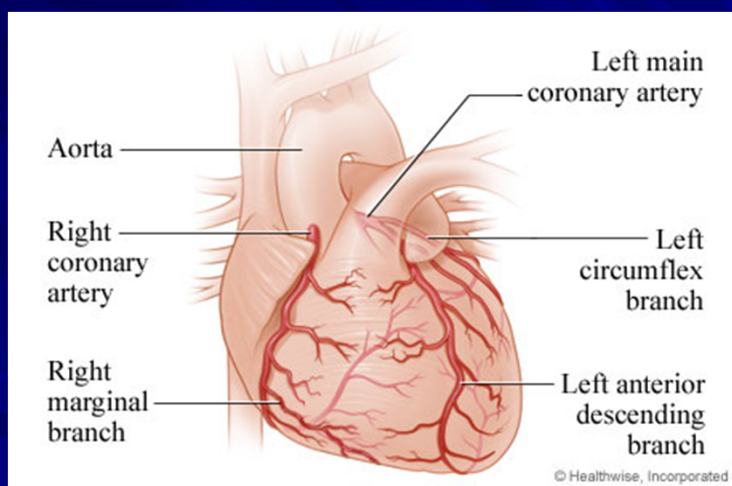


Coronary Artery Disease (CAD)

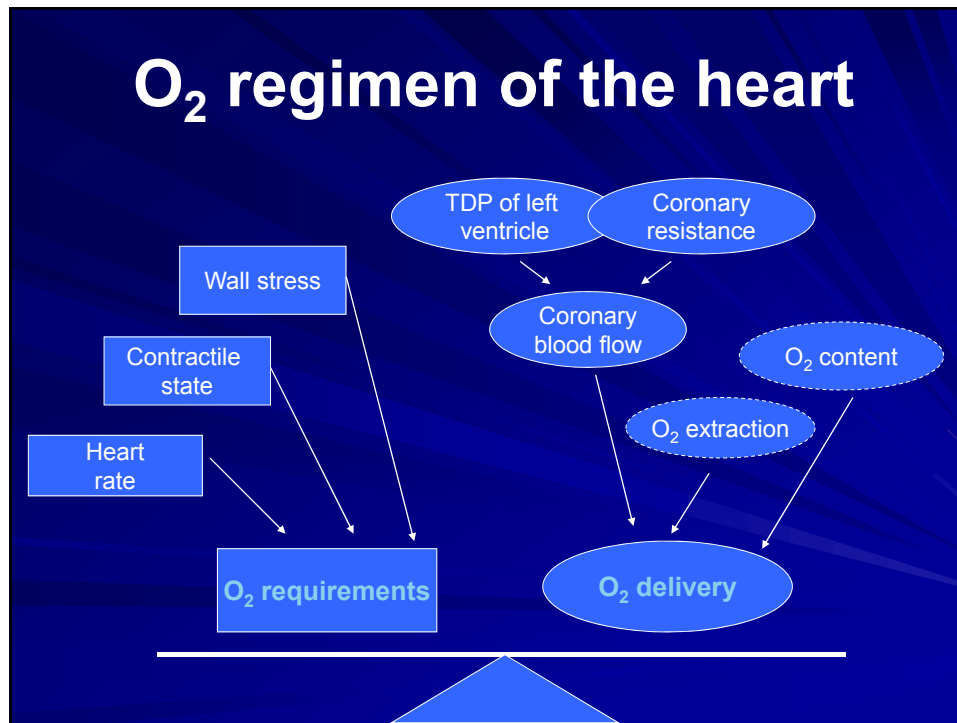
Arterial Hypertension

Blagoi Marinov, MD, PhD
Pathophysiology Dept.
Medical University of Plovdiv

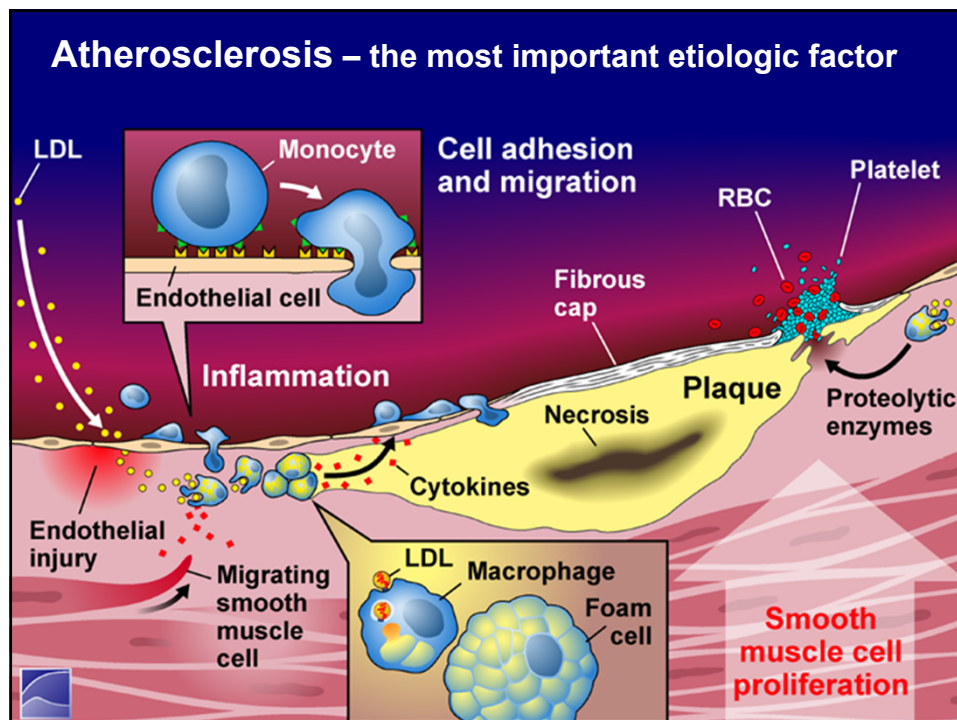
Coronary arteries



O₂ regimen of the heart



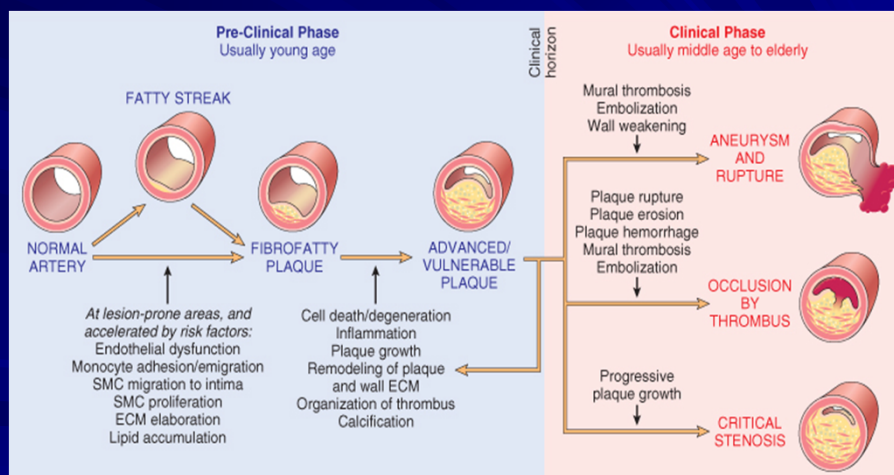
Atherosclerosis – the most important etiologic factor



Risk factors for Atherosclerosis

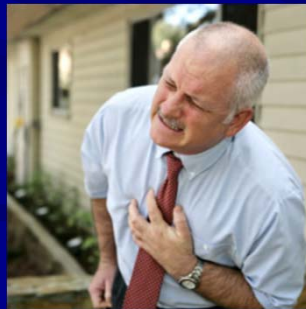
Major	Lesser, Uncertain, or Nonquantitated
Nonmodifiable	
Increasing age	Obesity
Male gender	Physical inactivity
Family history	Stress ("type A" personality)
Genetic abnormalities	Postmenopausal estrogen deficiency
	High carbohydrate intake
Potentially Controllable	
Hyperlipidemia	Alcohol
Hypertension	Lipoprotein Lp(a)
Cigarette smoking	Hardened (trans)unsaturated fat intake
Diabetes	<i>Chlamydia pneumoniae</i>

