

Occlusive Cardiovascular Disorders

Williams & Hopper

Chapter 23

Occlusive Cardiovascular Disorders

- Arteriosclerosis
 - Part of aging process
 - Intimal lining of artery loses elasticity and weakens
 - due to the high pressure that carries the blood
 - “Hardening of the Arteries” – actually weakness
- Atherosclerosis
 - Plaque formation within arterial wall
 - May begin in childhood and progress without symptoms

Pathophysiology

- Injury to endothelial cells that line walls of the artery
 - Damage stimulates growth of smooth muscle cell, causing secretion of collagen, fibrous proteins
 - Lipids, platelets, and clotting factors accumulate
 - Scar tissue replaces some of the arterial wall lining
 - The build up of fatty deposits is **PLAQUE**
 - Early indication is a fatty streak in lining of the artery
 - Over time the build-up becomes calcified and hardened
 - Build up causes turbulence, damage to cells and increases buildup
 - Fibrous cap may tear or rupture- blood clot forms
 - can block the coronary artery ;travel and lodge in a smaller vessel
 - Vessel may be stenosed by buildup
 - Causes partial or total occlusion of artery
 - Distal areas ischemic
- May be asymptomatic until develop s/s of CVA,TIA,PAD or ischemic coronary syndromes occur

Occlusive Cardiovascular Disorders – Risk Factors

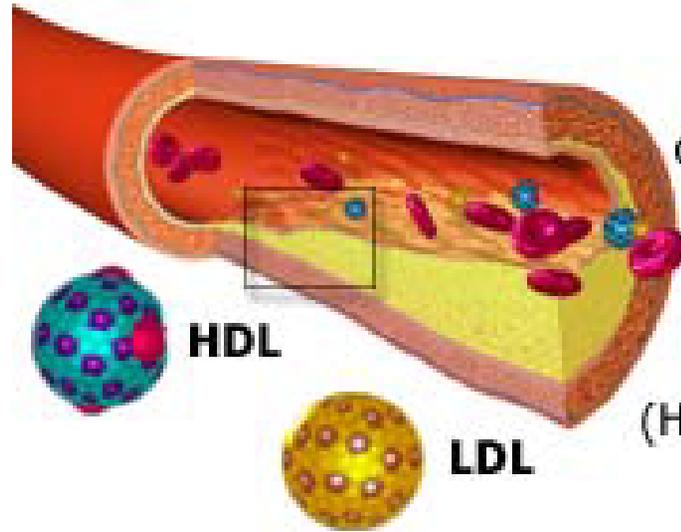
- Non-modifiable Factors
 - Age
 - Gender
 - Ethnicity
 - Genetics-
 - Modifiable factors
 - Diabetes mellitus
 - sedentary lifestyle
 - Hypertension
 - Smoking
 - Obesity
 - Depression
 - Excessive alcohol intake
- ↑ homocysteine level
- ↑ serum iron
- infection
- hyperlipidemia

Occlusive Cardiovascular Disorders – Signs & Symptoms

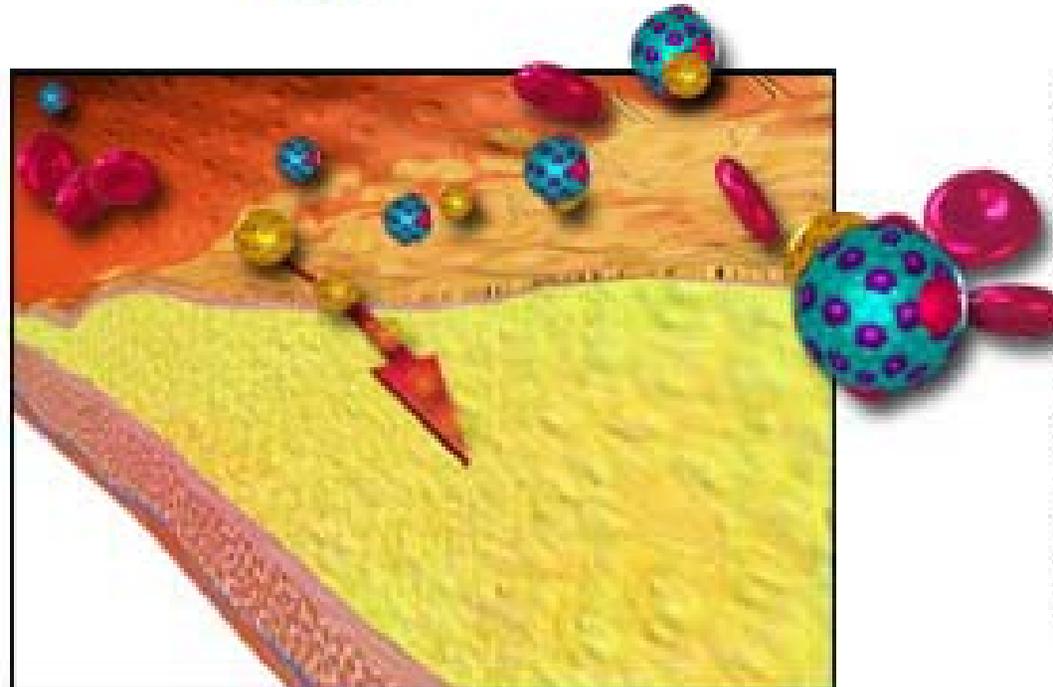
- Chest pain
- Nail bed pallor
- Reddish-purple extremities
- Prolonged capillary refill
- Thick nails
- Dry skin
- Hair loss on extremities
- ↓ or absent pulses
- Cool extremities

Occlusive Cardiovascular Disorders – Diagnosis

- Cholesterol & triglyceride levels
 - Total
 - HDL
 - LDL
- Glucose
 - Elevations may ↑ risk for atherosclerosis
- CRP
 - low grade inflammation and indicates future risk
- Radiological studies- See Chapter 20



Cholesterol is a waxy fat (lipid) carried through blood by lipoproteins. The two main types of lipoproteins are high density lipoproteins (HDLs) and low density lipoproteins (LDLs).



HDLs (good cholesterol) carry LDLs (bad cholesterol) away from artery walls. LDLs stick to artery walls and can lead to plaque build-up (atherosclerosis).

