

AP2, Lab 3 – Coronary Vessels, Valves, Sounds, and Dissection

[PROJECT 1]: BLOOD SUPPLY TO THE MYOCARDIUM (See images p. 681-685 / 665-669)

The myocardium is not nourished by the blood while it is being pumped through the heart chambers.

Instead, **CORONARY ARTERIES and VEINS** visible on the surface of the heart supply nutrient rich and oxygen rich blood to (and from) the working myocardial muscle tissue.

Two main arteries feed the heart: **R and L CORONARY ARTERIES**.

- They both originate from the aorta very low at the level of the aortic SL valve. Find these on the heart models. They might actually be covered by fat or the pulmonary trunk where they emerge from the aorta.

The R and L coronary arteries both have branches that feed parts of both ventricles.

Which ventricle is the pump for the systemic circuit? _____ Our primary concern is blood supply to this ventricle.

Identify the **R CORONARY ARTERY (RCA)** by following the border along the upper edge of the RV and lower edge of the RA. Trace its branches far enough to see how it supplies blood to the inferior and posterior walls of the LV.

- It supplies blood to the **SA node** in 55% of people and to the **AV node** in 90% of people.
 - If you were to lose BF to the SA node what arrhythmia (of the 3 you learned) would you have and approximately what HR? _____. Explain.
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Identify the **L. CORONARY ARTERY (LCA)** [Most of this vessel is hidden under the pulmonary trunk]

Note that as soon as it emerges from under the pulmonary trunk it spits into two main branches:

1st Branch:

- Identify the **L Anterior Descending artery (LAD)** (a.k.a. **Anterior Interventricular artery**) that descends on the anterior side of heart in the **IV sulcus**.
 - Trace its branches to see how this artery feeds the anterior wall of LV as well as the **interventricular septum**
 - What portions of the conduction system are in the IV septum?
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- So why would the LCA or the LAD be nicknamed “THE WIDOW MAKER”?
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2nd Branch:

- Identify **L Circumflex artery** that follows the border between the LA and LV around to the posterior side of the heart.
- It supplies blood to the lateral portion of posterior wall of LV
- It supplies blood to the SA node in 45% of people and to the AV node in 10%

Realize that since the smaller branches of these vessels travel into and through the myocardium they will be occluded during SYSTOLE... and open during DIASTOLE. So, ironically, the myocardium receives a surge of blood flow during diastole – not systole. (...like a sponge fills with water when you stop squeezing.)

The various coronary veins (blue) return blood from the myocardium to the **CORONARY SINUS** on the posterior side of the heart. The coronary sinus then empties into the RA. **Confirm accuracy of above with instructor.**

[Project 2:] From notes given by instructor:

Define:

ATHEROSCLEROSIS

ARTERIOSCLEROSIS

CORONARY ARTERY DISEASE (CAD)

ISCHEMIA

HYPOXIA

ANGINA and ANGINA PECTORIS

INFARCTION

MYOCARDIAL INFARCTION (MI)

OYO: View some online videos and describe the **ANGIOPLASTY** procedure.

What is the benefit?

What is a **STENT**?

PREVENTION OF ATHEROSCLEROSIS

If you want to prevent or slow down the rate of atherosclerosis:

1. Stop smoking. Tobacco smoke accelerates plaque formation.
2. Live an active lifestyle. Exercise raises HDL, the good cholesterol
3. Keep your fat intake to a minimum. Total fats, especially saturated fats raise cholesterol levels.

[PROJECT 3:] FROM NOTES GIVEN BY INSTRUCTOR

INTERESTING POINTS ABOUT HEART VALVES:

- 1) They are totally passive structures. They do not open and close by nerve impulses nor by muscle contractions. Instead, they are pushed and pushed closed by blood flow (BF) resulting from pressure differences.
- 2) Heart valves do not cause blood to flow. Instead they prevent blood from flowing the wrong direction. They prevent the backflow of blood. Blood is allowed to flow through in one direction but not the opposite direction.

HEART SOUNDS - p. 697 / 681 [film clip 10:35275→]

The sounds of the beating heart are often described as “lub-dup” “lub-dup” “lub-dup.”

Closure of the AV valves produces the first, lower pitched and louder sound.

Closure of the two SL valves produces the 2nd, higher pitched sound.

Distinguish between **turbulent BF** and **laminar BF**. Relate this to the heart sounds.