Pathogenetic events, and clinical complications of atherosclerosis in the coronary arteries



Definition

Ischemia refers to an insufficient amount of blood. Since the **coronary arteries** are the only source of blood for the heart muscle its blood supply will suffer tremendously.

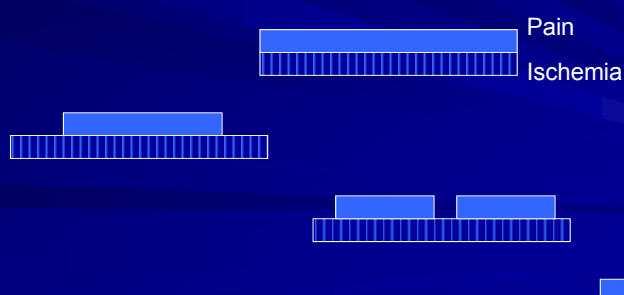


Myocardial Ischemia

- Myocardium becomes ischemic within 10 seconds of coronary occlusion
- **Working** cells remain viable for up to 20 minutes
 - Anaerobic mechanisms kick in
 - Lactic acid
 - Free radical damage, especially after reperfusion

Ischemic episode

- Severity
- Duration
- Frequency



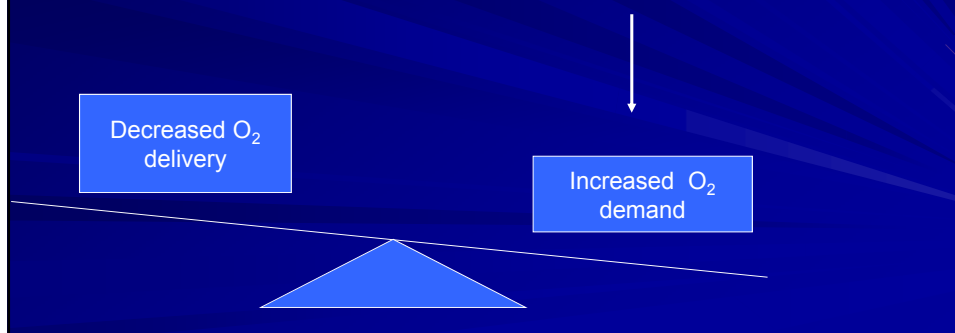
CAD classification

- Stable angina
- Unstable angina
- Atypical angina (Prinzmetal)
- Myocardial infarction
- Atherosclerotic myocardiosclerosis
- Silent ischemia
- Sudden cardiac death

