

Cardiovascular

Atherosclerosis and Dyslipidemia

Arteriosclerosis and Atherosclerosis

Definition: atherosclerosis is thickening of the tunica intima and media of arteries, with deposition of oxidized lipids and other compounds as well as cellular accumulation, proliferation, and calcification of the endothelium. Arteriosclerosis is a broader term that includes atherosclerosis and other types of thickening, hardening or loss of elasticity in arterial walls; atherosclerosis is the primary type of arteriosclerosis

Risk Factors: almost universally present in western population; alcohol abuse, low nutrient/high kcal diet, high saturated fat diet, high trans-fatty acid intake, sedentary lifestyle, chronic stress, obesity, age >30 years, males, HTN, hyperlipidemia, low HDL levels, high LDL/HDL ratio; smoking, DM, ↓exercise, genetic factors, hyperhomocysteinemia (screening not recommended)

Signs/Sx: variable; usually asymptomatic; chest pain, orthopnea, dyspnea, edema; dyspnea may be worse with exertion and lying down due to limited cardiac blood flow

Evaluation: chem panel with lipid fractionation, fast CT scan (for coronary artery disease), stress test (esp. for CAD), various new serological measures (e.g., apolipoprotein measurements, highly-sensitive CRP)

Sequelae: ischemic heart disease (IHD), angina pectoris, MI, intermittent claudication, ischemic stroke, CHF, HTN. See “Manifestations of Atherosclerosis by Arteries Affected” (table 6.1) on the next page for a summary of the relationships among these conditions; however, atherosclerosis is not the only or even a necessary cause of some of these conditions (e.g., functional angina related to Mg deficiency, HTN due to renal disease)

Prognosis: good if risk factors can be reduced

For differential diagnosis of all ischemic cardiovascular conditions, see “Differential Diagnosis of Ischemic Cardiovascular Conditions” (table 6.2) on the following page.

Ischemic Heart Disease (IHD), Coronary Artery Disease (CAD)

Definition: syndrome resulting from atherosclerosis of the coronary arteries and/or microvascular dysfunction

Risk Factors: similar to atherosclerosis, which is its main cause

Signs/Sx: substernal chest pain, exertional dyspnea, orthopnea, paroxysmal nocturnal dyspnea, tachycardia, cardiomegaly

Evaluation: high triglycerides, high total cholesterol, high LDL, low HDL, ST segment depression and inverted T waves on ECG, positive stress ECG/treadmill test (best CAD screening test for males), positive echocardiogram (best CAD screening test for females), cardiac catheterization (gold standard for CAD; used for angina with neg treadmill or treadmill contraindicated, pre-op, etc.). Consider carotid intima-media thickness scan or fast CT to assess for calcification of coronary arteries.

Sequelae: angina pectoris, unstable angina, MI, sudden cardiac death

Prognosis: variable; progressive without lifestyle changes

Follow-up Assessment: lipids, glucose, homocysteine, CRP, weight, ECG; exercise stress test if severe

Table 6.1: Manifestations of Atherosclerosis by Arteries Affected

ARTERIES AFFECTED	RESULTING DISEASE(S)
Coronary arteries	IHD, angina, MI, CHF
Femoral arteries	Intermittent claudication
Carotid and cerebral arteries	Ischemic stroke
Systemic	Hypertension
Enteric arteries	Mesenteric ischemia

Table 6.2: Differential Diagnosis of Ischemic Cardiovascular Conditions

Pericarditis

Esophageal disorders (hiatal hernia, etc.)

Mitral valve prolapse

Aortic stenosis

Pneumothorax

Aortic aneurysm

Endocarditis

PUD

Pulmonary embolism

Pleurisy

Anxiety/panic attack

Costochondritis

Women with cardiac ischemic commonly develop prominent GI symptoms, unlike men.

