Lab 19: Dissection: Pericardium, Heart, and Mediastinum 2/23/2023

Goals

1. Open the pericardium, study its parts, and demonstrate the "great" vessels of the heart.
2. Remove the heart.
3. Define the extent and boundaries of the mediastinum as a whole; describe the boundaries and contents of the subdivisions of the mediastinum.
4. Clean and demonstrate the structures in the superior mediastinum.
5. Clean and demonstrate the contents of the posterior mediastinum.
6. Review the blood supply and venous drainage of the posterior thoracic wall.
7. Identify the sympathetic trunk.
8. Clean the epicardium of the heart and study its external features and coronary arteries.
9. Open the four heart chambers and study the internal anatomy.

Pericardium

You should have removed the fatty thymus from the anterior surface of the great vessels and pericardium during your 501 lab covering the thorax.

> In what part(s) of the mediastinum is the thymus located? What is the function of the thymus?

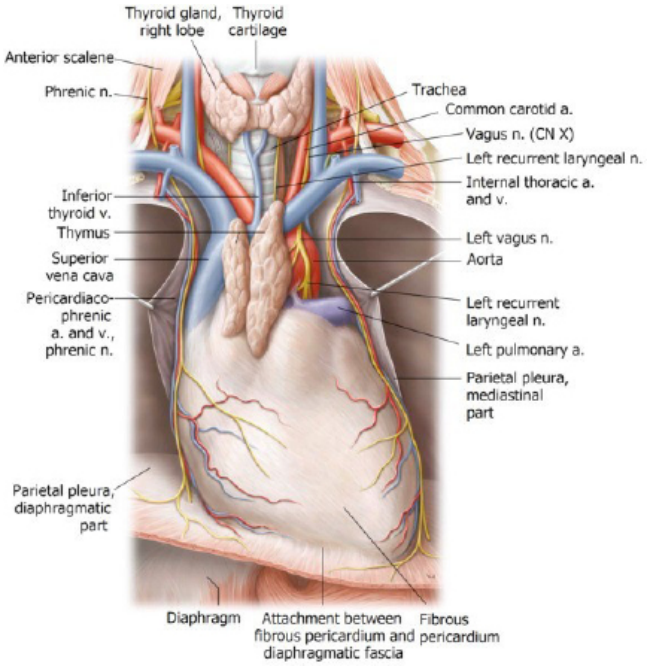

Figure 19.1. Contents of the mediastinum. From: Gilroy, Atlas of Anatomy, 3rd ed., Illustrator: Wesker/Voll ©2018 Thieme Medical Publishers, Inc. All rights reserved.

Open the pericardium.

Opening the pericardium will allow you to view the heart and the roots of the **great vessels** that leave/enter the heart.

1. With forceps, grasp the pericardium and pull it away from the underlying heart.
2. With scissors, make a flap as illustrated in figure 19.2. Don't make the flap too wide or you will damage the phrenic nerves.

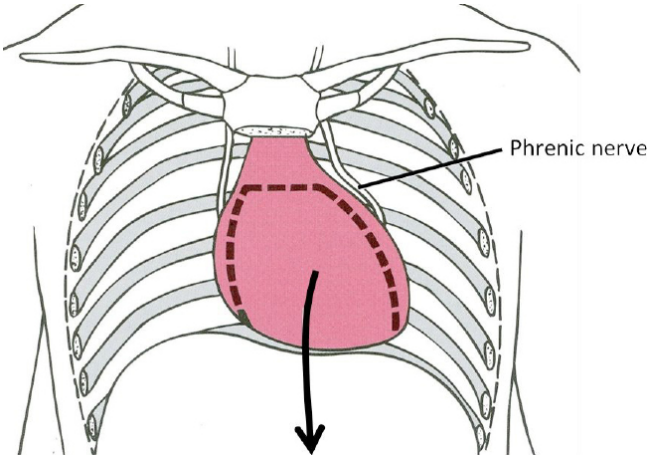

Figure 19.2.

3 Fold the flap downward to reveal the heart and great vessels.
4 Identify the **superior vena cava** on the right, **ascending aorta** in the middle, and **pulmonary trunk** tucked posterior and to the left.

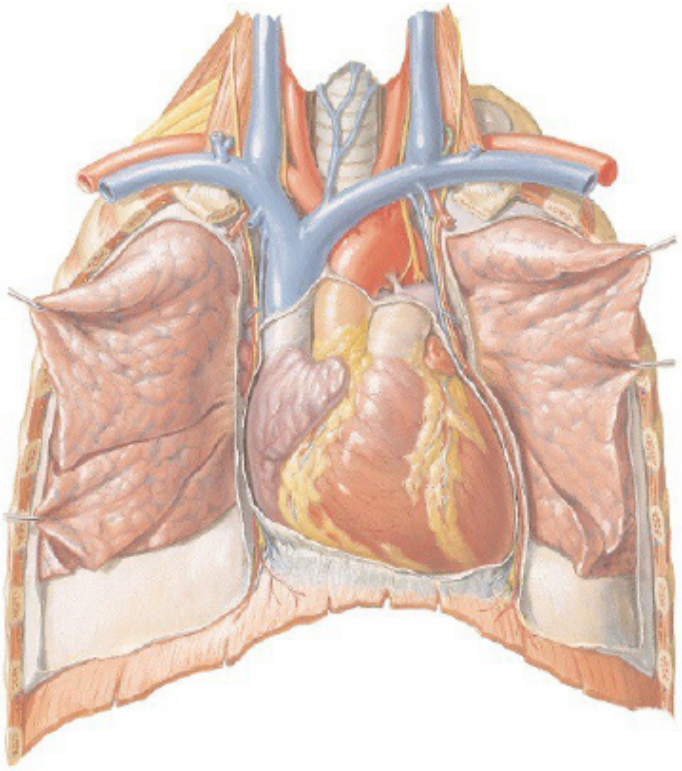

Figure 19.3. The anterior wall of the pericardium has been removed. Netter, Atlas of Human Anatomy, Plate 209.

EXAMINE the Layers of the Pericardium and the Pericardial Cavity.

The pericardium is a bag around the heart—the bottom of the bag is fused to the superior surface of the diaphragm, while the mouth of the bag is sealed around the great vessels that enter and exit the heart from above.

The outer part of the pericardium (the part we made a flap in) is formed from two fused layers = the external layer is the **fibrous pericardium**; the internal layer is the **parietal layer of the serous pericardium** (a serous membrane).

Grasp the pericardial flap between your fingers and feel the textures of the two layers. Both come from somatic mesoderm. Think of the fibrous pericardium as a detached part of the body wall (it peeled off the body wall in the embryo).

The heart is surrounded by a serous sac: the **serous pericardium**.

- The **parietal layer of the serous pericardium** is fused to the inside of the fibrous pericardium.
- The **visceral layer of the serous pericardium** (aka = **epicardium**) is the outer layer of the heart itself. This layer is laden with fat in most hearts.

The epicardium continues superiorly from the heart's surface onto the roots of the great vessels that are entering and leaving the heart. Thus the pericardial sac surrounds not only the heart, but the roots of the great vessels as well.

The diagram on the right is a schematic coronal section of the heart and pericardium. The layers of the serous pericardium are indicated with the dashed line. Between the two layers is the **pericardial cavity**.

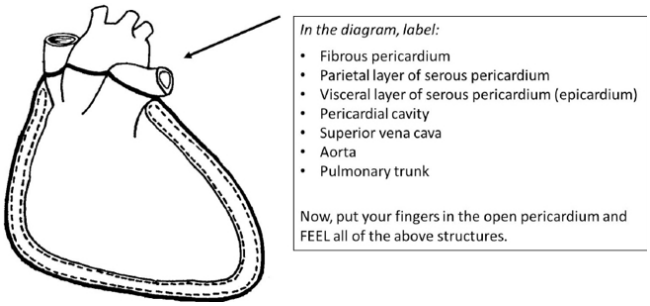

Figure 19.4.

Place a finger in the pericardial cavity, between the parietal and visceral layers of serous pericardium. A snug fit, eh? The pericardial cavity has two specialized regions:

1 **Transverse pericardial sinus**: A channel connecting the left and right sides of the pericardial cavity, posterior to the arterial end of the heart. Slide a finger behind the ascending aorta and pulmonary trunk.

> **Clinical correlation**
>
> A cardiothoracic surgeon could pass a clamp into the transverse sinus and around the great arteries during heart surgeries.

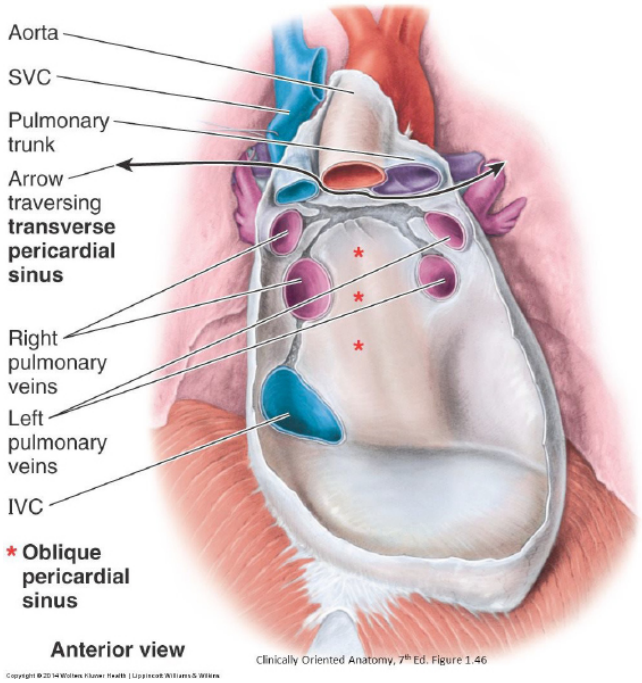

Figure 19.5.