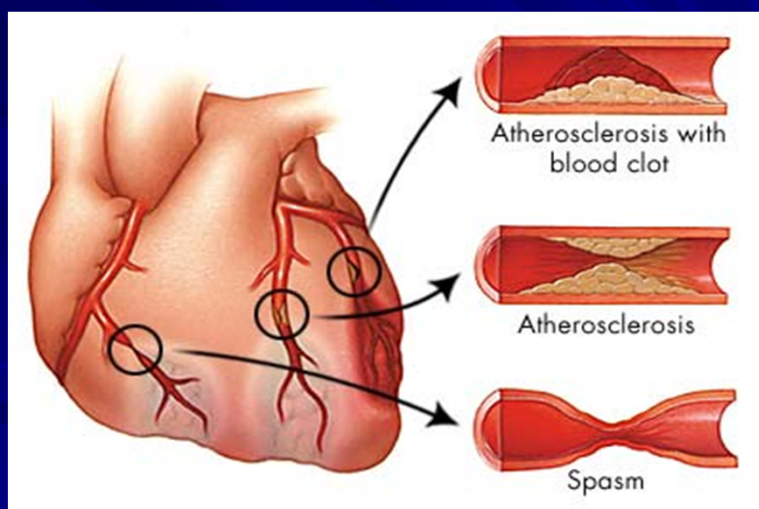
Stable angina

Chest pain with exertion

- May radiate, may have diaphoresis, SOB, pallor
- Relief with rest or nitrates



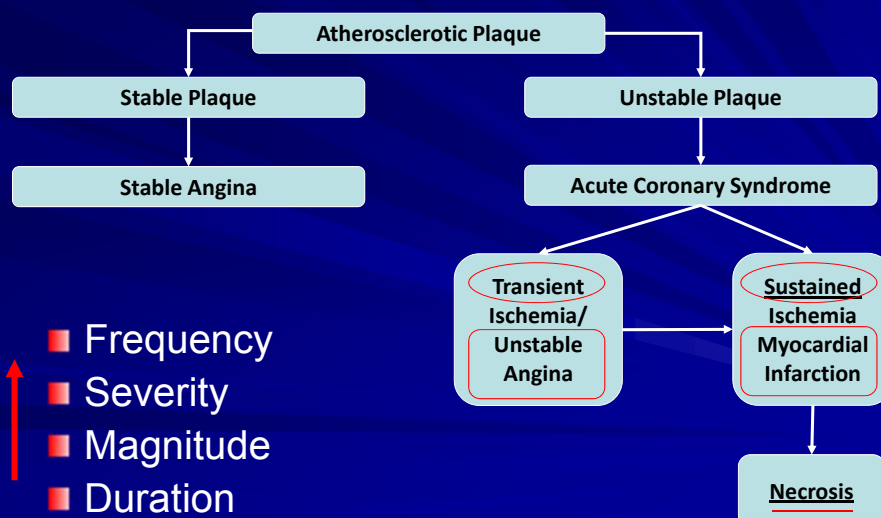
Morphological substrate

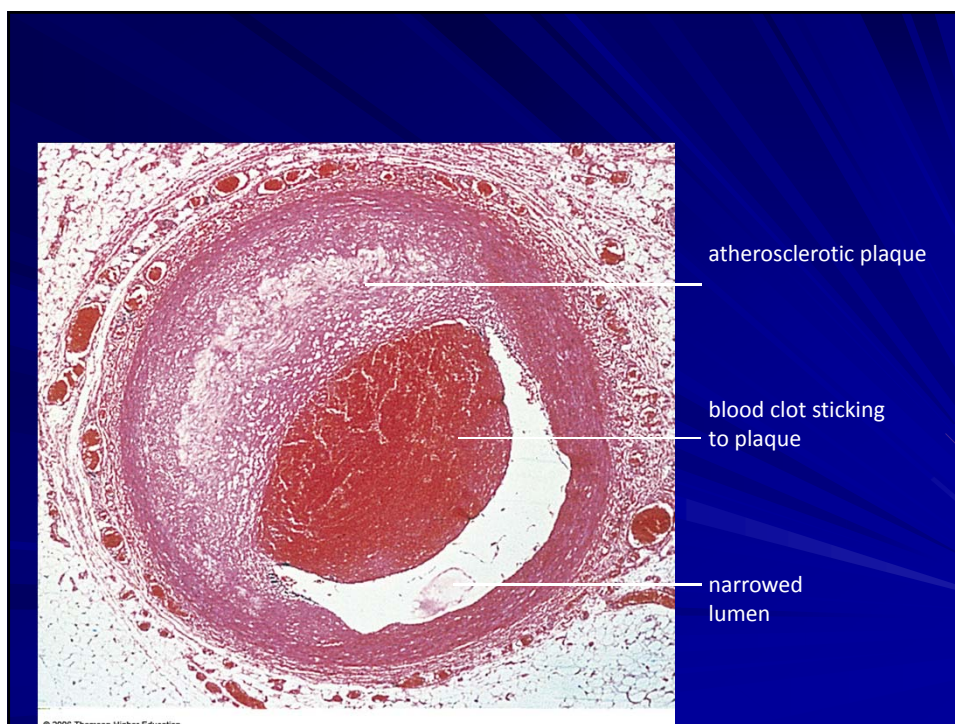


Treatment for Stable Angina

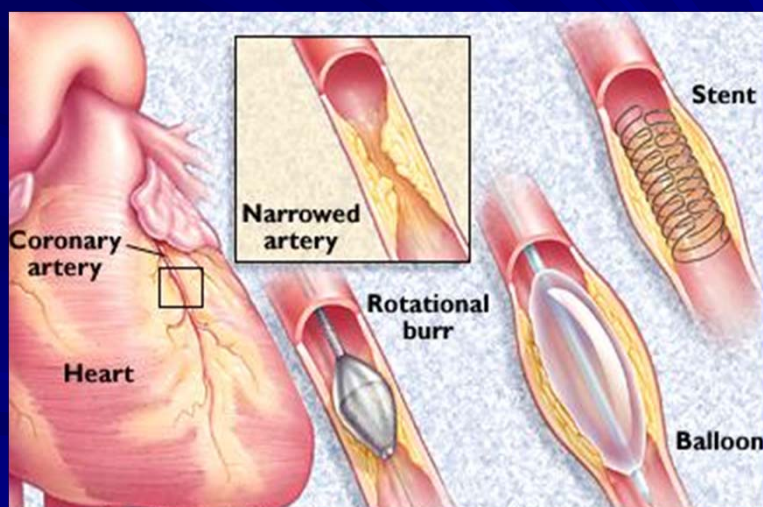
- Drug
 - Nitrates
 - Beta blockers
 - Calcium Channel Blockers
 - Statins
- Invasive cardiology
 - PTCA
 - Stent
- Surgery
 - Bypass