Occlusive Cardiovascular Disorders – Treatment

- Diet
- Smoking
- Exercise
- Lipid lowering agents
 - Statins- reduce LDL
 - Fibrates-reduce triglycerides
 - Bile acid sequestrants- lower cholesterol
 - Niacin –prevent conversion of fat into VLDL

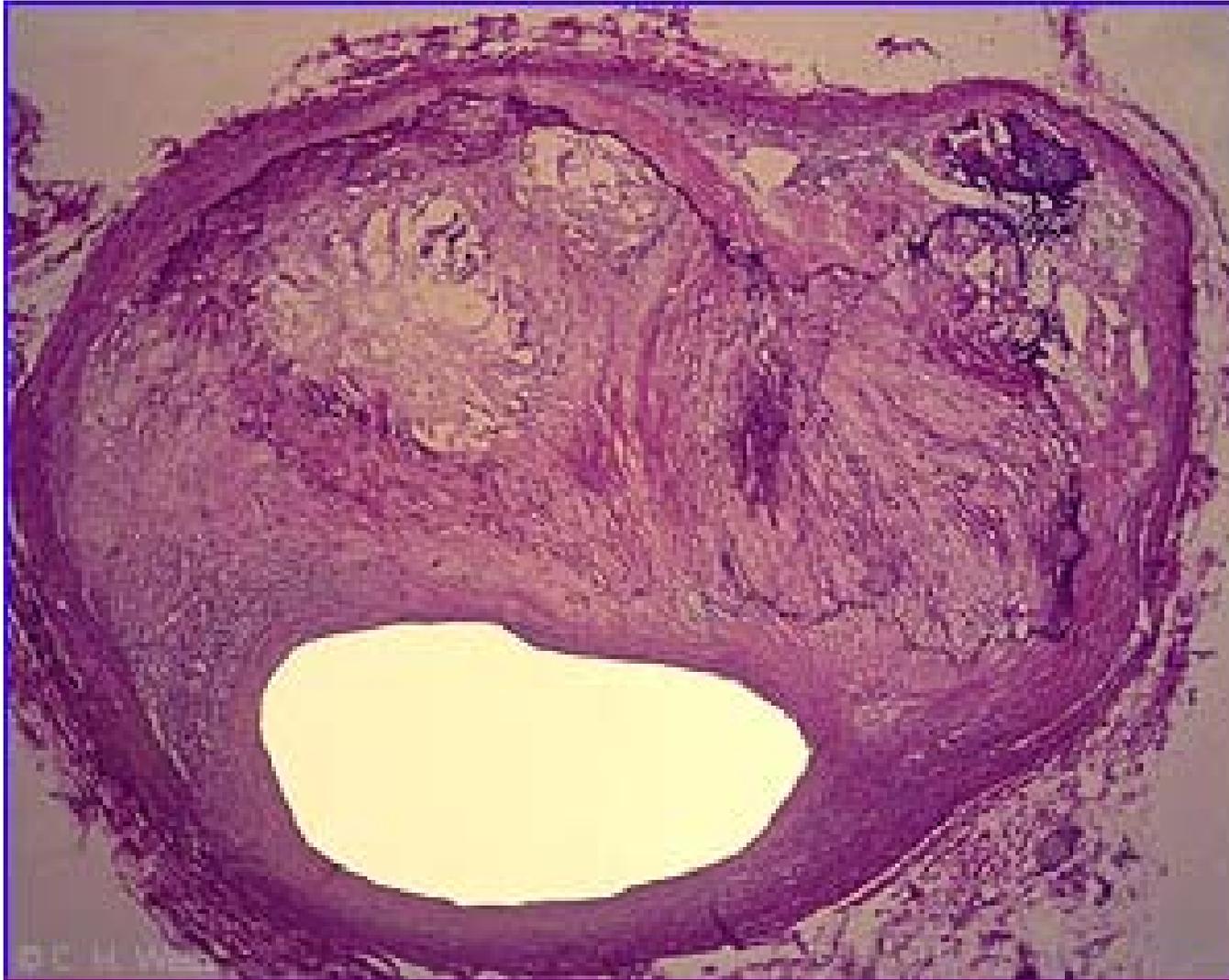
Coronary Artery Disease

- Obstructed blood flow
 - Through coronary arteries
- Atherosclerosis
 - Primary cause
- Acute Coronary Syndrome (ACS)
 - Encompasses the continuum of CAD
 - Describes s/s USA, Non-ST elevation MI, ST elevation
- Decreased myocardial blood flow
 - Myocardial Infarction, causing irreversible damage