2 **Oblique pericardial sinus**: This is a cul-de-sac behind the base of the heart (left atrium), surrounded by the veins entering the heart. Lift the heart up and out of the pericardium and slide your fingers behind the base of the heart. Your finger will be halted by the serous pericardium that reflects from the inside of the pericardial sac onto the **pulmonary veins**. Your fingers are in the oblique sinus.

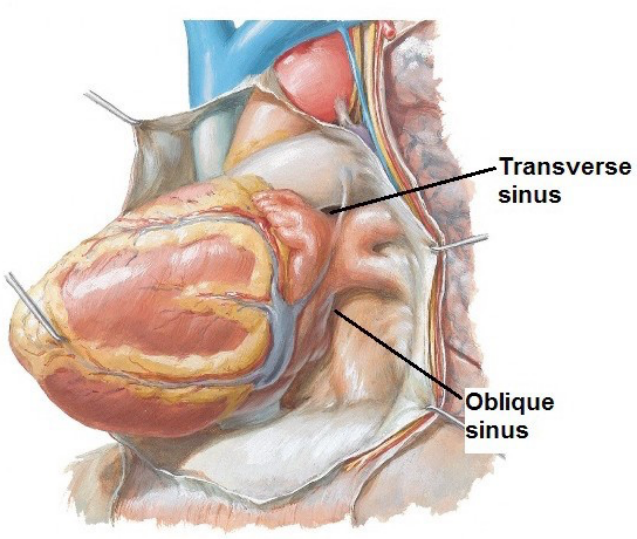

Figure 19.6. Netter, Atlas of Human Anatomy, Plate 212.

Remove the heart.

Use a scalpel or large scissors to cut the great vessels. Leave about an inch of each vessel **attached to the heart**. Use the following sequence:

1 Elevate the heart to reveal the short course of the **inferior vena cava** within the pericardium. Cut the IVC above the diaphragm.
2 From right to left, cut the **superior vena cava**, **ascending aorta**, and **pulmonary trunk**. Don't cut the pulmonary trunk too high (where it branches into left and right pulmonary arteries), or you will damage the **ligamentum arteriosum**.
3 Lift and rotate the heart from side to side in order to cut the **left and right pulmonary veins**.
4 Remove the heart from the pericardium and place it on a tray.

Now, back to the pericardium: EXAMINE the **parietal layer of the serous pericardium**—the shiny layer on the inside of the pericardial sac that remains in the cadaver. Note the reflection of the serous pericardium as it forms cuffs around the pulmonary veins. Identify the location of the **oblique pericardial sinus**.

Figure 19.7.

There will be two paths for today's dissection:

1. the heart and
2. the mediastinum (and as Robert Frost said, sorry I could not travel both!).

Half of your group should work on finding the contents of the **mediastinum**, while the other half focuses on structures of the external and internal **heart**. Take turns showing each other what you found.

The Mediastinum

The mediastinum ("median septum") is the part of the thoracic cavity in the midline, between the two pleural sacs.

Review: Boundaries and Divisions of the Mediastinum

Boundaries:

- Superior to inferior: From the **superior thoracic aperture to the diaphragm**
- Anterior to posterior: from the **sternum/ costal cartilages to the bodies of the thoracic vertebrae**

Divisions:

- A horizontal plane drawn from the sternal angle to the IV disc between T-4/T-5 subdivides the mediastinum into **superior** and **inferior** parts.
- The pericardium and heart further subdivides the inferior mediastinum into **posterior**, **middle**, and **anterior** parts.

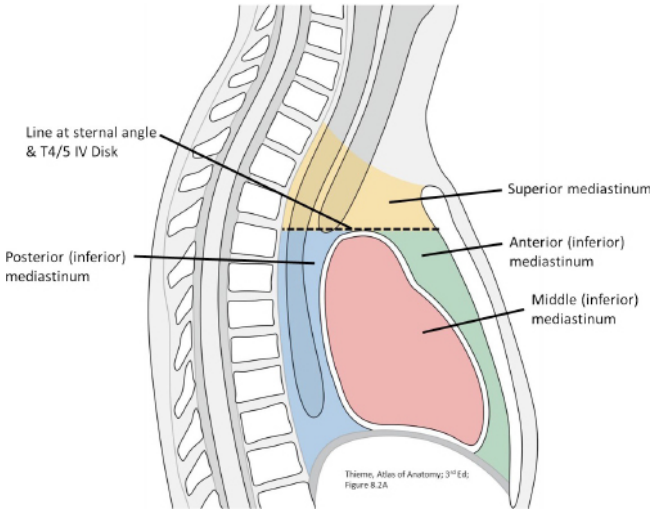

Figure 19.8.

You already studied and dissected a number of the structures in the mediastinum during your cursory study of the thorax in FMS 501. In today's lab we will we expand our exploration of the superior and posterior mediastinum, and you should continue work cleaning these structures and studying their relationships. In particular, the posterior mediastinum will be more accessible than in previous labs now that you have removed the heart.

Superior Mediastinum

Main contents (shortened):

- **Thymus**
- **SVC**; **Right and Left Brachiocephalic veins**
- **Arch of aorta and its 3 branches (What are these?)**
- **Vagus** and **phrenic nerves**; **Left recurrent laryngeal nerve**
- **Trachea**, **Esophagus**, **Thoracic duct**

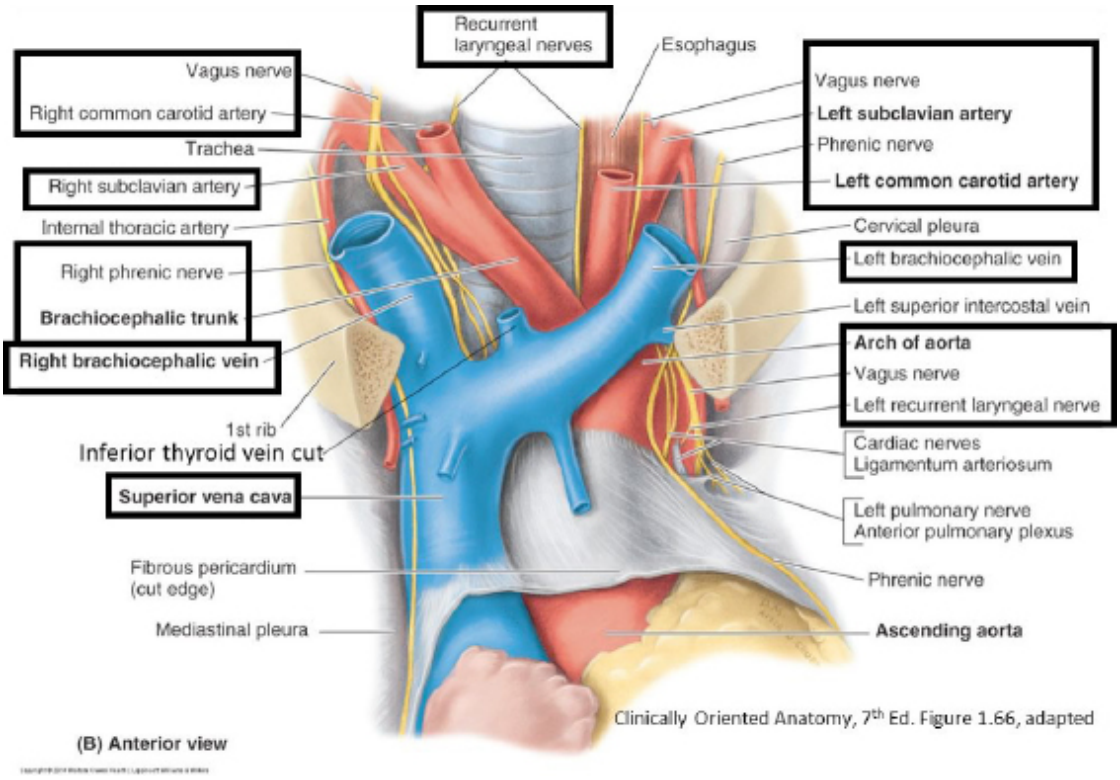

Figure 19.9.

Big Picture of Superior Mediastinum

Rules of thumb that tie in with all that neat embryology you are learning:

1 The derivatives of the embryonic **foregut** are placed in the CENTER of the superior mediastinum—verify this by locating the **trachea** and **esophagus** with blunt dissection.

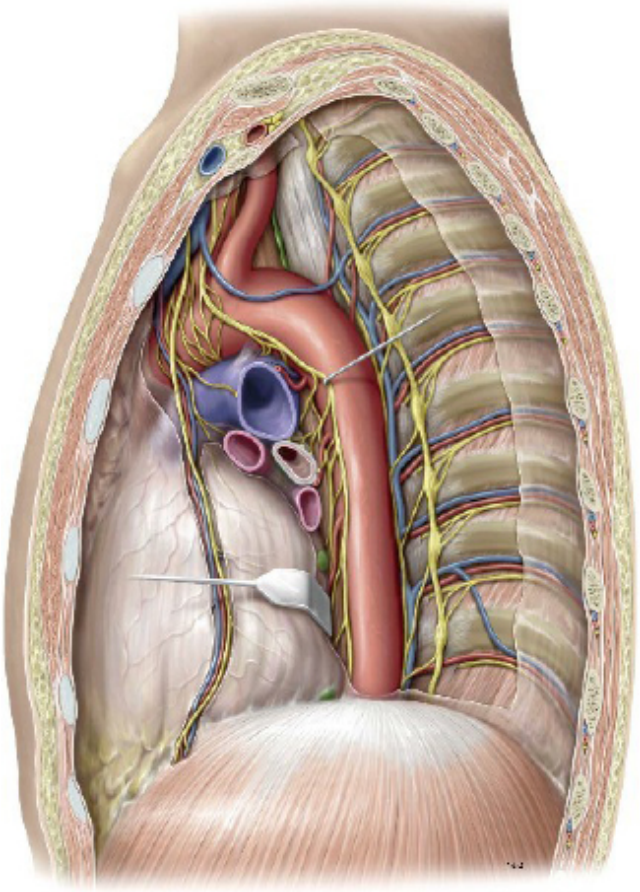

Figure 19.10.