Acute Coronary Syndrome





Advances in interventional cardiology



PTCA: Percutaneous Transluminal Coronary Angioplasty

- Invasive, but nonsurgical technique to reduce frequency and severity of chest discomfort
 - May also be used during evolving MI
- Procedure performed under fluoroscopic guidance in cardiac cath lab
 - Balloon inflation may be repeated until lesion is reduced or eliminated
 - Stents may be placed at time of procedure

CABG: Coronary Artery Bypass Graft

- Most common cardiac surgery
- Indicated for patients who do not respond to medical management of CAD or when disease progression is evident
- To be bypassed vessels should have proximal lesions with > 70% occlusion
- Most effective when good ventricular function remains and ejection fraction is more than 40-50%
- Requires Cardiopulmonary bypass during surgery

Myocardial infarction (MI)

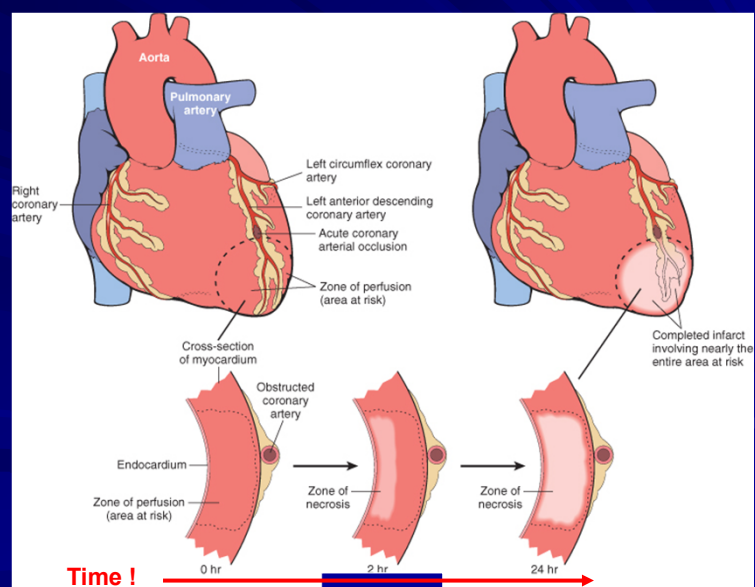
Ischemic necrosis of the part of myocardium (more frequently on the left).

- Transmural
- Non-transmural (subendocardial, without Q wave)

General characteristics

- Myocardium becomes hypoxic
- Shift to Anaerobic Respiration
- Waste products release/hypoxic injury
- Cardiac output impaired

Pathogenesis of MI



Myocardial Changes

■ Myocardial **stunning**

- Temporary loss of contractility that persists for hours to days

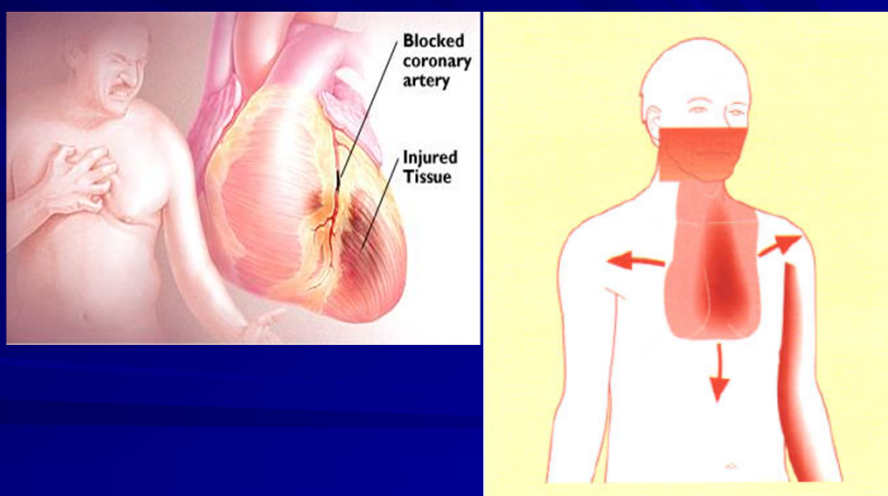
■ Myocardial **hibernation**

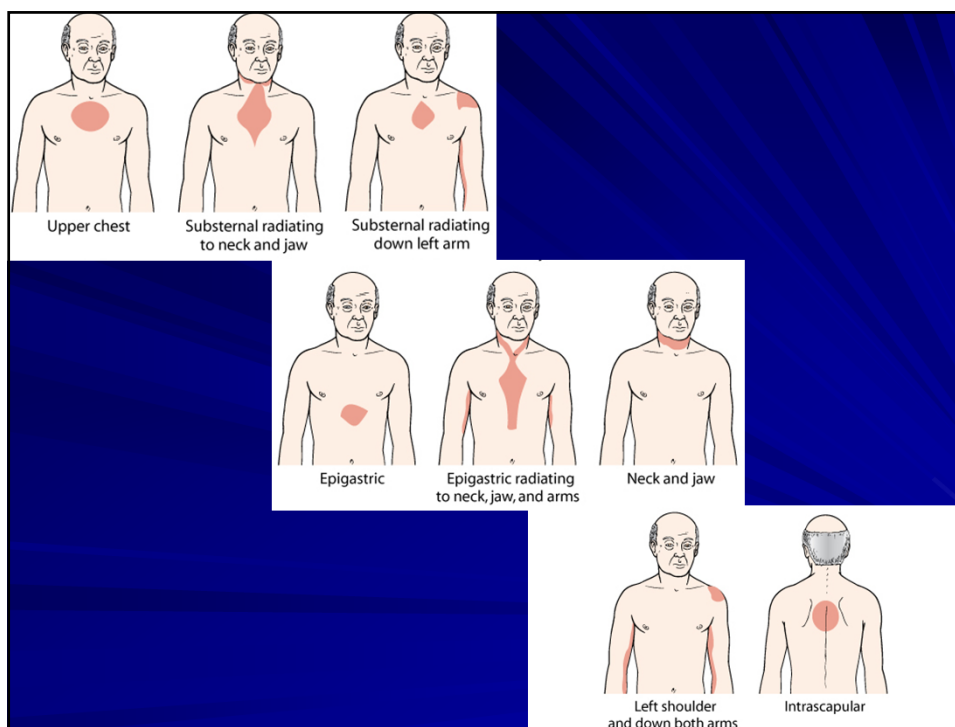
- Chronically ischemic; myocytes are hibernating to preserve function until perfusion can be restored