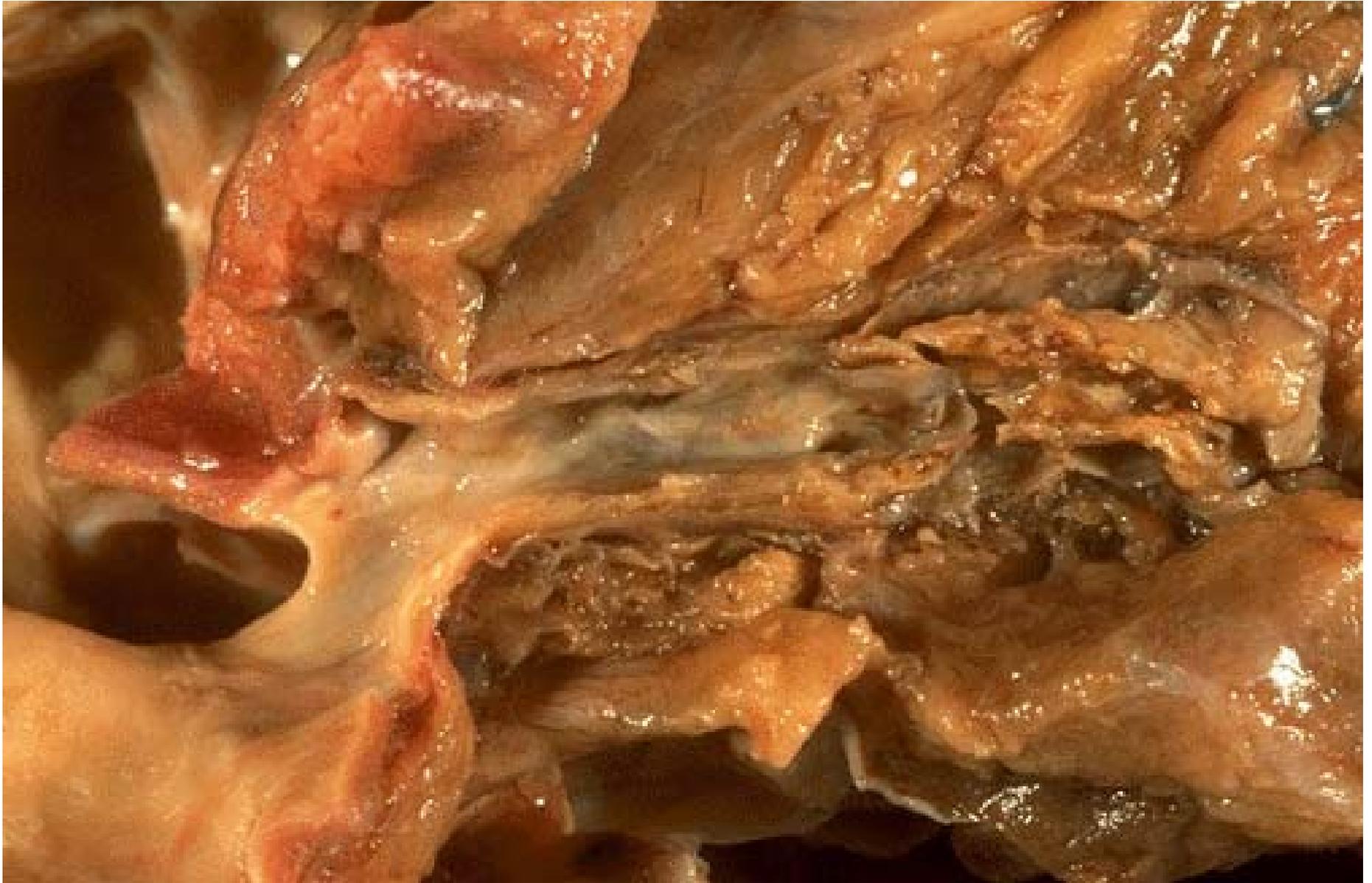
Coronary Artery Disease

Etiology

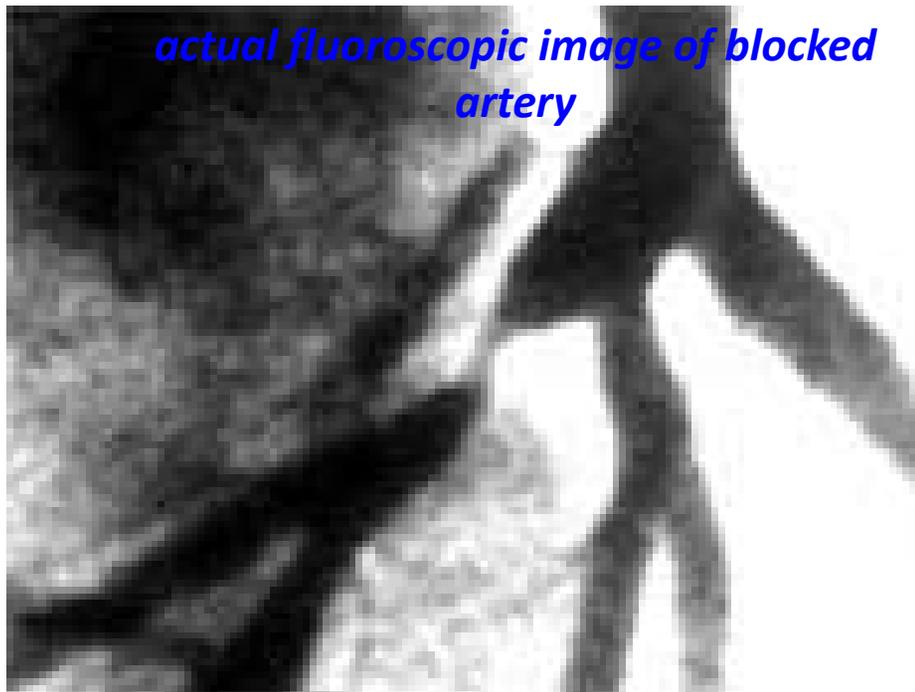
- Accumulation of fatty deposits & minerals in coronary arteries
 - Atheroma (plaque)
 - Leads to stenosis – eventual occlusion
- Go to
- Blood flow to the myocardium is reduced
- Arteries unable to dilate
 - Myocardial oxygen needs are unmet ischemia occurs
- Angina Pectoris is the pain occurs from lack of oxygen
- [CAD animation](#)



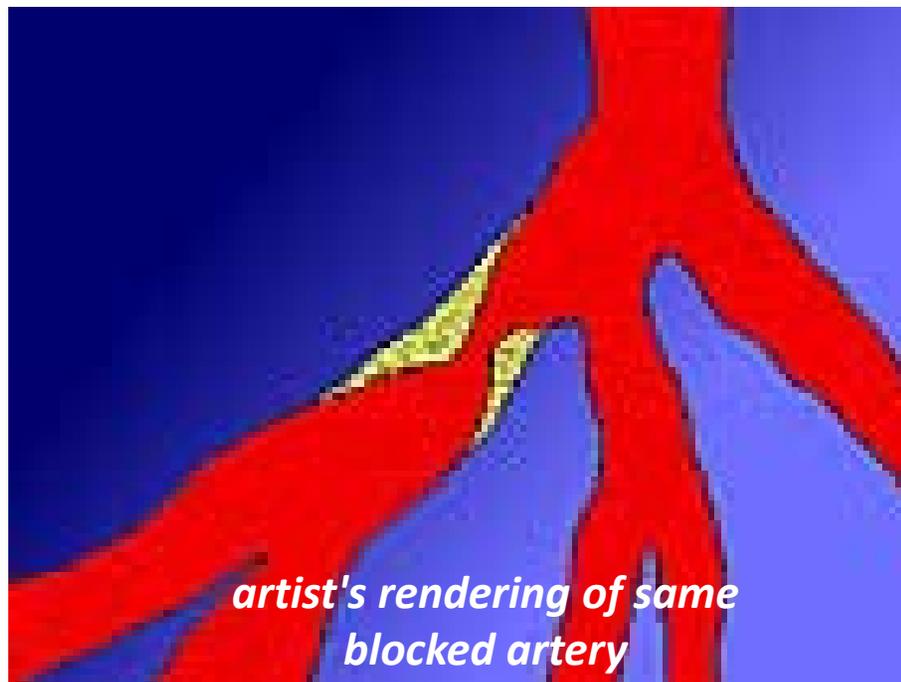
This photograph shows a cross-section of a coronary artery affected by atherosclerosis. Deposits of plaque – fatty material, cholesterol, calcium and blood clot – have narrowed the artery considerably. A heart attack happens when the coronary artery becomes blocked.