2 Major arteries predominate on the LEFT side: verify this by locating the course of the **aorta**.

3 Major veins predominate on the RIGHT side: verify this by locating the **superior vena cava** and **azygos vein**.

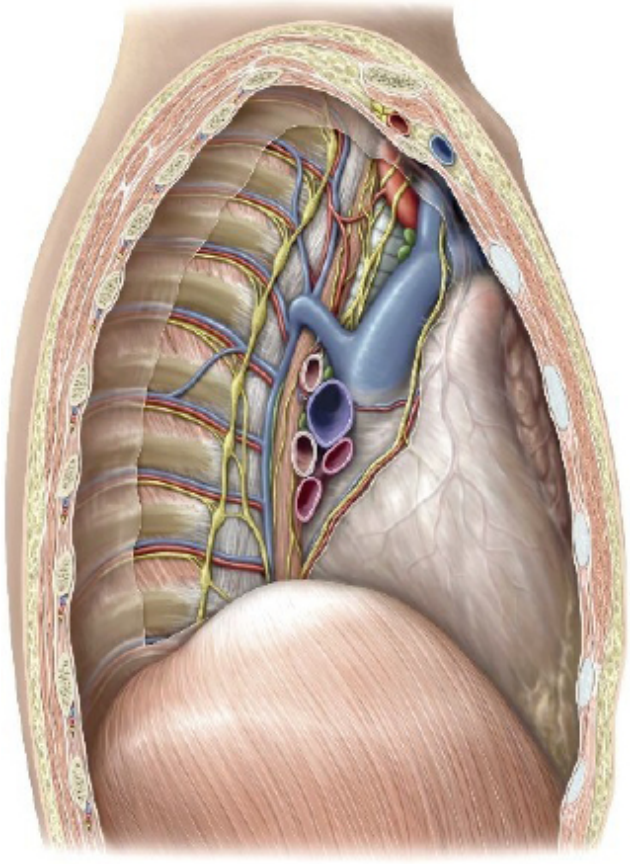

Figure 19.11.

Clean and identify the veins, arteries, and nerves of the superior mediastinum.

Identify the major veins in the superior mediastinum.

1 Identify the **left** and **right brachiocephalic veins**. Which one is longer? Why? At the base of the neck, each brachiocephalic vein is formed by the union of the **internal jugular** and **subclavian veins**.

2 Identify the **superior vena cava**.

3 Find the arch of the **azygos vein** as it passes over the root of the right lung to enter the SVC.

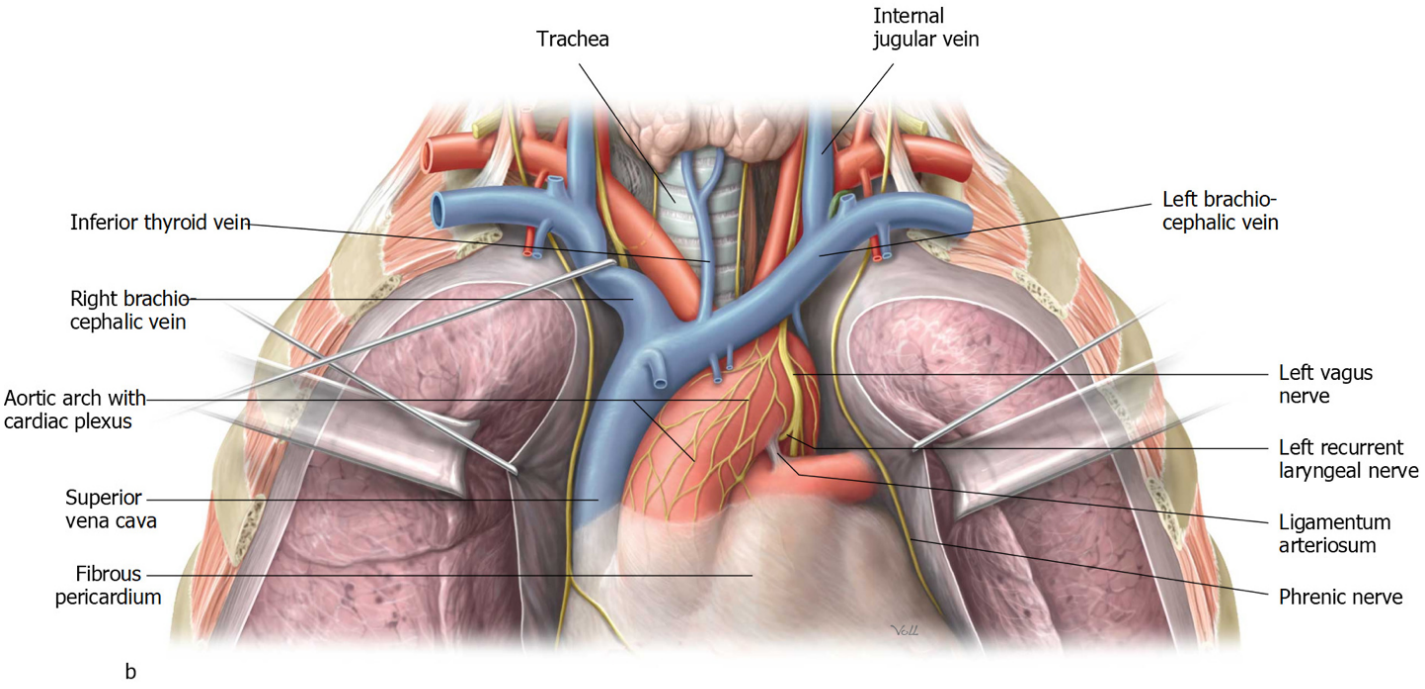

Figure 19.12.

Extra: Inferior thyroid veins drain from the thyroid gland in the neck downward into the left brachiocephalic vein. They lie superficial to the trachea!

> **Clinical correlation**
>
> Emergency tracheotomy should not be done without a way to control bleeding, since inferior thyroid veins may be in the way.

Review the major arteries in the superior mediastinum.

1. Follow the course of the aorta as it arches to the left.
2. Identify the three branches from the **arch of aorta**:
   - **Brachiocephalic artery**
   - **Left common carotid artery**
   - **Left subclavian artery**

3 Remove any mediastinal pleura covering the arch of the aorta. Take care not to damage the **phrenic nerve** or **vagus nerve** as they cross the aorta.
4 Clean tissue and nodes away from the concavity (under side) of the arch of the aorta to find the **ligamentum arteriosum**. It attaches between the left pulmonary artery and arch of aorta.

What was its function in prenatal life?

Clean and identify major nerves passing through the superior mediastinum.

1 Start at the **superior thoracic aperture** and locate the **phrenic** and **vagus nerves**. Both pass from the neck into the thorax sandwiched between the subclavian vein and artery.
    - The vagi are near the **common carotid arteries**.
    - The phrenic nerves are lateral to the vagi.
2 Carefully clean both sets of nerves with forceps and follow them into the superior mediastinum. The mediastinal pleura hides the nerves, so make sure it has been completely removed.

Phrenic nerves pass around the periphery of the pericardium on their way to the left and right domes of the **diaphragm**. You will find them tethered to the fibrous pericardium—they are located **ANTERIOR to the root structures of the lungs**. If they aren't already, carefully free them up and clean them with scissors and forceps.

Can you identify the phrenic and vagus nerves on the right side? How about on the left?

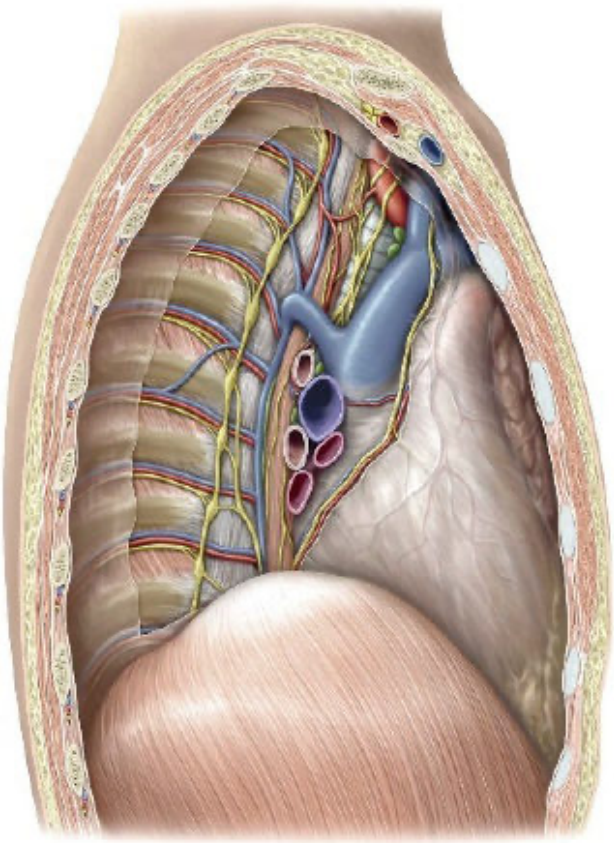

Figure 19.13a.

