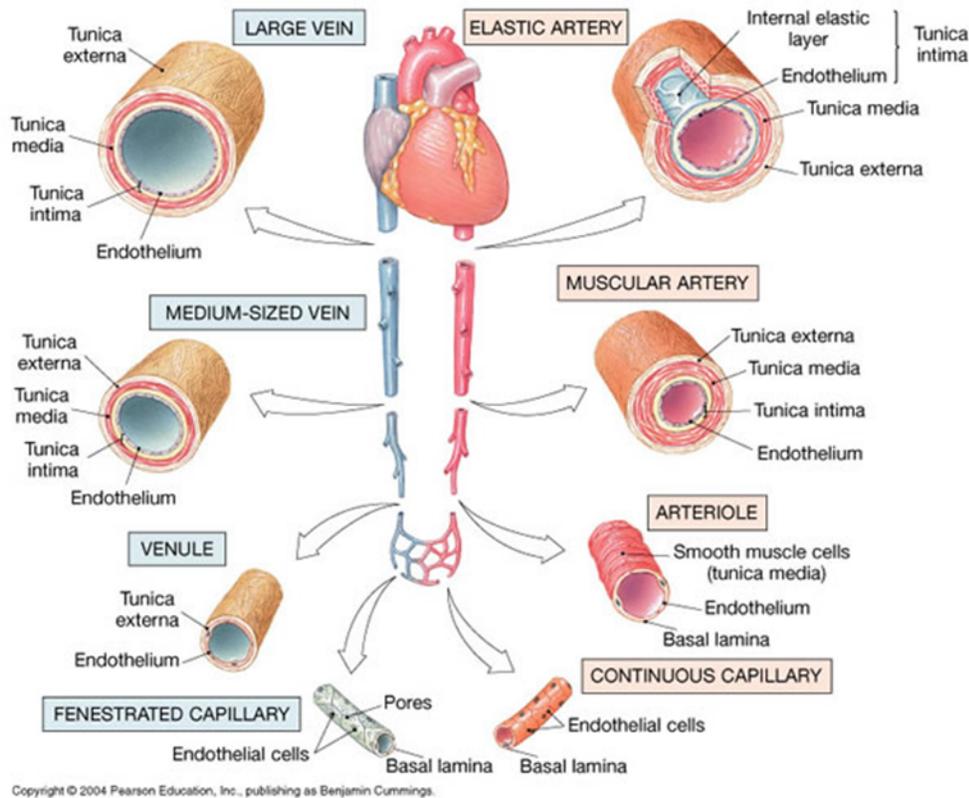


LAB 4: THE MUSCLE AND CARDIOVASCULAR SYSTEM

THE MUSCLE AND CARDIOVASCULAR SYSTEM

The focus of this week's lab will be pathology of the cardiovascular system. The cardiovascular system is composed of the heart and its associated structures as well as the vasculature. Cardiovascular disease is extremely common and the leading cause of death worldwide. Understanding the histology and pathology of cardiovascular disease has been an integral part of developing treatments to help prevent and manage disease.

Many tissues of the cardiovascular system are affected by disease. The arterial system is affected by atherosclerosis, hypertension, dissection, aneurysm, thrombi, and vasculitis. Pay attention to the type of blood vessels involved in different disease processes and the layers present in each vessel type.



Other parts of the cardiovascular system such as the myocardium and valves may also be affected by disease. Myocarditis refers to disease of the myocardium whereas endocarditis refers to valvular disease. As a result, valvular disease often results in murmur formation, whereas parenchymal disease may result in heart failure.