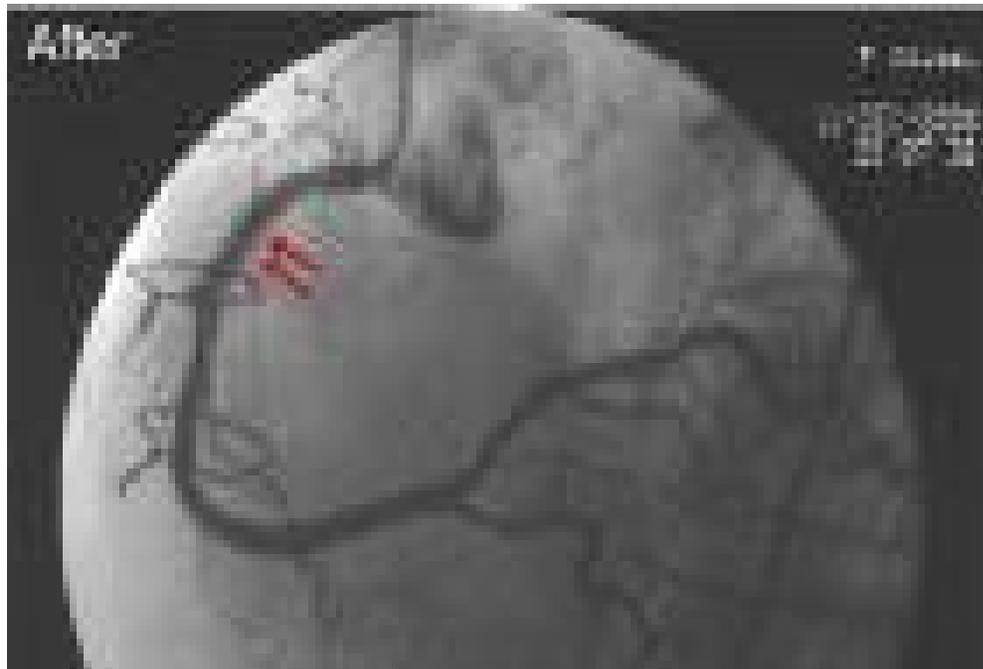
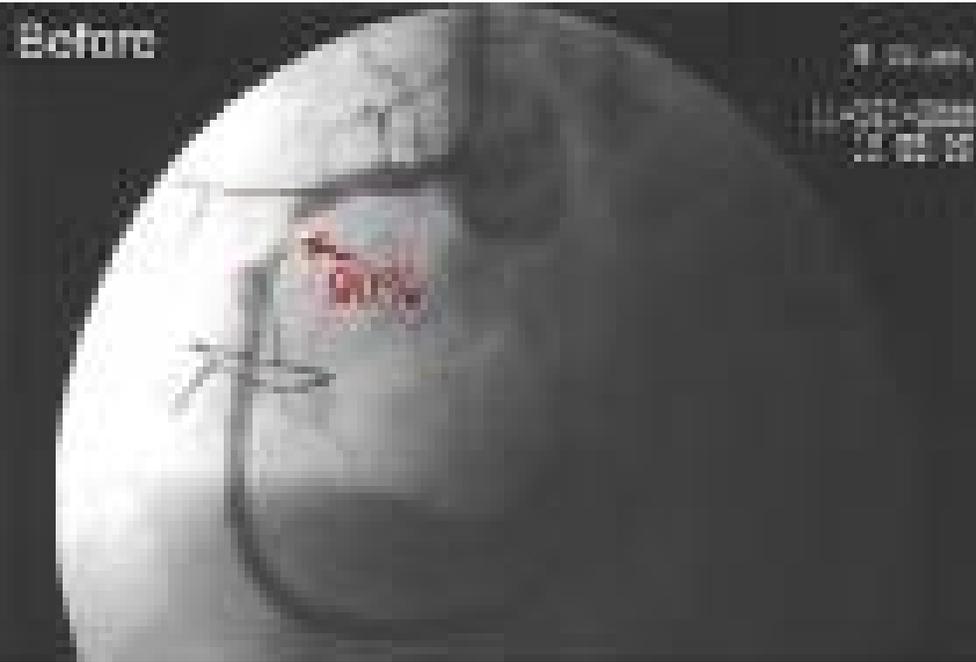


actual fluoroscopic image of blocked artery



artist's rendering of same blocked artery





Coronary Artery Disease

Risk Factors

- Non-modifiable
 - Heredity
 - Ethnicity
 - Gender
 - Age

Coronary Artery Disease

Risk Factors (cont.)

- Modifiable
 - Smoking
 - Hypertension
 - Elevated serum cholesterol
 - Diabetes
 - Obesity
 - Stress
 - Elevated serum homocysteine
 - Sedentary lifestyle
 - Excessive alcohol intake

Coronary Artery Disease

Risk Factors (cont.)

- Metabolic Syndrome
 - Requires ≥ 3 of the following:
 - Abdominal obesity (waist circumference)
 - Men > 102 cm (40 in)
 - Women > 88 cm (35 in)
 - Triglycerides ≥ 150 mg/dL
 - HDL cholesterol
 - Men < 40 mg/dL
 - Women < 50 mg/dL
 - Blood pressure $\geq 130/85$ mm Hg
 - Impaired fasting glucose (fasting glucose 100-125mg/dL)

Prevention

- Early treatment and prevention necessary
- Can progress to more serious cardiac disorders
 - Angina, MI, heart failure, cardiac dysrhythmias, sudden death
- Management of risk factors can prevent, modify, or stop progression of atherosclerosis and CAD