■ Myocardial **remodelling**

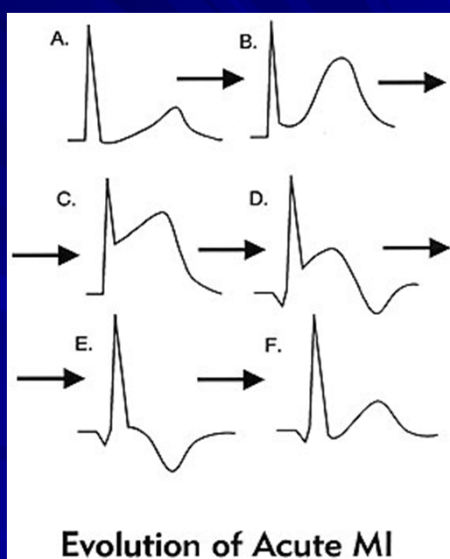
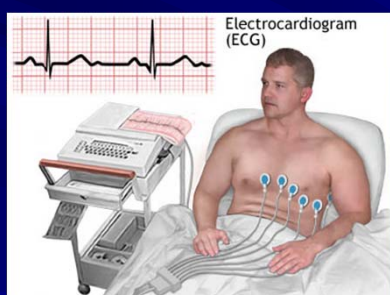
- Loss of contractility mediated by Ang II, catecholamines, and inflammatory cytokines

Signs and symptoms of MI

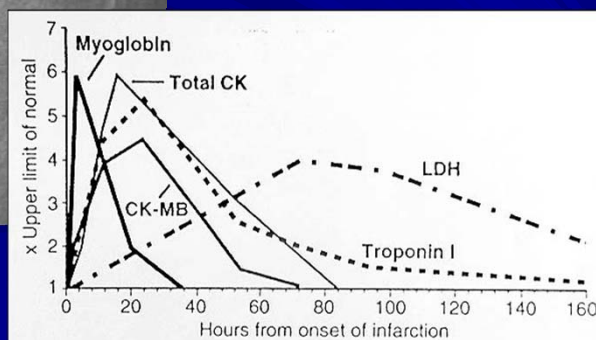
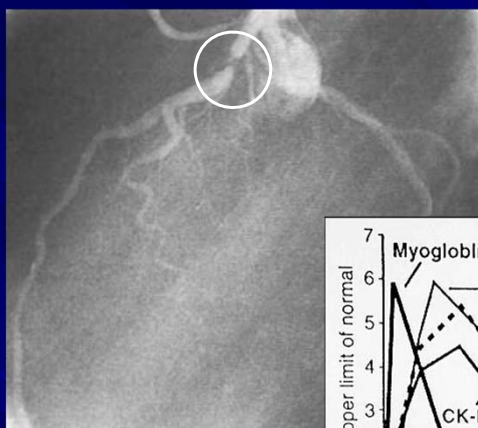




ECG changes



Change in serum enzymes



Immediate Post MI Tx

- Reduce myocardial workload
- Prevent Remodeling
- Reduce chances of reocclusion
- Reduce oxidative stress (reperfusion injury)

Long-term Post MI Treatment

■ Lifestyle

- Diet
- Exercise – Cardiac Rehab
- Stress management

■ Drugs

- Antiplatelet: aspirin, clopidogrel
- Beta blocker
- Statin medication
- Treat risk factors (HTN, lipid, smoke, etc.)

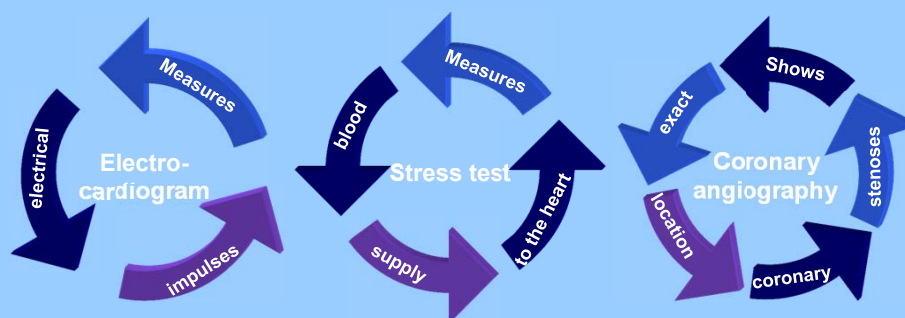
Complications of MI

- Disorders of rhythm and conduction
 - Supraventricular
 - Ventricular (tachicardia, fibrillations)
- Rupture of post infarction aneurism
- Pericarditis (Dressler syndrome)
- Post infarction angina (20-30 %)

Prognosis of MI

- Acute MI is associated with a **30% mortality rate**; half of the deaths occur prior to arrival at the hospital.
- An additional **5-10%** of survivors **die within the first year** after their MI.
- Approximately **half of all patients** with an MI are **rehospitalized within 1 year** of their index event.
- Overall, **prognosis is highly variable** and depends largely on the extent of the infarct, the residual LV function, and whether the patient underwent revascularization.

