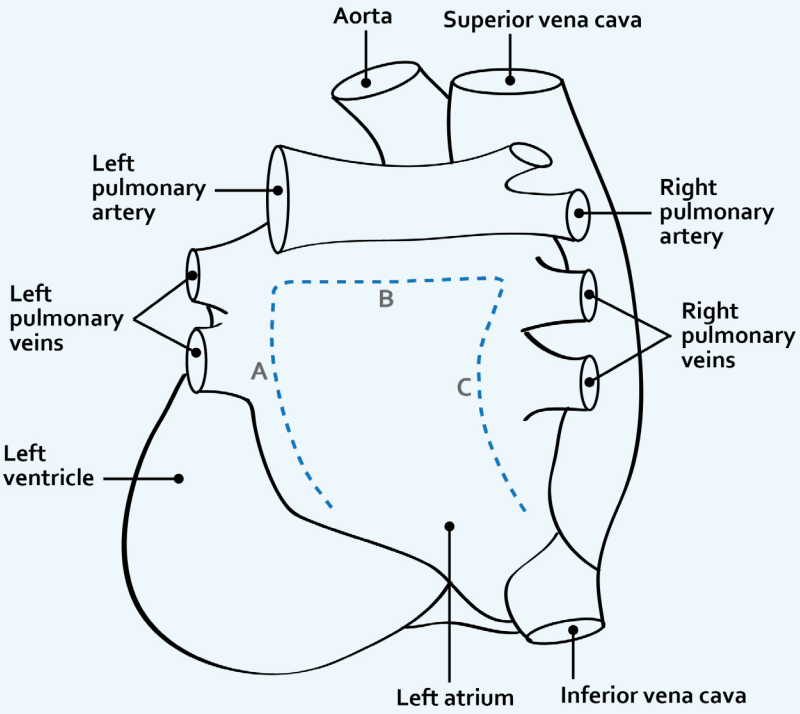
Dashed lines indicate the structures to cut around the heart (step 4)

Refer to checklist for structures to identify:

1. *Using forceps, remove fat as needed and identify the **coronary vessels**.*
2. *Examine the interior of the **right atrium**:*
   - Make incisions A, B and C in right atrium as indicated and reflect the flap
   - Identify interior features of the RA
3. *Examine the interior of the **right ventricle**:*
   - Make incisions D, E and F in right ventricle as indicated and reflect the flap
   - Identify internal features of the RV
4. *Examine the interior of the **left ventricle**:*
   - Make incisions G and H in left ventricle as indicated and reflect the flap
   - Identify internal features of the LV
   - Within the ascending aorta, identify the ostia ('mouth' or openings) of the coronary arteries



Anterior view of the heart (dashed lines indicate where incisions should be made)



Posterior view of the heart (dashed lines indicate where incisions should be made)

5. *Examine the interior of the **left atrium**:*
   - Make incisions A, B and C in the left atrium as indicated and reflect the flap
   - Identify internal features of the LA