Coronary Artery Disease

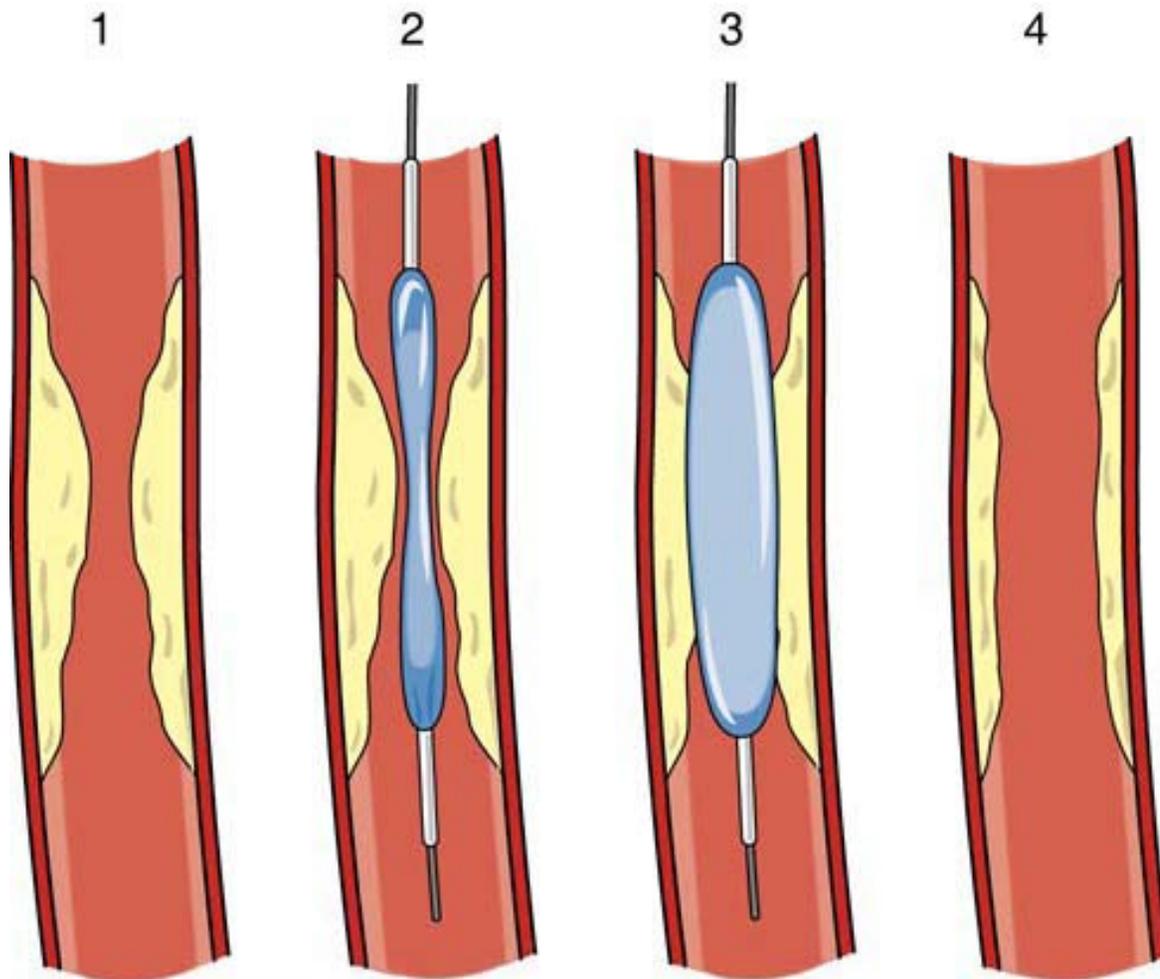
Medical Management

- **Prevention → Education!**
 - Teaching re: modifiable risk factors
 - Smoking cessation, dietary changes, control HTN, weight, DM
- Cholesterol < 300mg/day
- Medication
 - Lipid lowering agents
- Anticoagulants
 - Prevent thrombus formation
 - Low dose ASA used as well

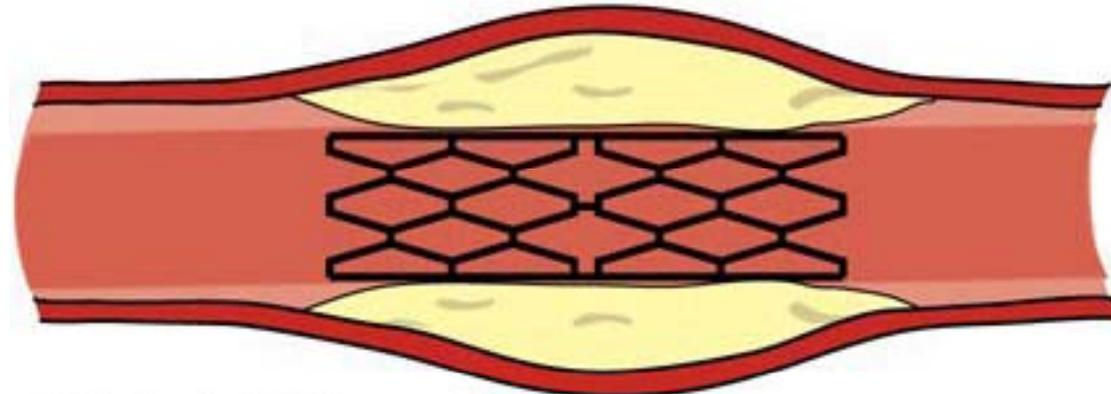
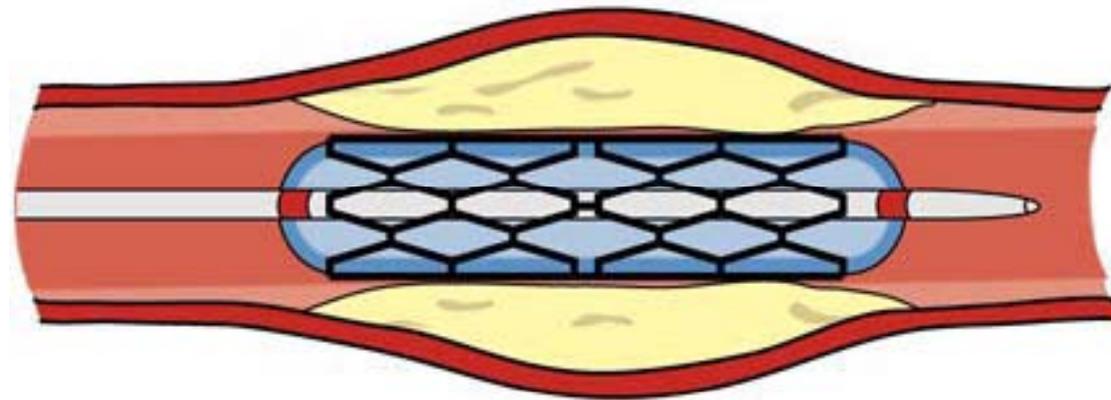
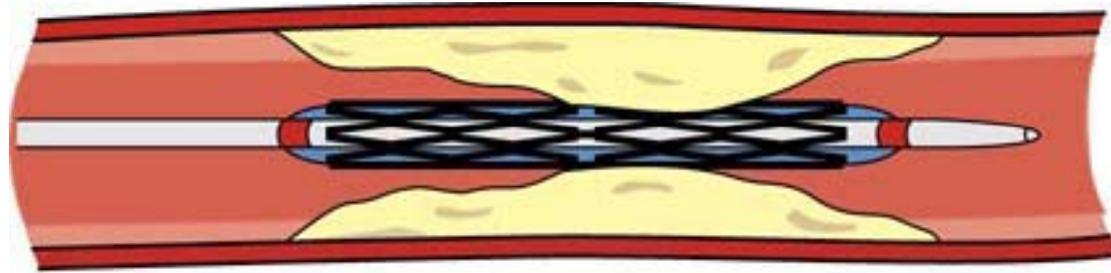
Coronary Artery Disease