The cases we will cover are:

- Atherosclerosis** Refer to virtual slide p_8
- Hypertension (hyaline and hyperplastic arteriolosclerosis)**-no virtual slide
- Myocardial Infarction (different timepoints)** Refer to virtual slide p_259 heart, recent MI with mural thromb at <https://med-vmicro.med.illinois.edu/v/360/> and virtual slide p_36 heart, infarct at <https://med-vmicro.med.illinois.edu/v/364/>

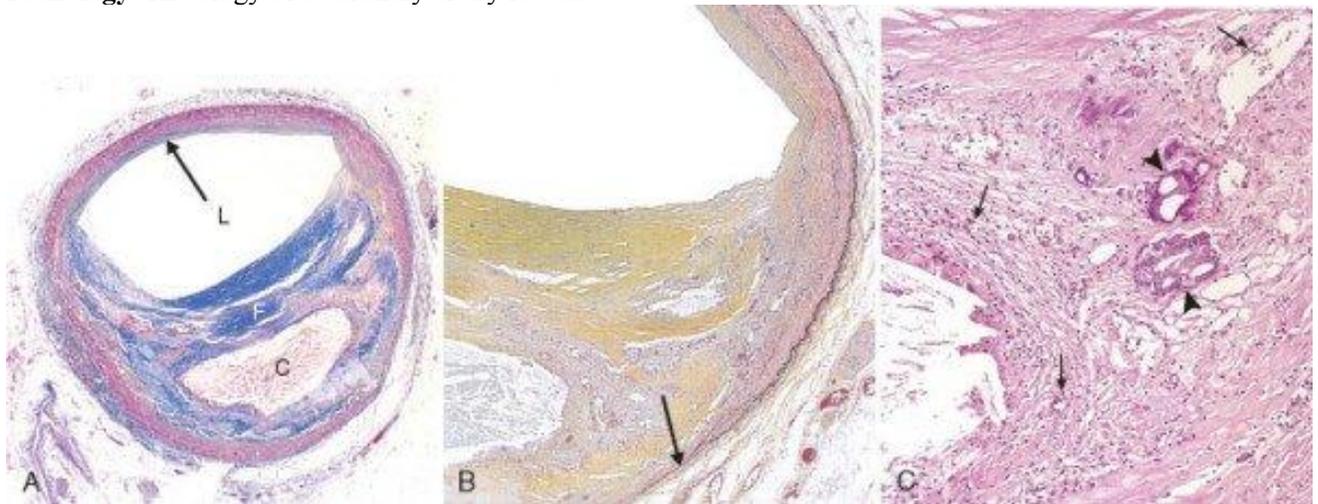
A. ATHEROSCLEROSIS

CC/HPI: A 59-year-old man complains of claudication that is relieved by rest. His symptoms have been occurring for a year. He is a smoker and smokes two packs of cigarettes per day.

PE: Physical exam reveals BP 150/100; diminished peripheral pulses bilaterally; carotid and femoral arterial bruits.

Labs: LDL=160mg/dL, HDL=40mg/dL, total serum cholesterol=250mg/dL.

Pathology: Histology of a coronary artery reveals:



What are the layers of the blood vessel wall?

Which layer is thickened in this sample due to the presence of an atherosclerotic plaque?

Describe the histological components of an atherosclerotic plaque.

What cell types are present in the shoulder of the atherosclerotic plaque?

Where do these cells come from?

B. HYPERTENSION (HYALINE AND HYPERPLASTIC ARTERIOLOSCLEROSIS)

CC/HPI: A 42-year-old man presents with chest pain and a headache. He has a history of labile essential hypertension for a few years.

PE: No fever, BP 230/150. Bilateral papilledema; no focal neurological defects.

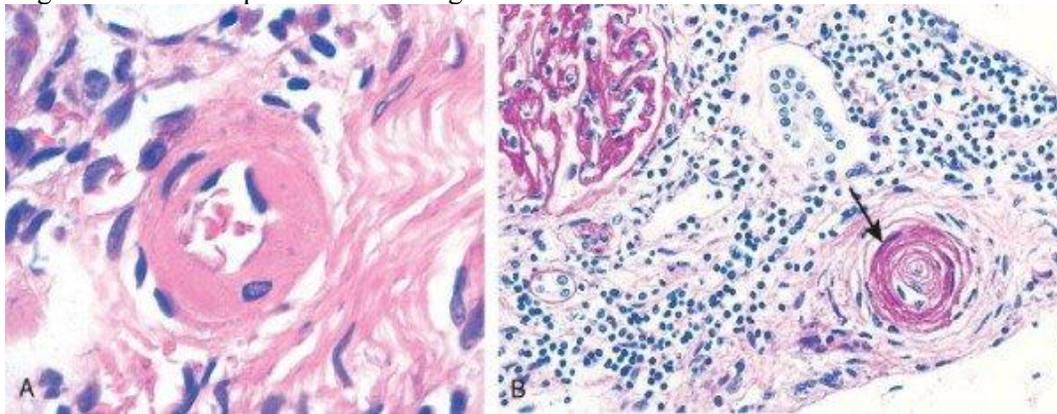
Labs/Imaging: Urinalysis reveals hematuria. Increased serum BUN and creatinine. Left ventricular hypertrophy.