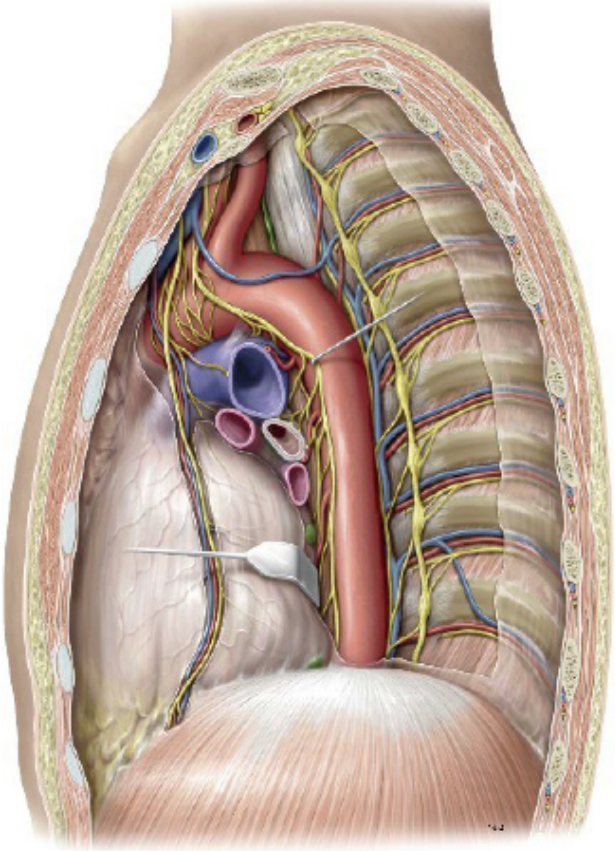

Figure 19.13b.

Vagus Nerves target the esophagus, so they pass **POSTERIOR to the root structures of the lungs**. Carefully free them up and clean them with scissors and forceps.

- The **right vagus** squeezes between the arch of the azygos and the trachea. Clean the right (lateral) side of the trachea to find the right vagus nerve.
- The **left vagus** passes onto the lateral surface of the arch of the aorta and is flattened and wide.

LOCATE and Clean the Recurrent Laryngeal Nerves

1 Trace the left vagus across the arch of the aorta. Make sure to clean and identify the **ligamentum arteriosum.**

2 The **left recurrent laryngeal nerve** leaves the vagus here, passes around the ligamentum arteriosum, and under the arch of the aorta.

3 Trace the right vagus across the proximal part of the **right subclavian artery**. The right recurrent laryngeal nerve branches from the vagus here and loops under the subclavian. There is no ligamentum arteriosum on the right, so the right recurrent laryngeal nerve departs from the vagus higher on the right than it does on the left. Development explains this—refer to the iBook (the **left 6th aortic arch artery** persists on the left to form the **ductus arteriosus—the recurrent laryngeal nerve loops around it**—there is no derivative of the 6th aortic arch on the right.)

4 Both recurrent laryngeal nerves ascend from their respective origins to the larynx (in the neck) in the **tracheo-esophageal grooves**. Use blunt dissection to separate the connective tissue between the trachea and esophagus to locate the recurrent laryngeal nerves.

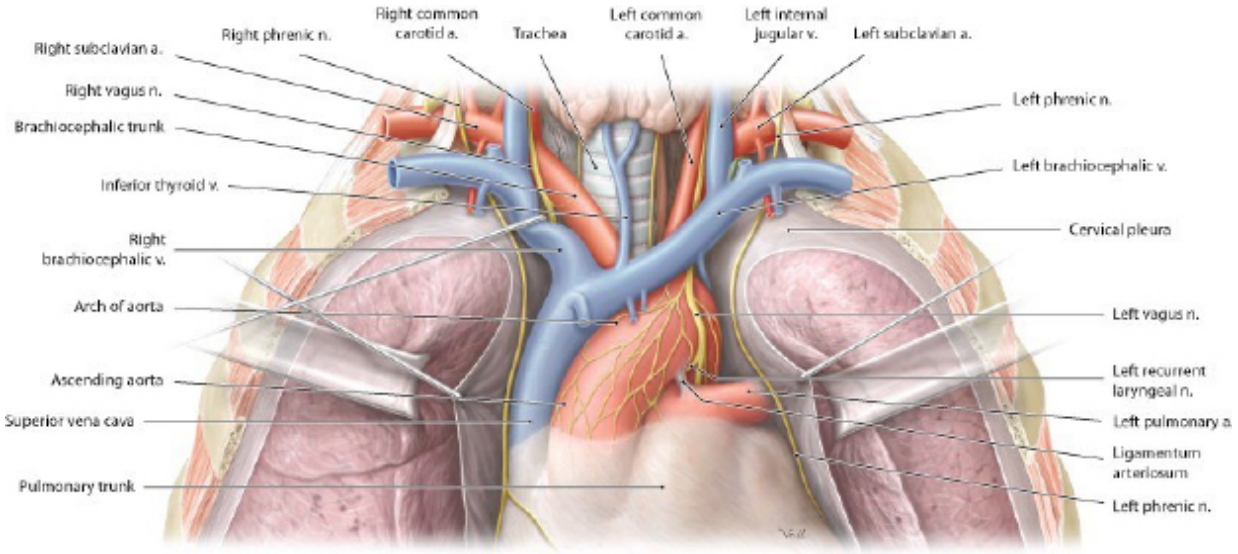

Figure 19.14. Superior mediastinum: Thymus removed.

Remove the pericardium and then clean and identify structures of the posterior mediastinum.

Use scissors to cut away and remove the pericardium. There will most likely be stumps of the left and right pulmonary veins attached to the pericardium. They need to be removed as well.

Clean and examine the trachea and bronchi.

1. Locate the **tracheal bifurcation**.
2. Do you see a network of nerve fibers—kind of a stringy mess, anterior to the tracheal bifurcation? If so, this is the **cardiac plexus** of autonomic nerves.

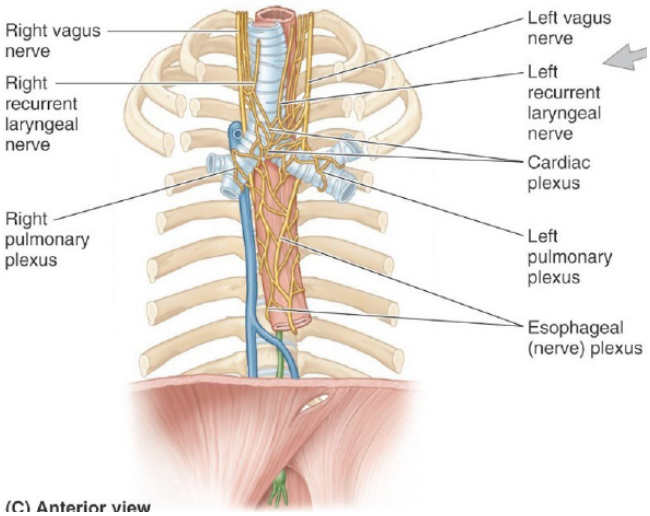

Figure 19.15. Clinically Oriented Anatomy, 7th ed., figure 168C, adapted.

Clean the azygos venous system.

The **azygos venous system** is composed of two vertical venous channels = the **azygos vein** proper on the right and the **hemi-azygos veins** on the left.

On the right side, clean the **azygos vein** (azygos means "unpaired"). Note that **right posterior intercostal veins** are tributaries of the azygos vein.

On the left, move the descending thoracic aorta as far to the right as possible. Clean the area behind it, searching for veins that pass vertically along the vertebral column. Two venous channels on the left receive the left posterior intercostal veins.

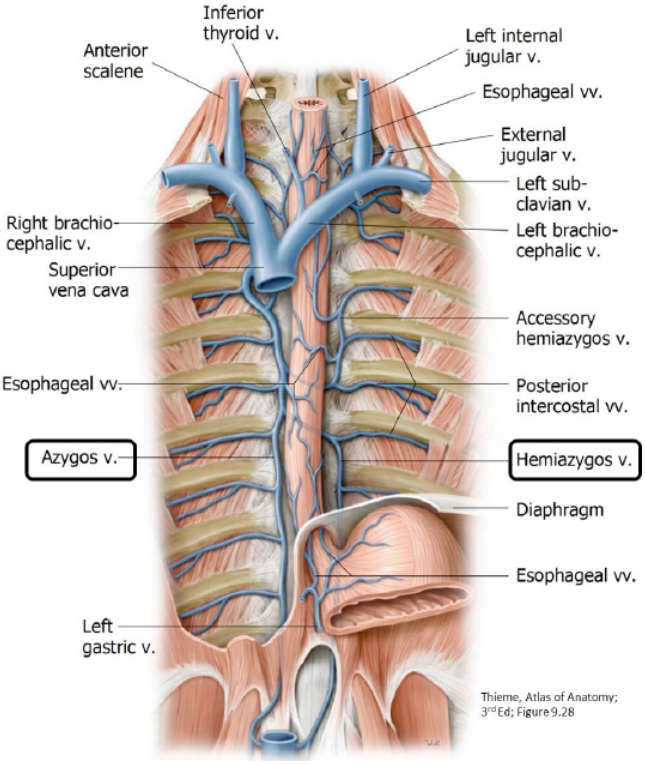

Figure 19.16.

Above is the **accessory hemi-azygos vein**. It usually receives blood via left posterior intercostal veins from the 3rd, 4th, and 5th intercostal spaces—but this is highly variable.

Below, and possibly obscured by the diaphragm, is the **hemi-azygos vein**. It usually receives venous blood from the left 6th to the 11th intercostal spaces. Again, highly variable. *The accessory hemi-azygos vein and hemi-azygos vein may join, or each may pass independently across the vertebral column to drain into the azygos vein*. **Regardless of the pattern, venous blood from the posterior thoracic wall (posterior intercostal spaces) ultimately drains into the azygos vein.**

Clean a few posterior intercostal arteries.