Surgical Management

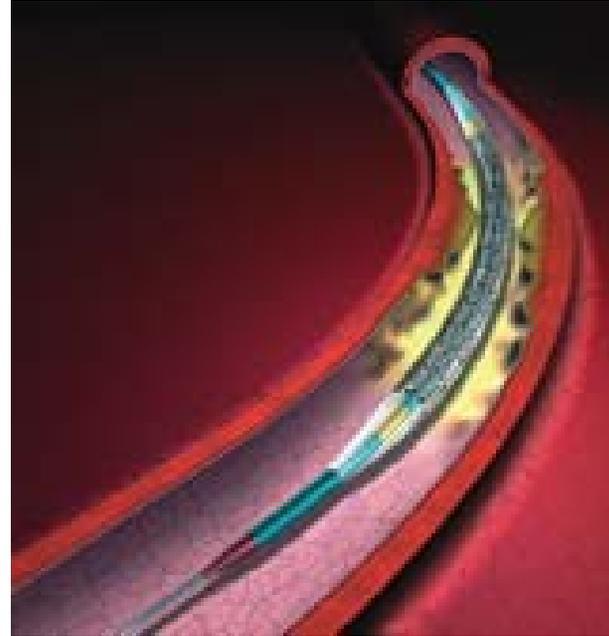
- Percutaneous Transluminal Coronary Angioplasty (PTCA)
- Coronary atherectomy
- Coronary artery stents
- Coronary artery bypass graft (CABG)
- Transmyocardial laser revascularization



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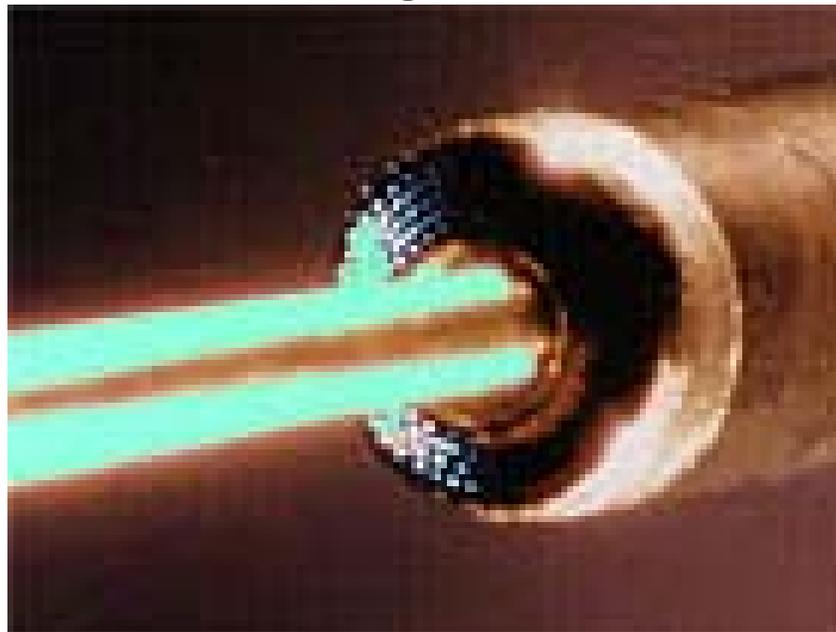
A. Shaver type