Audio/Video of Heart Sounds:

Heart sounds - Normal

<http://www.youtube.com/watch?v=X0p9GqvaKDw&feature=related>

Heart sounds - abnormal

http://www.youtube.com/watch?v=XvtBpnV_IOE

Transcript of the above for the hearing impaired: lub-dupp Lub-dupp Lub-dupp

NORMAL HEART VALVES (view film clips: 10:38314→, 10:38025→, and frames 1042, 1043, & 998)

ABNORMAL VALVES (A.K.A. VALVE IRREGULARITIES)

VALVE PROLAPSE

VALVULAR STENOSIS

HEART MURMURS

Which heart valve is most likely to have a problem and why? _____

Regardless of which valve is involved or the nature of the valve problem... what is the negative consequence to the heart? (not in text... brain storm)

OYO: Stenosis often causes a “backlog” of blood because passage of blood through the valve is restricted. This backlog often leads to edema. See fig. 18.5 p. 684 / 668

PULMONARY EDEMA (noticed as shortness of breath, SOB) Would suggest a problem with which valve(s)? Explain?

SYSTEMIC EDEMA (usually visible first at feet and ankles) would suggest a problem with which valve(s)? Explain?

[Project 4:] DISSECTION OF THE HEART

Identify the **APEX** and the **BASE** of the heart.

Identify the **ANTERIOR SIDE** of the heart by locating the **INTERVENTRICULAR SULCUS** that runs diagonally from top left to lower right. Then find the **PULMONARY TRUNK** passing out of the **RV** towards the upper left. (Remember: R & L belong to the patient.)

Because they sometimes cut so close to the heart when removing it they often cut off the **SUPERIOR AND INFERIOR VENA CAVA** and sometimes even the top portions of the **ATRIA**. The vena cavae often fuse into one vessel before entering the **RA**. You should find a large “hole” into the **RA** where they entered. **PULMONARY ARTERIES and VEINS** are usually absent for the same reason.

Identify the **R & L ATRIA**. They are much smaller than what you might expect and resemble spongy lung tissue. They appear to be attached to the heart rather than part of it. Are these wimpy or what?

Identify the **AORTA**. It comes out of the **LV**, originating deep to the pulmonary trunk, and then emerges slightly posterior to the pulmonary trunk. The walls are thicker and it stands more erect than the pulmonary trunk.

Depending on how the heart was cut out of the thoracic cavity you may or may not also see the very first 3 vessels that branched off the aortic arch supplying blood to the R shoulder and head. What are their names? _____

****Confirm your identifications of the above with your instructor ****

2. Gradually cut away portions of the **PULMONARY TRUNK** and look down toward the **RV** to find the **PULMONIC VALVE**. At the junction between the **RV** and the pulmonary trunk use your metal probe to find 3 very thin flaps of membrane-like tissue. These 3 flaps make up the **PULMONARY SEMILUNAR VALVE**. Pull them together to see how they would allow blood to flow out of the **RV** but would keep blood from flowing back down into the **RV**.

3. Bisect the heart along the **CORONAL (FRONTAL) PLANE** separating it into anterior and posterior halves.

You should now be able to view:

BOTH AV VALVES, L & R ATRIA, L & R VENTRICLES, CHORDAE TENDINEAE, PAPILLARY MUSCLES,	IV SEPTUM, ENDOCARDIUM, MYOCARDIUM, EPICARDIUM.
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Compare the thickness of lateral walls of the RV and LV. Account for the difference.

You may or may not be able to see the **AORTIC SEMILUNAR VALVE**. If not, cut away tissue as necessary to expose it. Locate, behind the valve flaps, the entrances to the **RIGHT CORONARY ARTERY (RCA)** and **LEFT CORONARY ARTERY (LCA)**. Insert your metal probe and trace the vessels to the surface of the heart. Excess fat might make this difficult. Go as far as you can.

On the posterior side of the heart locate the **CORONARY SINUS** which opens into the RA. The best way is to look in the RA and find a hole that leads to a passageway on the border between the atria and ventricles. What's the role of the coronary sinus?

Look inside the **atria** in several places. Are the surfaces smooth and flat? _____
Do you see how blood would be likely to 'pool' here and coagulate? _____
If a clot forms in the RA and then breaks free and travels it would likely plug a vessel in the _____. What should you call this? _____
If the clot forms in the LA where might it to? _____
What drug is often prescribed to patients with atrial fibrillation to reduce the chances of clot formation? _____. Many take this drug for the rest of their lives.

****Confirm your identifications of the above with your instructor. ****

Feel free to do any other cutting and exploring you care to.