Screening of different forms of CAD

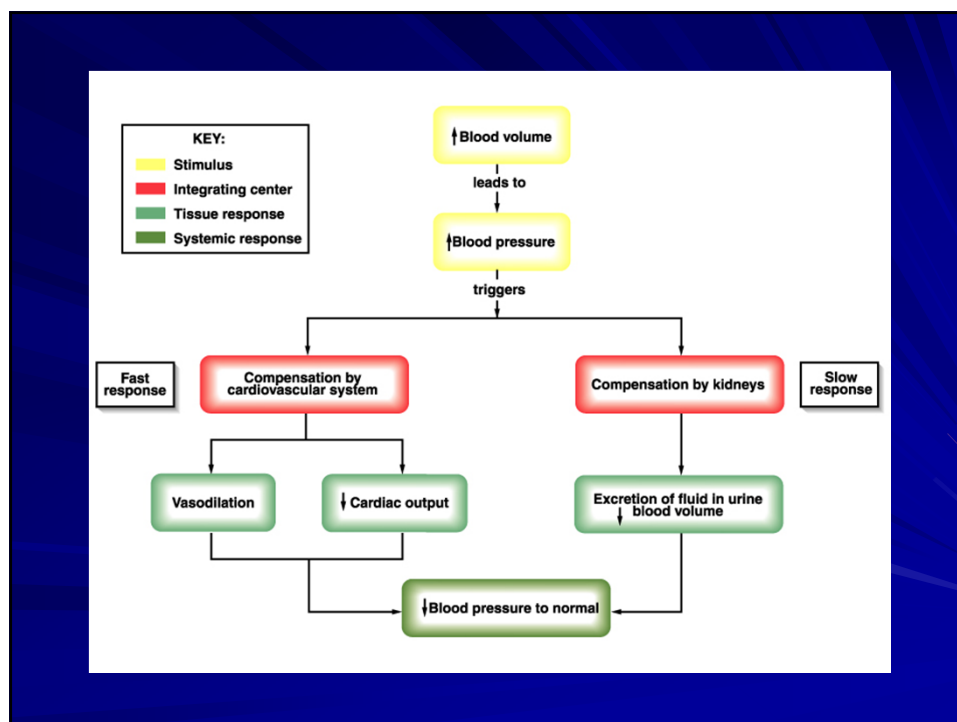
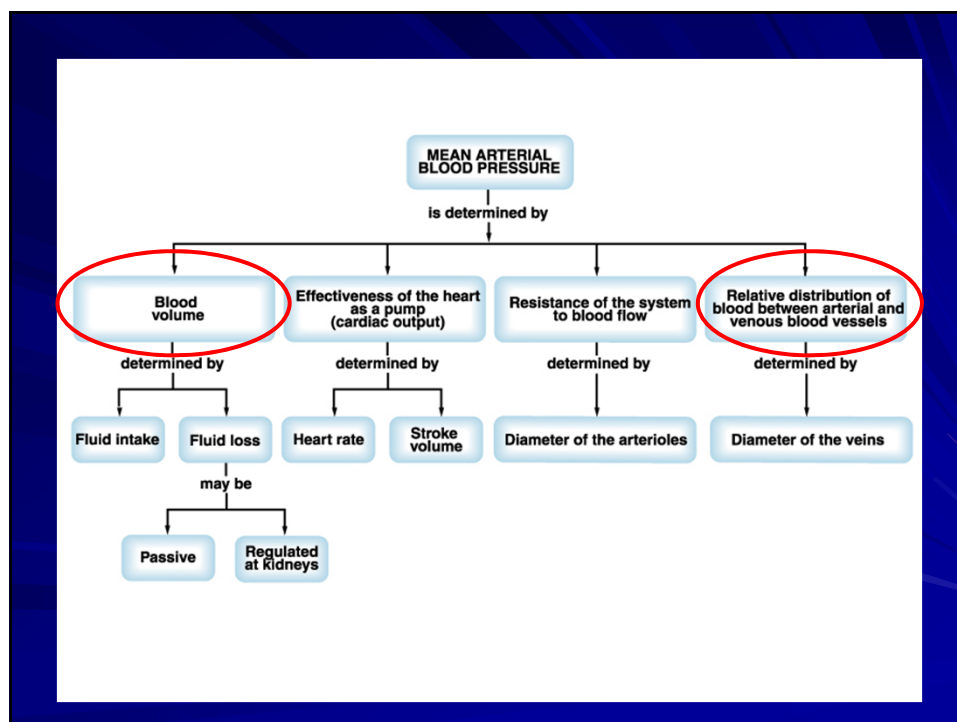


ARTERIAL HYPERTENSION

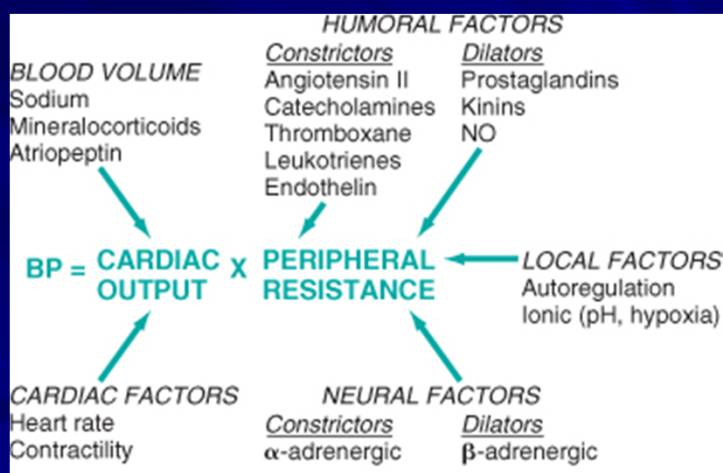
Blood pressure levels*

Systolic	Diastolic	Level
120	80	Optimal
< 130	< 85	Normal
130-139	85- 89	Normal borderline
140 -159	90 - 99	Mild hypertension
160-179	100-109	Moderate hypertension
> 179	> 109	Severe hypertension
> 140	< 90	Maximum or systolic hypertension