Posterior intercostal arteries arise from the **descending thoracic aorta**. They supply intercostal spaces 3–11 (the upper two spaces receive arteries from vessels in the neck). Clean the areas directly adjacent to the descending aorta on its left and right side to find the posterior intercostal arteries branching from the aorta.

Which posterior intercostal arteries are longer: left or right? Why?

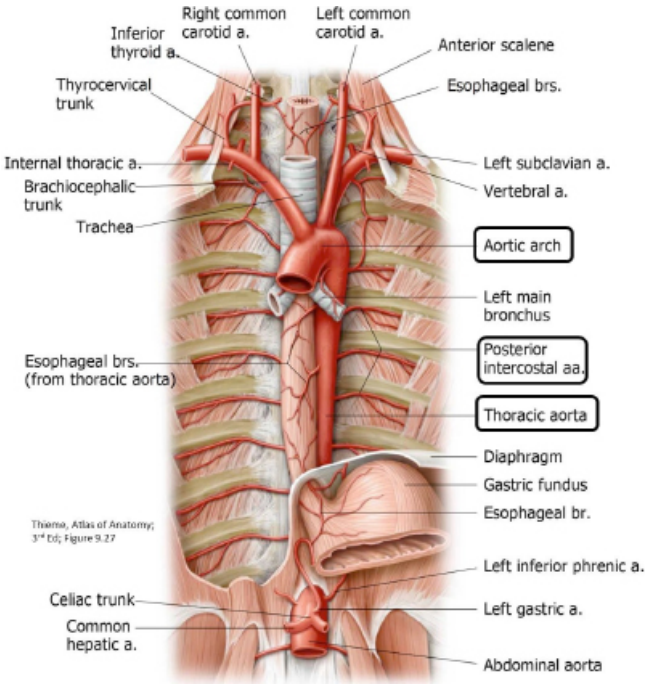

Figure 19.17.

Clean the anterior surface of the esophagus.

See if you can trace the **left** and **right vagus nerves** on to the esophagus. The vagi branch and rebranch on the esophagus, contributing nerve fibers to the **esophageal plexus**. The **esophageal plexus** is a network of nerves fibers on the esophagus—it is composed of autonomic nerve fibers—both sympathetic (from the sympathetic trunk) and parasympathetic (from the vagi).

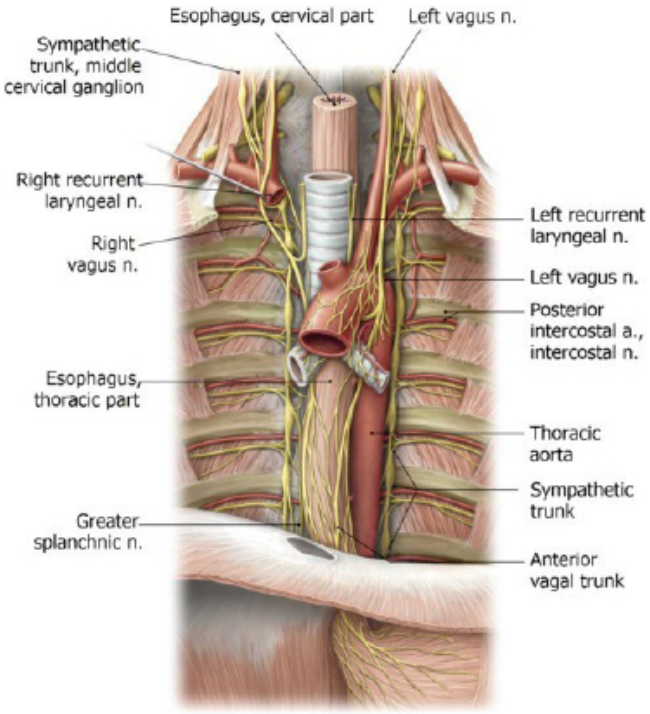

Figure 19.18. A, Esophageal plexus Esophageal plexus in situ. Anterior view. From: Gilroy, Atlas of Anatomy, 2nd ed., Illustrator: Wesker/Voll ©2018 Thieme Medical Publishers, Inc. All rights reserved.

Locate and clean the thoracic duct.

The thoracic duct is in the "Bermuda Triangle" of the posterior mediastinum. The three corners of the triangle are made up of the **esophagus, azygos vein**, and **descending aorta.** It is pale in color (why—what does it carry?) and somewhat beaded in appearance—its diameter is about the width of the tip of a blunt probe.

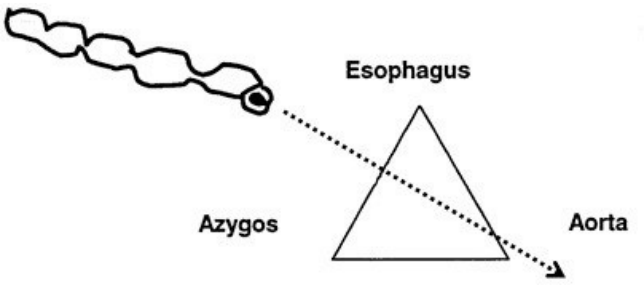

Figure 19.19.

Have you heard the one about the "four fowls" of the mediastinum?

Yeah, there's:

- the vay-GOOSE
- the a-zy-GOOSE,
- the esoph-a-GOOSE,
- and the thoracic DUCK!

Hey—clean anatomy jokes are hard to come by!

The thoracic duct **commences in the abdominal cavity roughly at L-2**. It terminates in the root of the neck on the left side, by joining the union of the **left internal jugular and subclavian veins** (**left venous angle**).

The thoracic duct drains about 75% of the body's lymph. Can you describe the body regions that it drains?

The other 25% of the body is taken care of by the **right lymph duct**.

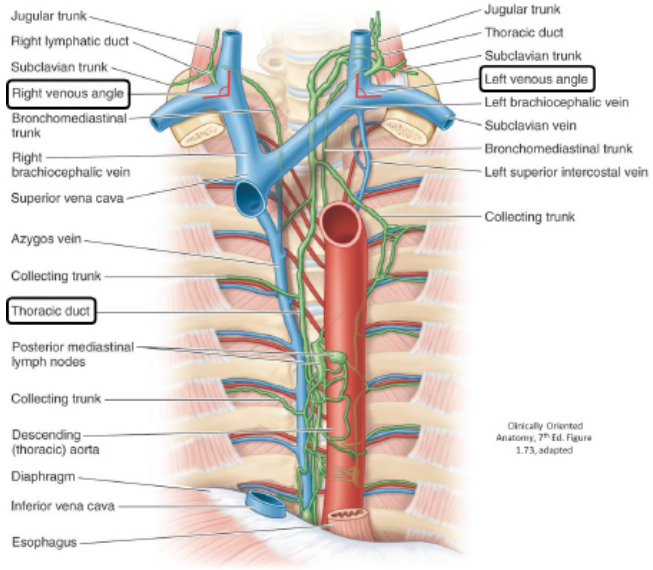

Figure 19.20. Course of thoracic duct. Note its termination in the left jugulosubclavian angle.

How does the thoracic duct pass from the abdominal cavity into the thoracic cavity? (Be sure to name the specific opening it passes through!)

Clean and examine the sympathetic trunks.

On one side of the vertebral column, use forceps and blunt tools to clean off the loose connective tissue around the **sympathetic trunk**. This is tedious work so don't worry about creating a masterpiece.

One old dissection trick is to rub the area with the blunt end of your scalpel handle to liquefy the fatty tissue a bit—then wipe the area down with paper towels to remove the liquid fatty tissue.

The sympathetic trunk is part of the autonomic nervous system (ANS). It is a bilateral structure composed of interconnected **sympathetic** (**chain**) **ganglia**.

Trace the sympathetic trunk from the superior thoracic aperture down to the diaphragm.

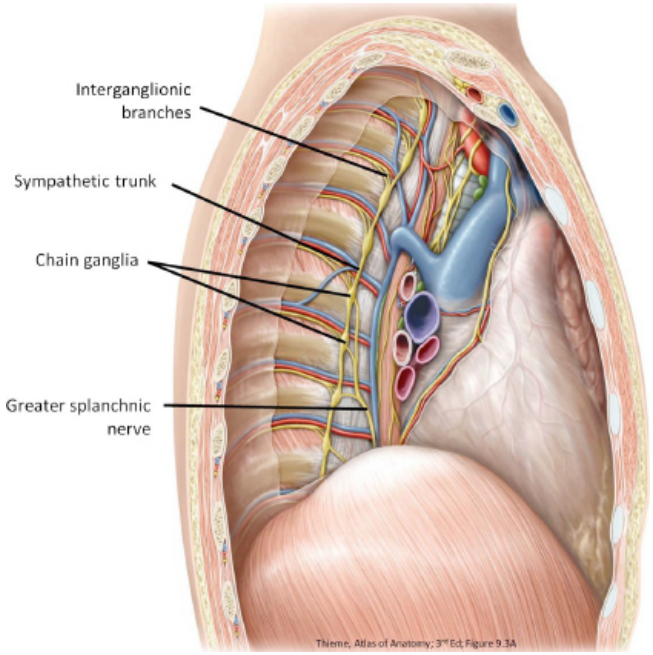

Figure 19.21. Sympathetic trunk: Right lateral view.

Recall that autonomic innervation pathways always involve two neurons. Regarding the pathway to the heart: Where are the cell bodies of the postganglionic sympathetic neurons that innervate the heart? Why are they located here? (Hint: think embryology!)"

Clean and identify the external features of the heart.

EXAMINE the external anatomy of the heart.
The heart is a modified blood vessel, so it has three layers (as vessels do).

The outer layer is the **epicardium** (aka = **visceral layer of serous pericardium**). It is a serous membrane = a single layer of epithelial cells (mesothelium) supported by a layer of connective tissue (which often contains considerable adipose tissue).

