Lab Activity 23

Cardiac Anatomy
Cardiac Muscle Histology

Intercalated disc: contains many gap junctions connecting the adjacent cell cytoplasm, creates a functional syncytium

Branching cells

Once central nucleus
External View

- aorta
- brachiocephalic artery
- pulmonary trunk
- pulmonary veins
- inferior vena cavae
- superior vena cavae
- rt. auricle
- coronary sinus
- rt. ventricle
- anterior inteventricular sulcus
- left ventricle
- left auricle
- anterior
Position in Thorax

Base: Where the Great Vessels enter and exit

Apex: points inferiorly, anteriorly and to the left
Position of Heart

Hint: Nipples are at the 4th intercostal space

Apex at 5th intercostal space during ventricular systole (contraction)

Point of Maximum Impulse: PMI is the apex on surface anatomy
Heart Wall

- Pericardium
- Myocardium

- Fibrous pericardium
- Parietal layer of serous pericardium
- Pericardial cavity
- Visceral layer of serous pericardium (epicardium)
- Myocardium
- Endocardium
- Heart wall
- Heart chamber

Copyright © 2001 Benjamin Cummings, an imprint of Addison Wesley Longman, Inc.
Chambers: External View

Anterior View

Posterior View
Heart Chambers

- **Papillary muscles** anchor the valves in the ventricles.

- **Trabeculae carneae** are the “waffle like” muscular ridges in the ventricles.
Vessels

Right Pulmonary Artery (branches)

Superior Vena Cava

Coronary Sinus

Inferior Vena Cava

Pulmonary trunk

Left Pulmonary Artery
Vessels: Posterior View

- Left Pulmonary Artery
- Superior Vena Cava
- Right Pulmonary Artery
- Right Atrium
- Inferior Vena Cava
- Coronary Sinus
Vessels

- Ascending Aorta
- Aortic Arch
- Left Pulmonary Vein (Right not visible)
- Descending Aorta
Vessels: Posterior View

- Left Pulmonary Veins
- Aortic Arch
- Left Atrium
- Right Pulmonary Veins
Valves

Right Side of Heart
- **Tricuspid**: Between Right Atrium and Right Ventricle
- **Pulmonary**: Between Right Ventricle and Pulmonary Trunk

Left Side of Heart
- **Mitral**: Between Left Atrium and Left Ventricle
- **Aortic Valve**: Between Left Ventricle and Aorta

Chordae Tendineae are only on the Tricuspid and Mitral Valves (valves between atrium and ventricle)
Valves

- **Pulmonary**
- **Tricuspid**
- **Aortic (behind the pulmonary trunk)**
- **Mitral**
- **Chordae tendineae**

Consist of 2-3 flaps of connective tissue covered by endothelium
• When the ventricles are **relaxed (diastole)**, the valves between the atria and ventricles are **Open: Mitral and Tricuspid**

• The valves leading out of the heart are **Closed: Pulmonary and Aortic valves**
• When the ventricles are **contracted (systole)**, the valves between the atria and ventricles are **Closed: Mitral and Tricuspid**

• The valves leading out of the heart are **Open: Pulmonary and Aortic valves**
Fetal Circulation Remnants

Fossa Ovalis
Fetal Circulation Remnants

Ligamentum Arteriosum
Conduction System

(a) The conducting system

- Sinoatrial (SA) node
- Internodal pathways
- Atrioventricular (AV) node
- AV bundle
- Bundle branches
- Purkinje fiber
**Impulse Conduction**

**Step 1**
SA node activity and atrial activation begins
*Time = 0*

**Step 2**
Stimulus spreads across the atrial surfaces and reaches the AV node
*Time = 50 msec*
Step 3
There is a 100-msec delay at the AV node. Atrial contraction begins
Time= 150 msec
Impulse Conduction

**Step 4**
The impulse travels along the interventricular septum within the AV bundle and the bundle branches to the Purkinje fibers to the papillary muscles of the right ventricle

Time = 175 msec
Impulse Conduction

**Step 5**
The impulse is distributed by Purkinje fibers and relayed throughout the ventricular myocardium. Atrial contraction is completed, and ventricular contraction begins.

Time= 225 msec
Coronary Circulation: Anterior View

- Right Coronary Artery
- Left Coronary Artery
- Circumflex Artery
- Left Anterior Descending
- Great Cardiac Vein
Coronary Circulation: Posterior View

- Circumflex Artery
- Marginal Artery
- Right Coronary Artery
- Coronary Sinus
- Posterior Cardiac Vein
- Posterior Descending Artery
- Middle Cardiac Vein
- Marginal Artery

Diagram showing the coronary circulation with labeled arteries and veins.
Terminology

- **Systole**: The contraction of the heart muscle, especially the ventricle.
- **Diastole**: The relaxation of the heart muscle.
- **Cardiac Cycle**: A complete heartbeat consisting of systole and diastole of both atria plus systole and diastole of both ventricles.
Heart Sounds

• One heart beat is described as “lubb-dupp”
• S1 “lubb”: This is the closing of the AV valves: Mitral and Tricuspid
  • Marks the beginning of ventricular contraction (beginning of systole)
• S2 “dupp”: This is the closing of the Pulmonary and Aortic valves
  • Occurs at the beginning of ventricular filling (end of systole)
Auscultation

• The sound of the valve closing radiates in the direction the blood is flowing.
• The actual location of the valve is not the best place to listen for it.
The End