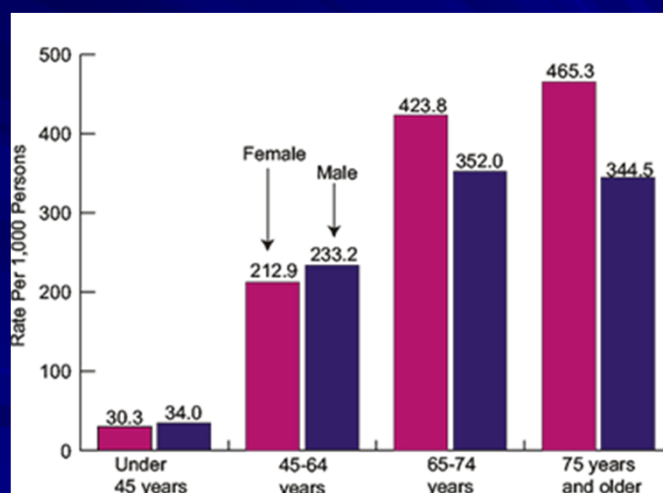
*Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and treatment of High Blood Pressure



Cardiac output and peripheral resistance in blood pressure regulation



The burden of hypertension (distribution by age and sex*)



*CDC. National Health Survey, 2005

Types of Hypertension

- ❑ Essential Hypertension (Primary)
- ❑ Secondary Hypertension

Risk factors for arterial hypertension

Primary

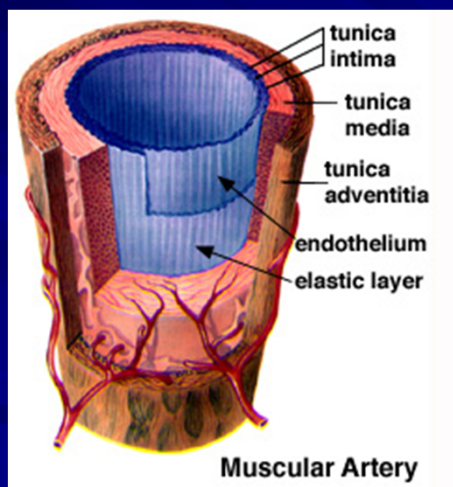
- NaCl rich diet
- Stress

Secondary

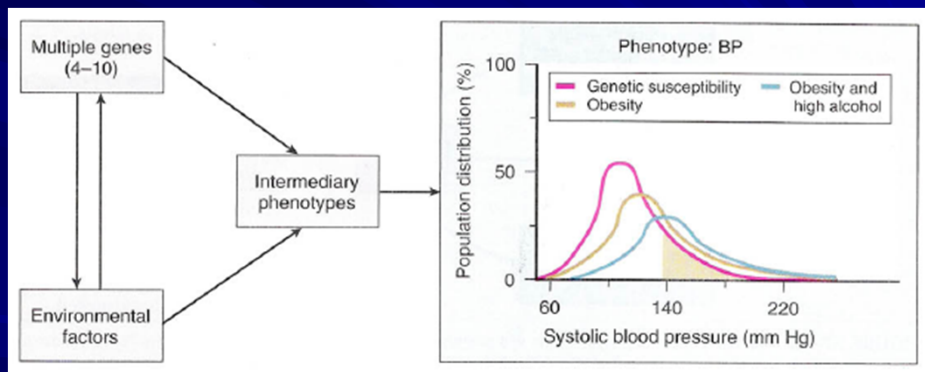
- ✓Hypercholesterolemia
- ✓Prediabetic state
- ✓Overweight
- ✓Sedentary lifestyle
- ✓Alcohol abuse



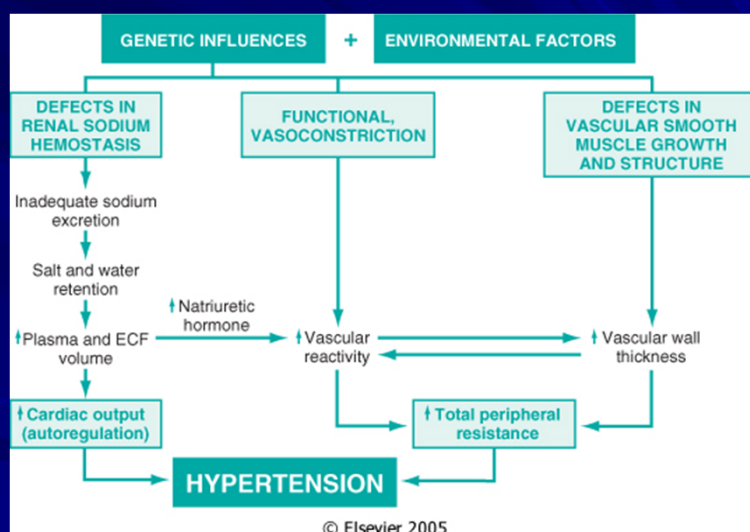
Medium caliber arteries are the most affected