B. Rotational type



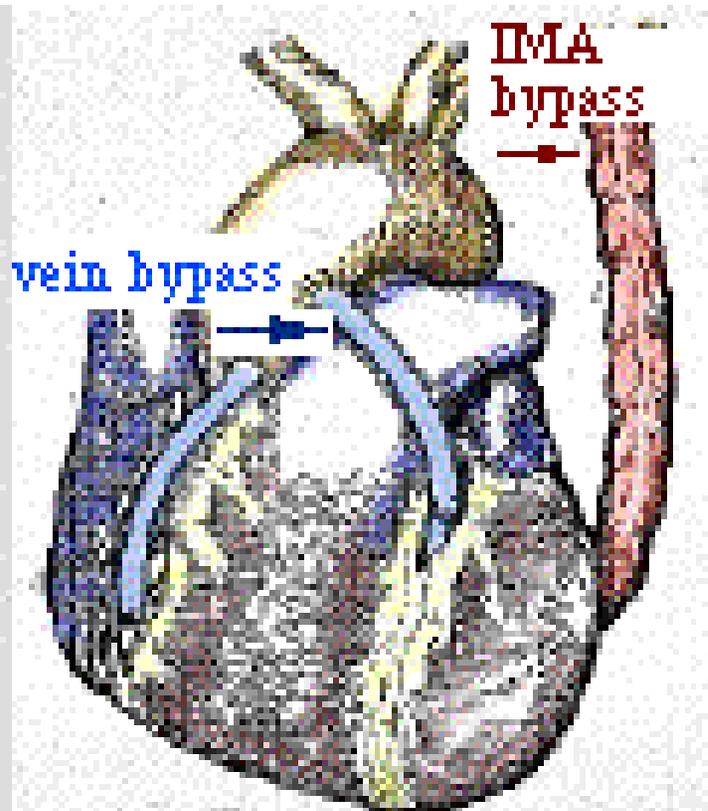
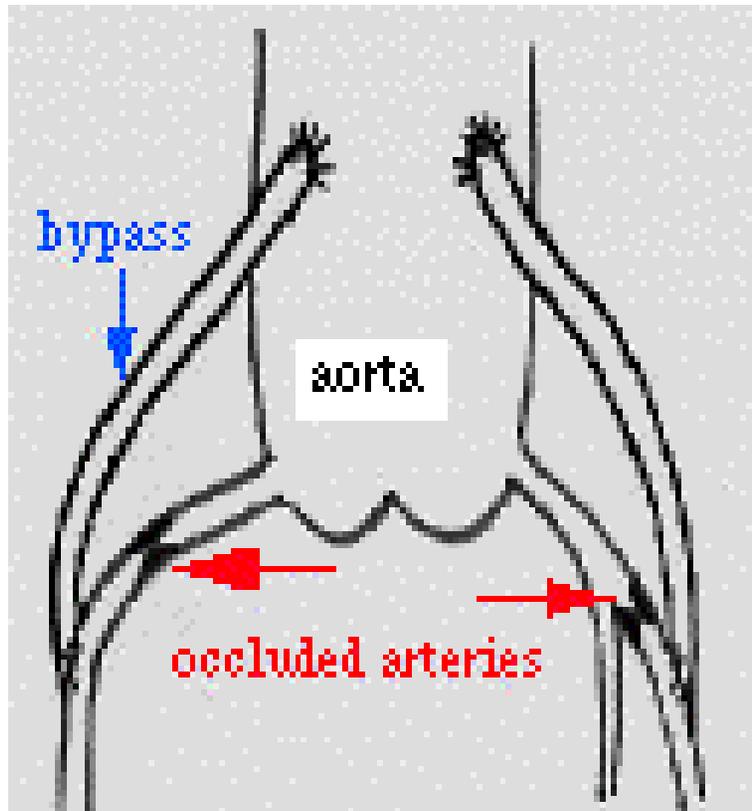
C. Laser fitting