What are the other two layers of the heart?

Locate these features:

- Apex
- Base
- **Sternocostal surface**
- **Diaphragmatic surface**
- **Left** and **right pulmonary surfaces**
- **Inferior border**

Which chambers of the heart are associated with each of the above surfaces and borders?? We'll give you a hint and a head start: the Base of the heart is formed by the left atrium.

- Locate the **left and right auricles**. Clinicians sometimes call these the atrial appendages. The auricles ("ear-shaped") are parts of the atria.
- The **coronary sulcus** is an external groove that separates the atria from the ventricles. It is filled with blood vessels and lots of epicardial fat.

- The **interventricular sulci (anterior and posterior)** are landmarks on the sternocostal and diaphragmatic surfaces, respectively. They indicate the location of the interventricular septum within the heart and can be used to demarcate the locations of the ventricles externally. They are filled with vessels.

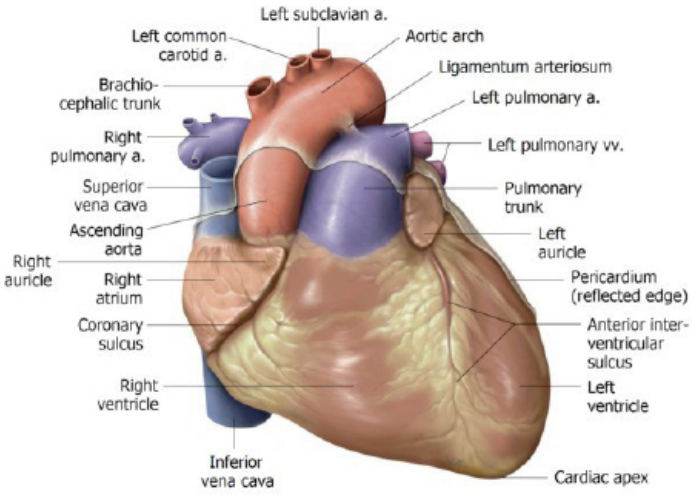

Figure 19.6. Surfaces of the heart. Anterior (sternocostal) surface. From: Gilroy, Atlas of Anatomy, 2nd ed., Illustrator: Wesker/Voll © 2018 Thieme Medical Publishers, Inc. All rights reserved.

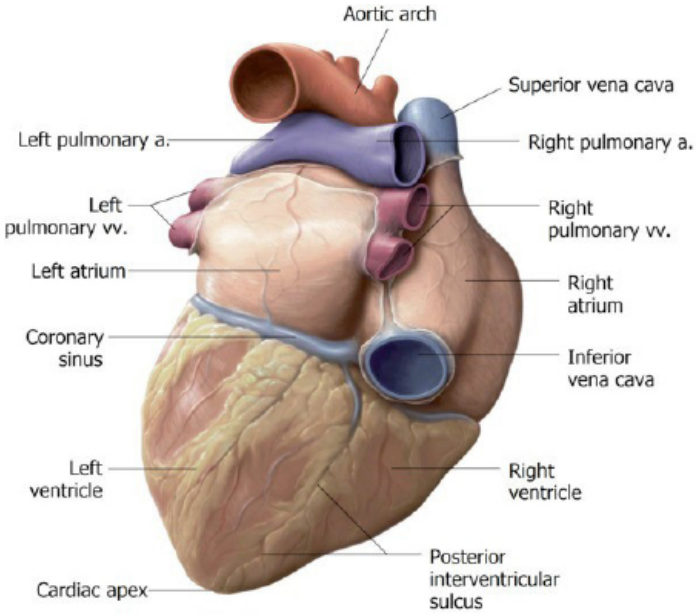

Figure 19.23. Surfaces of the heart. Inferior (diaphragmatic) surface. From: Gilroy, Atlas of Anatomy, 2nd ed., Illustrator: Wesker/Voll © 2018 Thieme Medical Publishers, Inc. All rights reserved.

EXAMINE THE CHEST RADIOGRAPH HERE.

The **left** and **right borders** of the heart are clinical entities that are revealed against the dark lung fields adjacent to the heart. These borders are curved convex laterally.

Which chamber forms most of the left border?

Which chamber forms the right border?

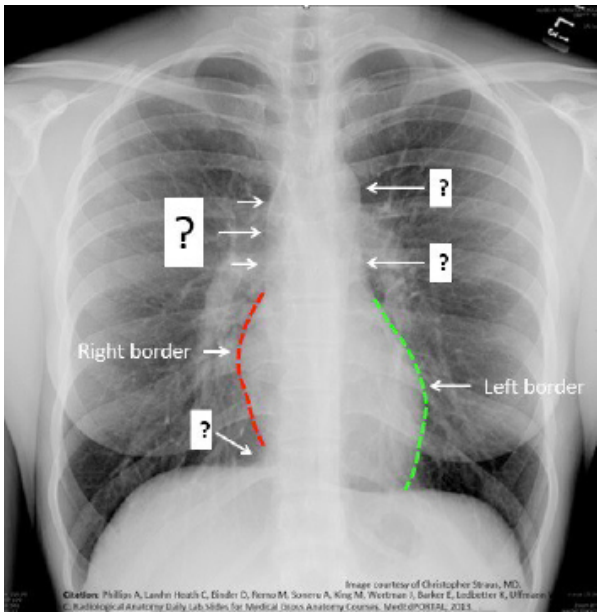

Figure 19.24.

Which vessels merge with the left and right borders of the heart to complete what is called the "cardiac silhouette"?
(Example = can you see the SVC (above) and the IVC (below) merging with the right border of the heart? What structures are seen on the left side?)

Clean and identify the coronary arteries and cardiac veins.

Use blunt dissection with fingers, forceps, probes, and scissors to remove the epicardium from the surface of the heart. Use paper towels to wipe up fat. It can be a messy job!

Clean and trace the right coronary artery.

1 In the **coronary sulcus**, find the **right coronary artery** (RCA) leaving the ascending aorta *under the right auricle*. Clinicians refer to this part of the RCA as the **"right main" coronary artery**.

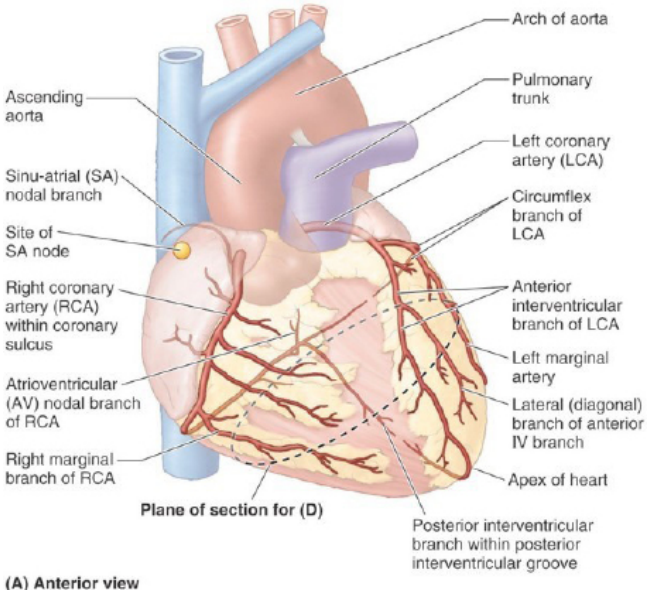

Figure 19.25.

2 Follow the RCA downward in the coronary sulcus and find the **right marginal artery** along the inferior border of the heart.

3 Continue following the RCA onto the diaphragmatic border of the heart—it terminates in the posterior interventricular sulcus as the **posterior interventricular artery** (**posterior descending artery**).

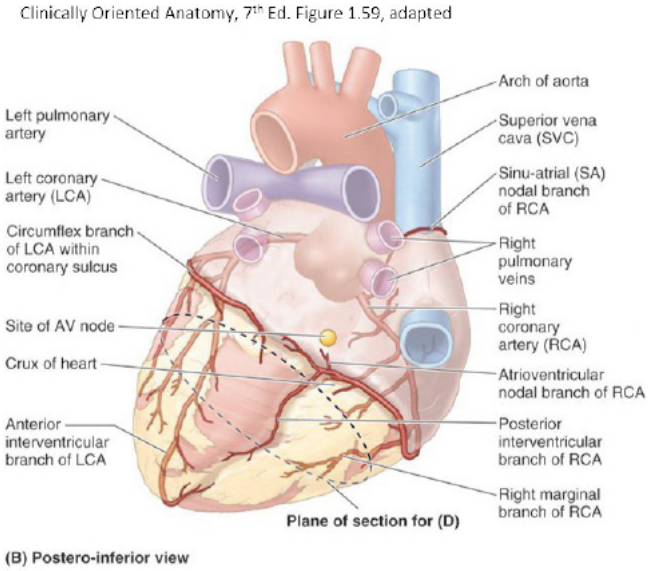

Figure 19.26.

This occurs in the right dominant pattern of coronary circulation.

Which cardiac vein runs parallel with the posterior descending artery in the posterior interventricular sulcus?

Clean and trace the left coronary artery and its major branches.

Find the (short) **left coronary artery** leaving the aorta posterior to the pulmonary trunk, under the left auricle. Clinicians refer to this short artery as the **"left main" coronary artery**. It immediately divides into:

- **Circumflex artery** travels in the coronary sulcus to the left and circles onto the left pulmonary surface of the heart.
- **Anterior interventricular artery** (or **left anterior descending artery = LAD**) descends in the anterior interventricular sulcus towards the apex of the heart.

The **great cardiac vein** travels with the anterior interventricular artery. Remember: "great aunt" (aunt = anterior).

Identify the Coronary Sinus.