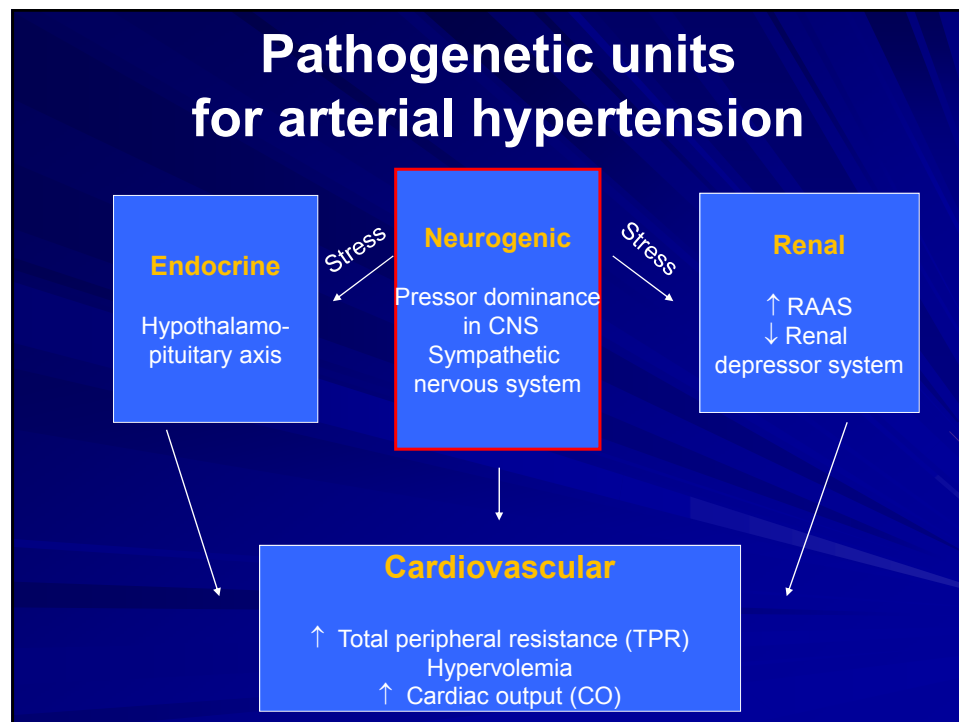


Genetic background



Pathogenesis of Hypertension

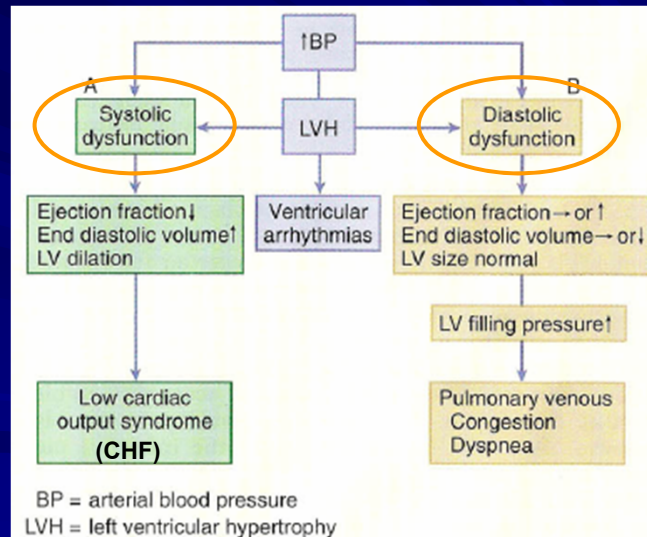




Symptoms and signs

- Almost always asymptomatic
- Dyspnea most common
- Headache, Dizziness, Tinnitus, Fainting not correlated with hypertension
- Symptoms poorly correlated to degree of hypertension

Consequence of HTN



Staging of arterial hypertension

■ Labile hypertension

- Increased CO
- Normal TPR

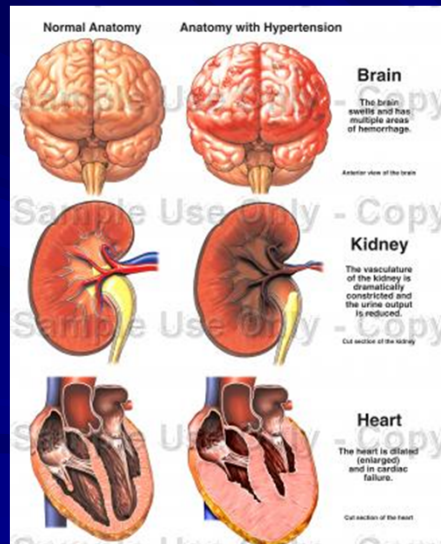
■ Stable hypertension

- Increased TPR
- Normal CO

■ Organ damage and complications

- Compensated
- Decompensated

Complications of Hypertension



It can always get worse ...

Secondary Hypertension

Renal

- Acute glomerulonephritis
- Chronic renal disease
- Polycystic disease
- Renal artery stenosis
- Renal artery fibromuscular dysplasia
- Renal vasculitis
- Renin-producing tumors

Endocrine

- Adrenocortical hyperfunction
- Exogenous hormones
- Sympathomimetics,
- Pheochromocytoma
- Acromegaly
- Hypothyroidism (myxedema)
- Hyperthyroidism (thyrotoxicosis)
- Pregnancy-induced

Cardiovascular

- Coarctation of aorta
- Polyarteritis nodosa (or other vasculitis)
- Increased intravascular volume
- Increased cardiac output
- Rigidity of the aorta

Neurologic (Psychogenic)

- Increased intracranial pressure
- Sleep apnea
- Acute stress, including surgery

Antihypertensive Agents

■ General Classes of Agents:

- Diuretics
- Sympatholytic agents
 - α blockers (central)
 - β blockers (peripheral)
- Vasodilators
- Agents which interfere with the RAAS
 - ACE inhibitors
 - Angiotensin receptor blockers

Thank you !