

SESSION II: MECHANISMS OF HUMAN DISEASE: LABORATORY SESSIONS
CARDIOVASCULAR PATHOLOGY I

November 5, 2009
10:30 am – 12:00 pm

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GOAL: Describe the basic morphologic and pathophysiologic changes in various conditions of the cardiovascular system. Define (describe) and correlate symptoms and signs of a disease with the structural changes in diseased organs.

OBJECTIVES:

1. Review the normal gross and histologic anatomy of the heart.
2. Describe the morphologic characteristics of myocardial infarction.
3. Describe the morphologic characteristics of acute infectious diseases of the heart.
4. Describe the morphologic characteristics of large blood vessel diseases.

CLINICAL CASES:

1. **Case 1**

A 55-year-old man presents to the emergency room with chest pain radiating to his left arm and dyspnea for two hours. He rates the intensity of the chest pain at 10/10 and describes it as “crushing”. For several months prior to presentation he has had a few episodes of mild chest pain which developed while climbing stairs. The pain resolved within several minutes after resting.

The patient smokes and has been told that his cholesterol is “on the high side”.

On exam, the patient is obese. He is diaphoretic and is grabbing his chest.

As part of his evaluation the ER physician orders an EKG, as well as serum myoglobin and troponin levels.

Myoglobin 106 (0-75ng/mL)

Troponin 1.37 (<0.1ng/mL)

- a. Identify the organs: **Heart/Coronary artery**
- b. Describe the characteristic pathologic features in each organ. **Section of the left ventricle reveals transmural ischemic necrosis (emphasize staining difference between infarct and normal myocardium). The necrotic fibers have lost nuclei and cross striations. The interstitium contains neutrophils and congested blood vessels with some extravasation of RBCs.**

A cross section of the coronary artery reveals occlusion by a recent thrombus. The vessel wall shows modest atherosclerotic changes, including intimal fibrosis, few cholesterol clefts, focus of calcification and infiltrating macrophages.

- c. Diagnosis: **Acute Myocardial Infarct. Coronary Atherosclerosis/Thrombosis.**
- d. Correlate the clinical findings with the pathology.
Typical clinical feature of acute myocardial infarction is crushing substernal pain with radiation.
The several transient episodes of chest pain after walking up stairs represent angina.
- e. What are major risk factors associated with this diagnosis?
Risk factors for atherosclerosis/ischemic heart disease
Nonmodifiable
Increasing age
Male gender
Family History
Genetic abnormalities
Potentially controllable
Hyperlipidemia
Hypertension
Cigarette smoking
Diabetes Mellitus
C-reactive protein
- f. What hereditary disorders are associated with this diagnosis?
Usually they are multifactorial
The also include familial hyperlipidemias

2. Case 2

A 37-year-old Mexican male presents with fever and flank pain.

Several weeks ago, he received treatment from a dentist for severe periodontal disease. He was not prescribed any medication for that procedure.

His past medical history is significant for an episode of joint pains and fever when he was 10-years-old and still living in Mexico. He received some medication at that time but did not follow-up with any doctor after that.

Physical exam revealed a low grade fever and a heart murmur.

- a. Identify the structure (organs): **Cardiac valve/kidney**
- b. Describe the characteristic pathologic changes in each organ.
Section of cardiac valve with attached vegetation. The valve is distorted (thickened) by fibrosis and chronic inflammation. Acute inflammation (necrosis) is superimposed on the old pathology. A large attached vegetation is composed of fibrin, RBC's inflammatory cells and masses of blue bacteria. Section of the kidney demonstrates an ischemic infarct.
- c. List the potential manifestations of this disorder and correlate them with the pathology. List and describe the characteristic cardiovascular clinical findings in patients who have aortic or mitral

valves involved by this pathologic process.

- **Destruction of a valve causing a murmur**
- **Emboli to multiple organs such as the brain (stroke), intestinal tract (infarction/pain) and kidney (asymptomatic or flank pain).**

d. Diagnosis: **Infective Endocarditis/Renal Infarct**

e. Does the patient's past medical history have any significance to his current problem?

The patient may have had rheumatic fever as a ten year old with subsequent rheumatic valvular disease

During dental work he may have developed transient bacteremia which resulted in bacterial seeding of his deformed valve

3. Case 3

A 27-year-old woman presents with shortness of breath, swelling of her feet and difficulty sleeping flat of 4-5 days duration. She has felt her heart beating in a "funny way" for the last two hours. She had a sore throat three weeks ago.

On physical exam she has bilateral basilar lung crackles, hepatomegaly, mild ascites and pedal edema. Her heart rhythm is irregular and tachycardic

a. Identify the organ: **Heart**

b. Describe the characteristic pathologic changes. **Infiltration of the interstitium by mononuclear inflammatory cells, predominantly lymphocytes. Focal necrosis of myocardial fibers.**

c. Correlate the clinical finding with the pathology.

Inflammation/necrosis of the myocardium results in injury and weakens the myocardium causing less efficient contraction.

The patient has symptoms and signs of left and right heart failure

Inflammation and heart chamber dilatation may also induce an arrhythmia.

d. Diagnosis: **Lymphocytic myocarditis**

Preceding viral infections, such as Coxsackieviruses and other enteroviruses, are the most common cause of lymphocytic myocarditis in the United States

4. Case 4 (no virtual microscope slide)

A 63-year-old woman presents with a left-sided headache for 2 weeks. It is throbbing and is intermittently relieved by aspirin. Two days ago she developed blurred vision and diplopia in her

left eye which prompted her to see a physician.

On review of systems, the woman notes that she has malaise, occasional fevers and “achy joints”. On physical exam palpation reveals a thickened, nodular and tender temporal artery.

- a. Identify the structure: **Temporal Artery**
- b. Describe the characteristic pathologic features in the structure. **Mononuclear inflammatory cells are found in the media and adventitia. Three to four multinucleated giant cells are in the wall of the artery.**
- c. Correlate the clinical findings with the pathology. **The headache correlates with the inflammation of the temporal artery. Malaise, fever, and joint pain represents polymyalgia rheumatica syndrome which is often seen in a patient with temporal arteritis.**
- d. Diagnosis: **Temporal Arteritis**

5. Case 5 (no virtual microscope slide)

A 78-year-old man presents with sudden onset of low mid-back pain. His past history is significant for coronary artery disease and coronary artery bypass surgery. On examination, a pulsatile mass can be felt in the lower abdomen

- a. Identify the structure: **Aorta**
- b. Describe the characteristic pathologic features of the specimen.
Complicated atherosclerotic plaques
Dilatation (aneurysmal) of the aorta as a result of destruction/weakening of the media
Mural thrombus may be present
- c. List the possible clinical findings in this disorder and correlate with the pathology.
 - **Back pain – compression of nerves or early rupture**
 - **“Pulsatile” abdominal mass reflects transmission of arterial pressure in the mass**
 - **Abdominal bruits are auscultated and reflect turbulent flow**
 - **A thrill is palpated and reflects turbulent flow**
- d. Diagnosis: **Atherosclerotic Aneurysm of the Aorta**