Find the **coronary sinus** in the coronary sulcus on the diaphragmatic surface of the heart, below the left atrium (base). Most of the cardiac veins of the heart drain into the coronary sinus. The three largest of these are:

- **Great cardiac vein** (parallels anterior interventricular artery)
- **Middle cardiac vein** (parallels posterior interventricular artery)
- **Small cardiac vein** (parallels right marginal artery)

Coronary Artery Dominance

Concept of coronary artery "dominance": the coronary artery that gives rise to the **posterior interventricular artery** is said to be the dominant artery. The right dominant pattern is by far the most common (~70-80%). The other patterns are left dominant and co-dominant.

In a right dominant pattern, the coronary arteries supply these regions of the heart:

- **Right coronary artery**: Supplies the right atrium and most of the right ventricle; SA and AV nodes; posterior part of interventricular septum.
- **Left coronary artery**: Supplies the left atrium and most of the left ventricle; anterior part of the interventricular septum; AV bundle and bundle branches.

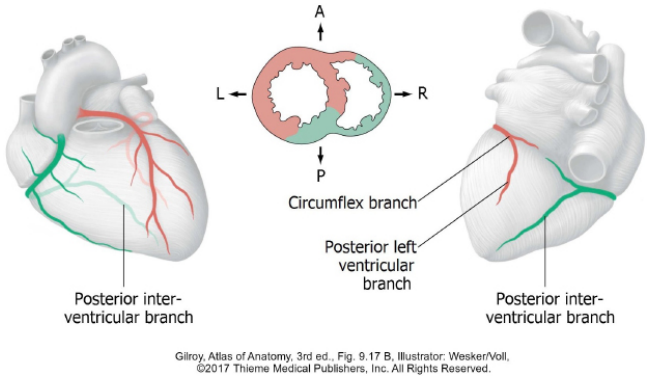

Figure 19.27. Blood supply patterns: Right dominant hearts.

Open the heart chambers and inspect the internal anatomy of the heart.

For consistency, examine Figure 19.28 and follow the instructions for opening the heart chambers.

1. **Atria:** Use scissors to cut flaps and open the right and left atria. (See Figure 19.28.)
2. **Ventricles:** Use scalpel or scissors to carefully open the ventricles as shown. (See Figure 19.28.)
   - **Right ventricle:** Cut an upside-down U in the anterior surface of the right ventricle and fold the flap of heart wall down. Don't cut into the pulmonary trunk. As you pass down along the right border of the interventricular sulcus, don't cut too deeply or you will sever the **moderator band** in the right ventricle.

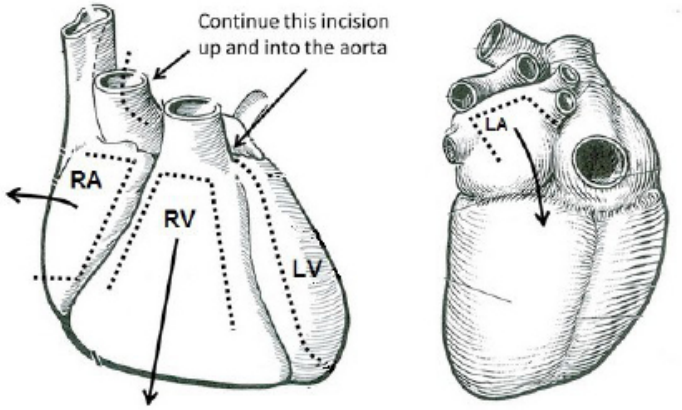

Figure 19.28.

- **Left ventricle:** With a scalpel, start your incision near the apex and proceed upwards to the left of the interventricular sulcus, passing behind the pulmonary trunk and continuing your incision into the ascending aorta. You will have to transect the left coronary artery as you do so.

3 Carefully clean out any **clotted blood** in the chambers. Take care not to rip the chordae tendinae or the valves. Put the clotted blood into the orange tissue containers along with the other tissue waste.

POINTS TO PONDER

The internal atria have smooth and rough parts.

Smooth anatomy is present where the venous blood enters the atria. The embryonic process of intussusception incorporated nearby embryonic veins into the walls of the atria, forming the definitive smooth parts.

The rough parts of the atria (containing the pectinate muscle) are derived from the embryonic trabeculated primitive atrium.

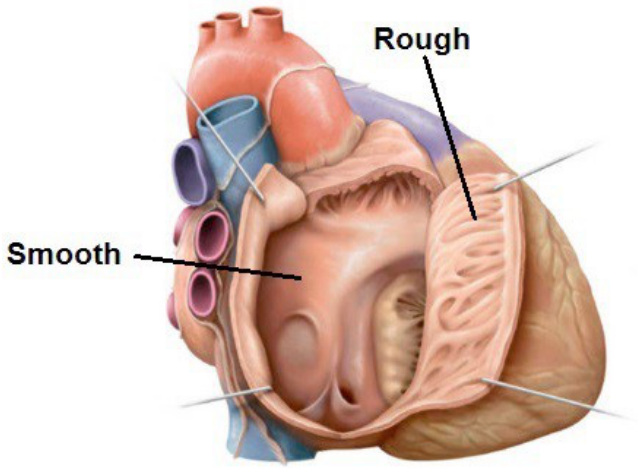

Figure 19.29.

The internal ventricles have inflow and outflow portions.

Inflow parts are directly below the atrioventricular valves. They receive the blood from the atria. The anatomy of the inflow parts is rough and presents features like trabeculae carneae.

Outflow portions have smooth anatomy; they are located below the semilunar valves. Blood enters the great arteries from the outflow portions.

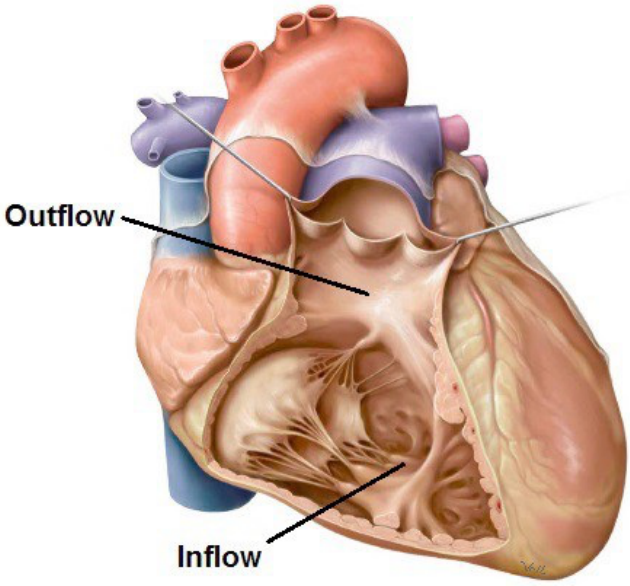

Figure 19.30.

Right Atrium

IDENTIFY:

- Openings of **SVC**, **IVC**, and **coronary sinus**
- **Sinus venarum** (the smooth part of the right atrium)
- Right auricle with **pectinate muscle**
- **Crista terminalis**= the junction of the smooth and rough parts of the right atrium.
- In the **interatrial septum** find the **fossa ovalis** and the ridge above it, the **limbus fossae ovalis**.

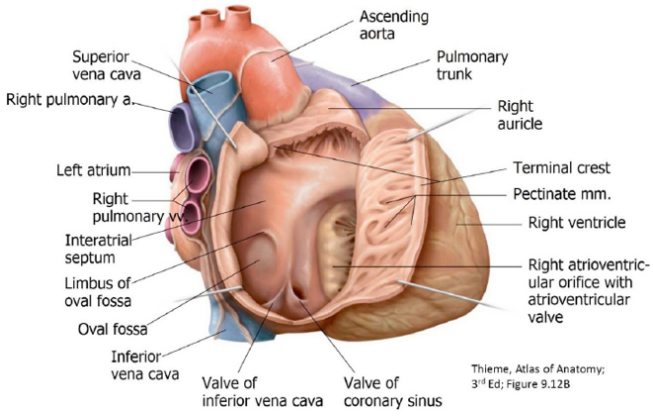

Figure 19.31.

Right Ventricle

IDENTIFY:

- **Tricuspid valve** (Right AV valve) with **anterior**, **posterior**, and **septal cusps**
- **Trabeculae carneae**
- **Papillary muscles**
- **Tendinous cords (chordae tendineae)**
- **Septomarginal trabecula** (aka = **Moderator band**)—contains a large portion of the **right bundle branch**, part of the heart's conducting system.
- **Infundibulum** (aka = conus arteriosus)—this is the outflow portion of the right ventricle
- **Pulmonary semilunar valve** with **right**, **left**, and **anterior cusps**
- Interventricular septum

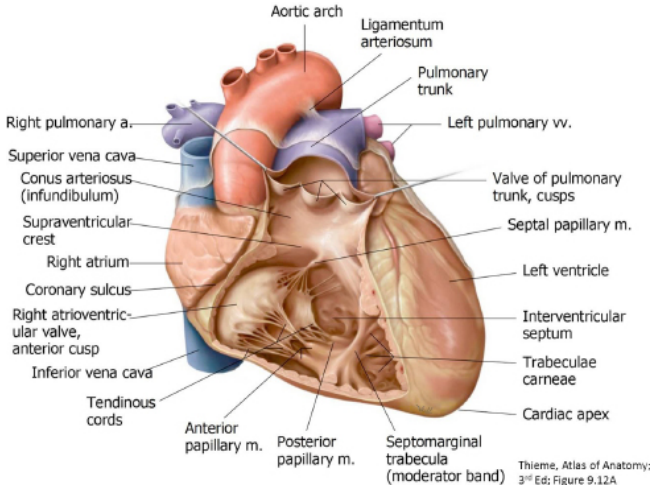

Figure 19.32.