What type of blood vessel is most significant for regulation of blood pressure?

How would luminal narrowing alter vascular resistance in this vessel?

If everything else remained constant, how would this change mean arterial pressure (MAP)? How could this change in total peripheral resistance (TPR) and MAP result in the left ventricular hypertrophy seen in this patient?

Pathology: Representative sections of his arterioles are shown below. The left picture indicates an earlier stage in this disease process and the right is more advanced.



What extracellular matrix feature is thickened (usually by duplication) in the sample on the left?

What cell type has proliferated in the section on the right?

C. MYOCARDIAL INFARCTION

CC/HPI: A 65-year-old white man is brought to the emergency room with nausea, dyspnea, and a crushing substernal chest pain that radiates to his left arm and jaw. The pain has lasted for 30 minutes and is not relieved by rest. One sublingual nitroglycerin tablet did not relieve his pain. He has a history that includes a sedentary lifestyle, moderate hypercholesterolemia, and obesity. He is also diabetic and a smoker.

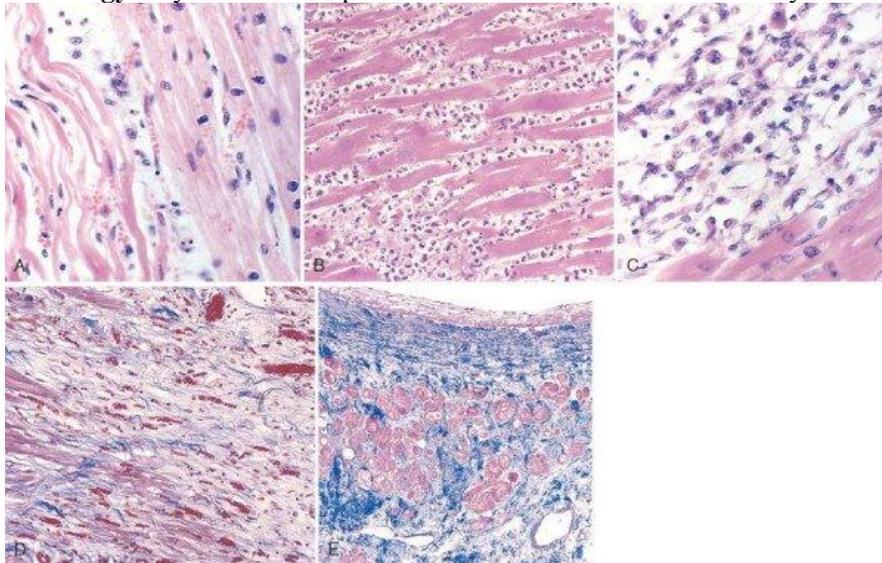
PE: Physical exam reveals hypotension and diaphoresis.

Labs/Imaging: EKG indicates ST elevation with peaking of T waves; subsequent development of inverted T waves and prominent Q waves. Later, ST and T waves normalize. Elevated CK-MB; elevated troponin T and I. Complete blood count shows leukocytosis.

What are CK-MB and troponin T? Why are they high in this patient?

Note: We have provided the EKG information so that interested students can examine the complete presentation of a myocardial infarction, but you do **not** need to go over the EKG information in any detail.

Pathology: Myocardium biopsies taken at different times after a myocardial infarction are shown below:



A: 1 day post infarct. B: 2-3 days. c: 7 days. D: 10 days. E: 2-3 weeks.

What looks different in the sample taken one day after myocardial infarction?

What looks different in the well-healed myocardial infarction?

What cell types have infiltrated at 2-3 days after infarction? What about at 7-10 days after infarction?

What does the sequence of cell infiltration tell you about the progression of healing after an MI?