Table 6.3: Conditions that cause chest pain and may lead to mortality

Myocardial infarct

Cardiac tamponade

Aortic dissection

Pneumothorax

Pulmonary embolism

Angina Pectoris

Definition: chronic insufficiency of cardiac blood supply

Risk Factors: cigarette smoking, family hx of CAD, alcohol abuse, hyperlipidemia, high kcal/low nutrient diet, lack of exercise

Signs/Sx:

Stable angina: chest pain (dull ache) or pressure on exertion, better with rest (hallmark); very predictable onset and relief pattern; nitroglycerin relieves pain

Prinzmetal's angina: chest pain at rest; nitroglycerin usually relieves symptoms; more common in men than women; more common in younger (<40 years of age) men than older men; hypomagnesemia

Table 6.4: Diseases Elevating Serum Cardiac Enzymes

DISEASE	CARDIAC ENZYMES ELEVATED
Angina, severe	CK total (rarely), CK ₂ MB
Cardiomyopathy	CK, CK ₁ BB, CK ₂ MB, LD total
CHF	LD total, AST, ALT
Myocarditis	CK total and CK ₂ MB
Pericarditis	AST elevated

Unstable angina: changing pattern of chest pain or pressure; usually follows years of stable angina; pain on exertion more easily set off; pain increases and is prolonged with unpredictable pattern of occurrence; pain is severe; often nitroglycerin is useless

Evaluation: clinical; stress ECG/treadmill test, echocardiogram (ST ↓)

Sequelae: MI, cardiac arrest, CHF, arrhythmia

Prognosis: variable course

Follow-up Assessment: unstable angina patients are hospitalized; clinical exam as needed

Myocardial Infarction (MI)

Definition: acute restriction of myocardial blood supply to the point of causing local tissue death

Risk Factors: same as for atherosclerosis; more common in men than women, but the gap is narrowing; aspirin reduces risk

Signs/Sx: sudden onset severe chest pain, radiation to jaw or left arm, diaphoresis, fear of impending doom, duration > 2 h, crushing or dull pain, unrelieved by nitroglycerin; exercise exacerbates (increases myocardial energy demands); rest and quiet partially alleviate; men more likely to suffer pain during exercise; women more likely to have radiating pain, N and V, diaphoresis, fatigue and dyspnea

Evaluation: clinical; ECG (see “Basic elements of the electrocardiogram in normal sinus rhythm” (figure 6.1) on the next page (most common finding: ST ↑, echocardiography (ECHO), elevated levels of serum myocardial enzymes

ECG: where in the heart determined by which leads are affected (e.g., II, III for inf heart, etc.)

Rapid bedside whole blood CK-MB and cardiac-specific troponins are quick enough so that reperfusion therapy can be begun sufficiently quickly; LDH, CK, other enzymes too slow

Sequelae: CHF, myocardial rupture, cardiogenic shock, cardiac arrest, death, dysrhythmia, AV block, mitral regurgitation, ventricular septal defect, pulmonary embolism, DVT

Prognosis: complex and multifactorial; mortality rate up to 30% (50% of whom die before reaching hospital). Early reperfusion with preserved left ventricular function and no arrhythmias gives best prognosis. Long-term risk of re-infarction depends on treatment and lifestyle changes.

Follow-up Assessment: work on reducing risk factors to prevent re-infarction and reduce mortality; monitor physical activity, monitor cardiac enzymes and ECG

Intermittent Claudication

Definition: weakness progressing to cramping in upper or lower extremities usually due to severe atherosclerosis of the supplying arteries

Risk Factors: atherosclerosis, embolus, smoking, diabetes, HTN, hyperlipidemia, obesity

Signs/Sx: limb pain after even brief periods of exercise; generally better with rest

DDX: pseudoclaudication, sciatica, osteoarthritis, Buerger’s disease, mineral deficiency

Evaluation: clinical; arteriography (confirmatory), Doppler ultrasound, treadmill test with before and after ultrasound measurements

Sequelae: arterial insufficiency, amputation of affected limb

Prognosis: may improve if cause can be reversed; may progress to tissue necrosis

Follow-up Assessment: vascular studies every 6 months