Left Atrium

IDENTIFY:

- Externally, the left atrium forms the **base** of the heart
- Four **pulmonary veins** (open into the smooth part of the atrium)
- **Left auricle** with pectinate muscles
- Interatrial septum

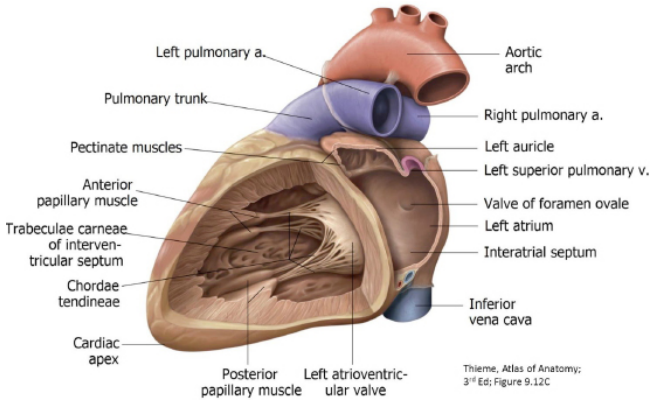

Figure 19.33.

Left Ventricle

IDENTIFY:

- **Mitral valve** (Left AV valve) with **anterior** and **posterior cusps**
- **Trabeculae carneae**
- **Papillary muscles**
- **Tendinous cords (chordae tendineae)**
- **Aortic vestibule—**this is the outflow part of the ventricle
- **Aortic semilunar valve** with **right**, **left**, and **posterior cusps**
- **Interventricular septum**

QUESTIONS ON ATRIOVENTRICULAR VALVES

What is their status during systole: open or closed?

What is their status during diastole?

What are the functions of the papillary muscles and tendinous cords?

The Semilunar Valves

The aortic valve has already been laid open by the incision you made earlier to open the left ventricle. Spread open the walls of the ascending aorta to demonstrate the architecture of the **aortic semilunar valve** (aortic valve). Peer down into the pulmonary trunk from above to inspect the **pulmonary semilunar valve** (pulmonic valve).

- The **pulmonary valve** has **right**, **left**, and **anterior cusps**
- The **aortic valve** has **right**, **left**, and **posterior cusps**
- Behind the three **aortic semilunar cusps** are swellings of the aortic wall called the **aortic sinuses** (right, left, and posterior).
- The **orifice of the right main coronary artery** is in the **right aortic sinus**. Verify this by inserting a probe into the right coronary artery.

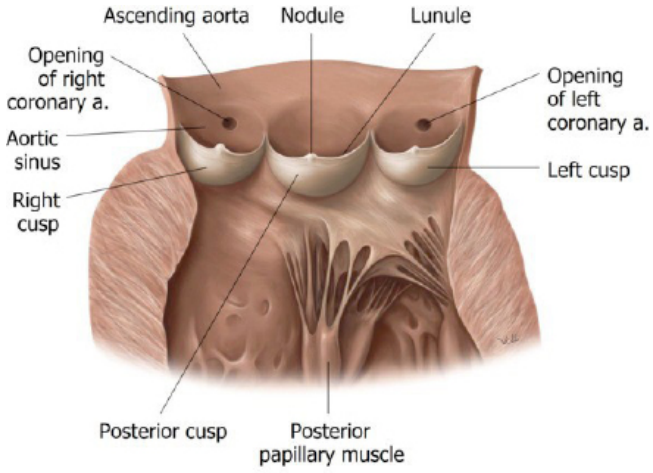

Figure 19.34.

- The **orifice of the left main coronary artery** is in the **left aortic sinus**. Verify this by inserting a probe.
- The posterior aortic sinus is empty—no coronary artery opens here. Thus, clinicians call the posterior cusp the "non-coronary" cusp.

MEMORY AID

Both valves have right and left cusps. If you remember that the pulmonary trunk is located anterior to the ascending aorta, then you will remember that the pulmonary valve has an anterior cusp, while the aortic valve has a posterior cusp.

QUESTIONS ON AORTIC AND PULMONARY VALVES

Are they open or closed during systole? During diastole?

Chalk Talk

Let's have some fun tracing the flow of blood through the heart. Start this exercise in the right atrium = trace the flow of blood through the right side of the heart—to the lungs—back to the left side of the heart—then out to the tissues of the body via the aorta. Name all the valves and great vessels the blood passes through.

Interatrial and Interventricular Septa

Place an index finger in one atrium and thumb in the other and grasp the **interatrial septum** between them.

- Feel the **fossa ovalis**.

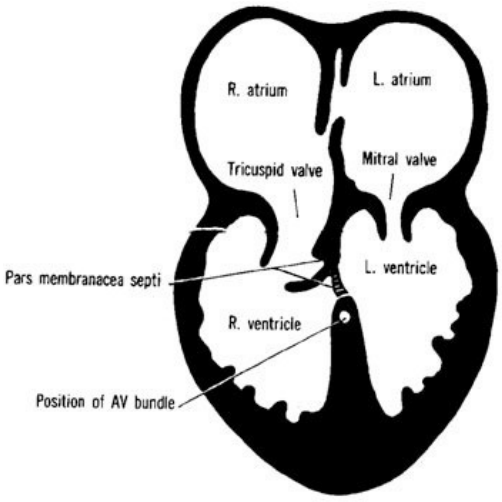

Figure 19.35.

> **Clinical correlation**
>
> The fossa ovalis marks the location of a right-to-left shunt in the fetus. What was this opening called in the fetus?
>
> A ridge, the limbus fossae ovalis, arches above the fossa ovalis. Which embryonic structure (septum) formed the limbus?

Do a similar thing in the two ventricles.

- Feel low in the interventricular septum. This thick portion is the **muscular interventricular septum**.
- Work your way up high near the attachment of the septal cusp of the tricuspid valve in the right ventricle. How does the IV septum feel here? It should be much thinner—this is the **membranous interventricular septum**.

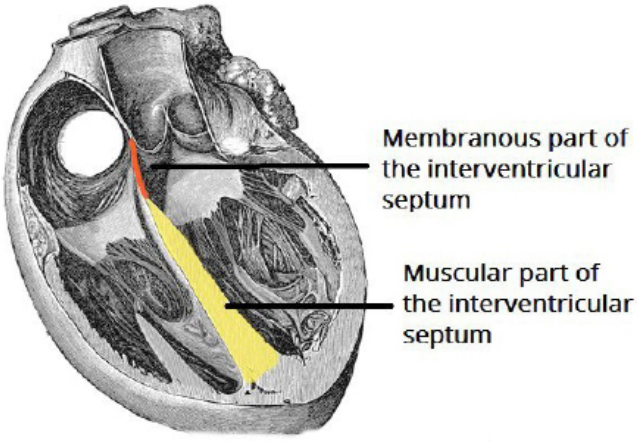

Figure 19.36.

The septal cusp attaches to the membranous IV septum at its midpoint.

- Above the attachment of the septal cusp, the IV septum actually overlaps a bit of the right atrium.
- Place your index finger high up in the **aortic vestibule** (outflow portion) of the left ventricle and your thumb in the right atrium.
- Pinch down—between thumb and index finger is the **atrioventricular portion of the membranous interventricular septum**. Crazy!

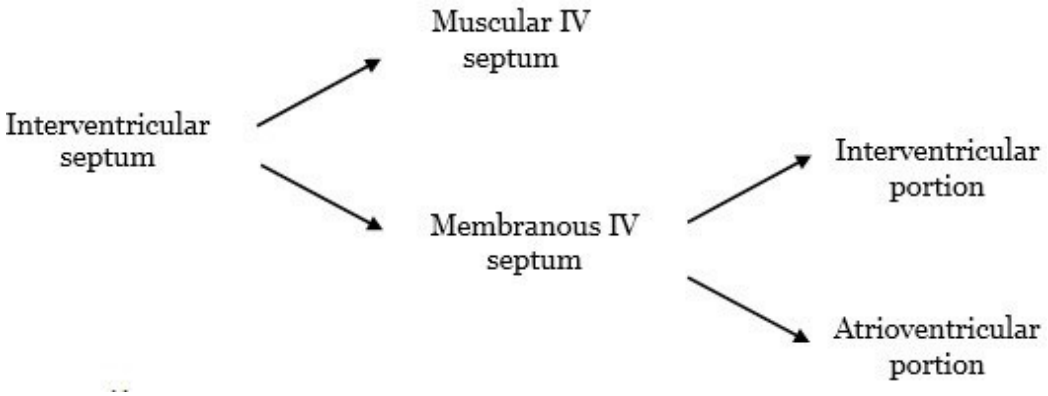

Figure 19.37.

! When you have finished this session, return the lungs, heart, and chest plate to your cadaver. Clean off trays and tabletops, and make sure all tissue scraps go into the orange tissue containers.

CHECKLIST, LAB #19

REVIEW AND MAKE SURE YOU HAVE IDENTIFIED EACH OF THE STRUCTURES BELOW.

PERICARDIUM & HEART

- ☐ Fibrous pericardium
- ☐ Parietal layer of serous pericardium

- [ ] Visceral layer of serous pericardium
- [ ] Pericardial cavity
- [ ] Transverse pericardial sinus
- [ ] Oblique pericardial sinus

SUPERIOR MEDIASTINUM

- [ ] Superior thoracic aperture
- [ ] Trachea
- [ ] Esophagus
- [ ] L & R brachiocephalic veins
- [ ] Superior vena cava
- [ ] Aorta: ascending, arch, and descending
    - [ ] Brachiocephalic artery (trunk)
    - [ ] L common carotid artery
    - [ ] L subclavian artery
- [ ] Ligamentum arteriosum
- [ ] L & R phrenic nerves
- [ ] L & R vagus nerves