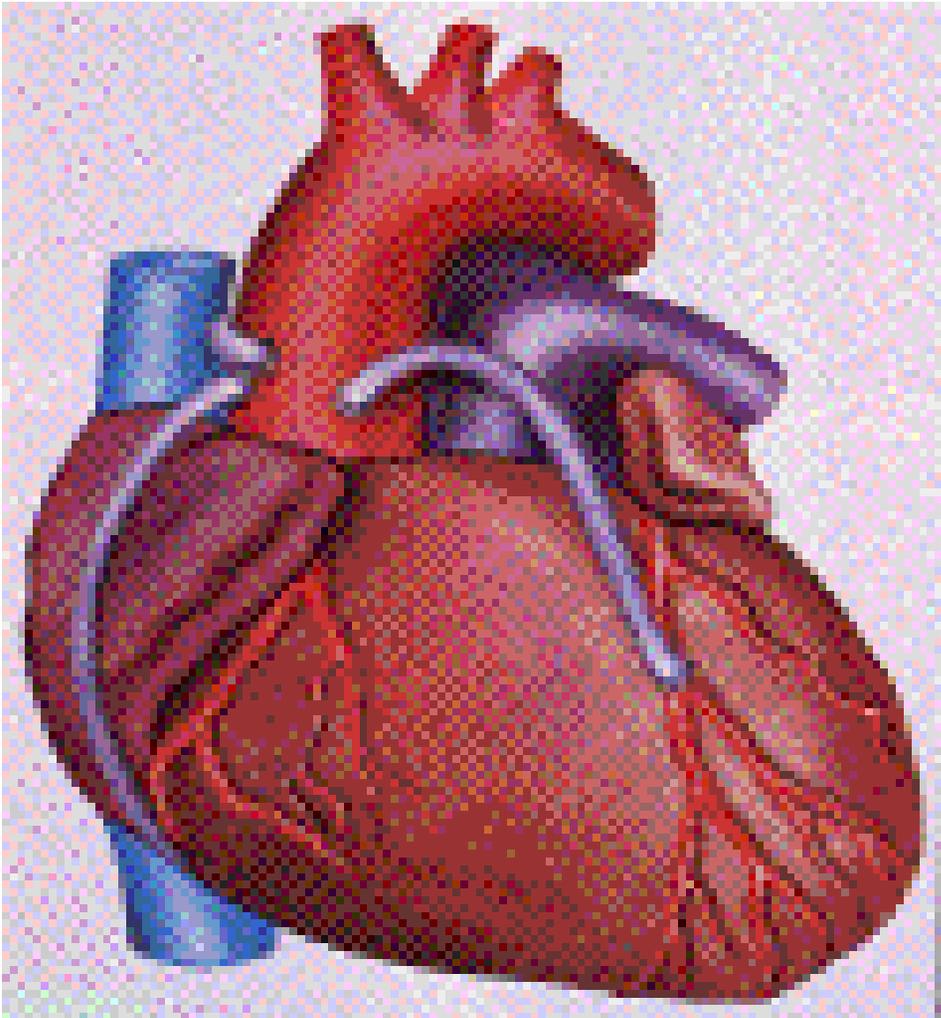


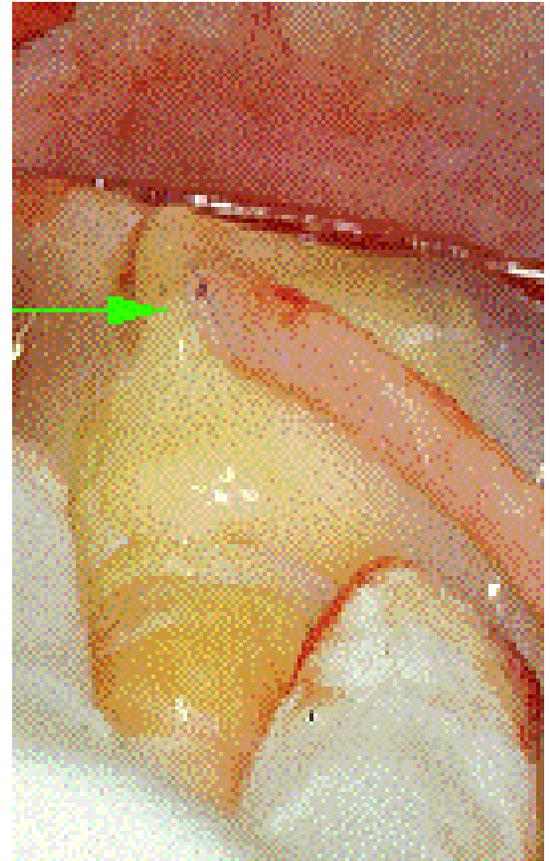
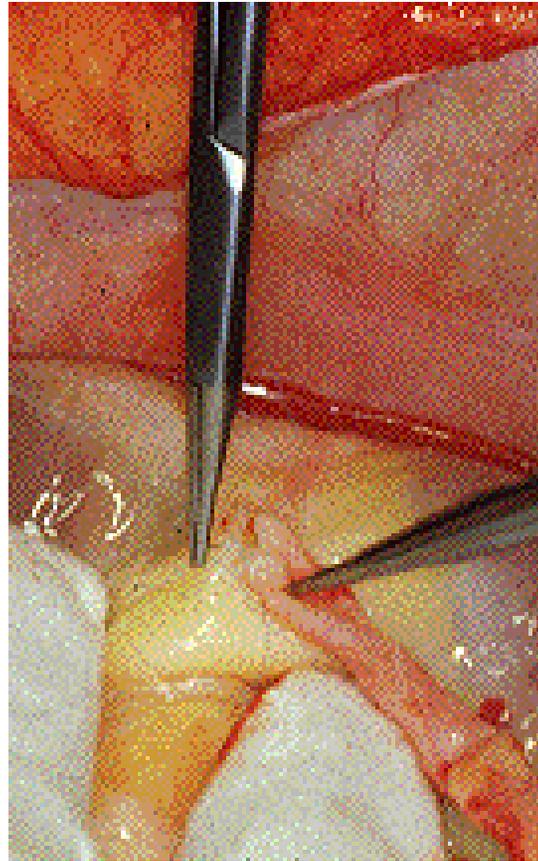
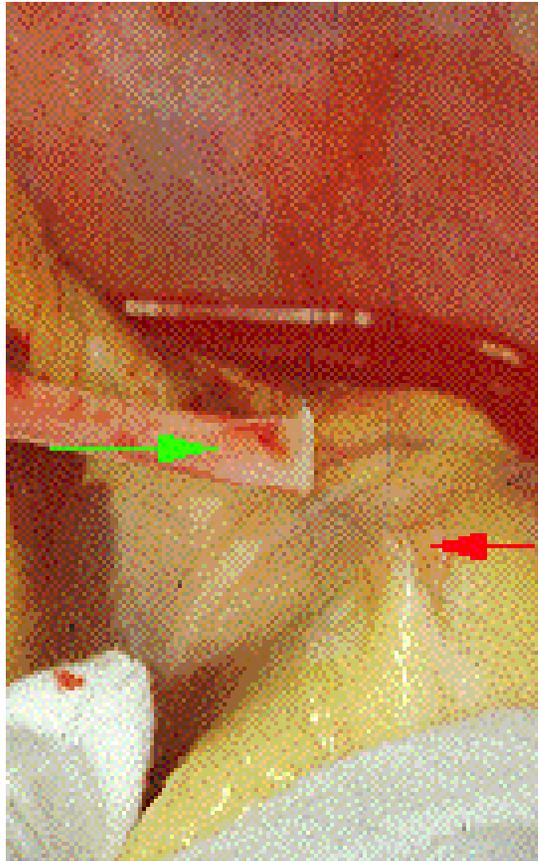
Myocardial revascularization

Coronary Artery Bypass Graft

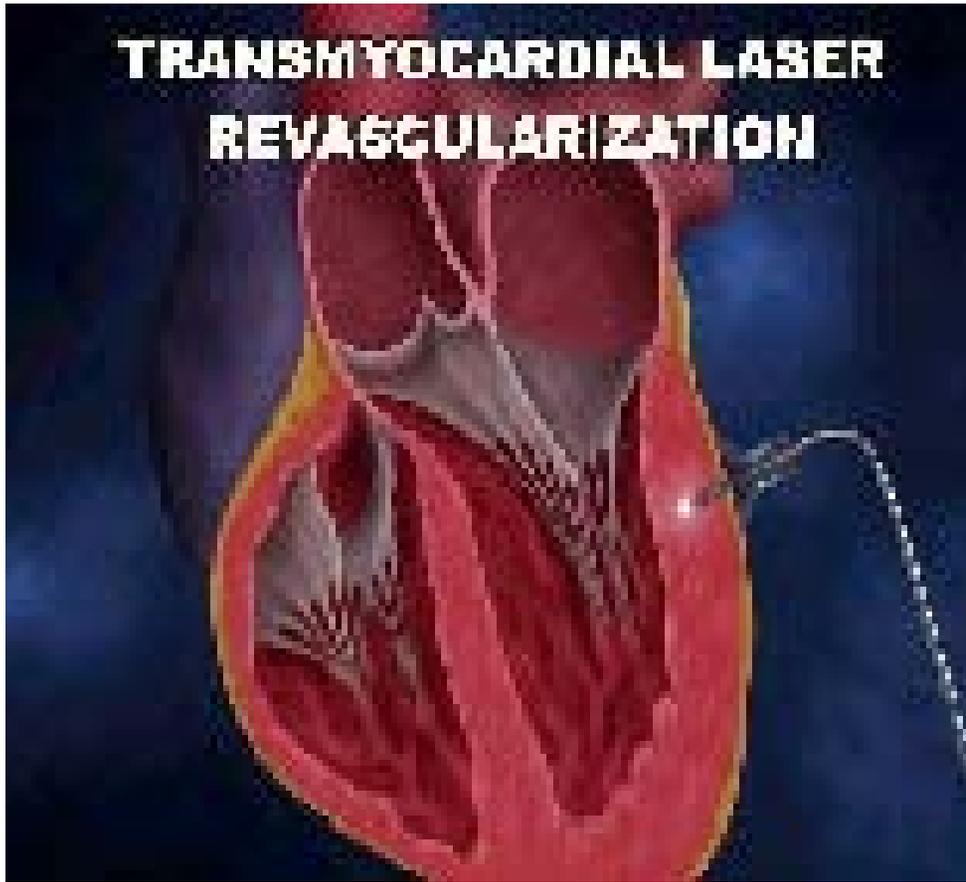
- Increases blood flow and oxygen to myocardium
- Alleviates anginal symptoms
- Blood vessel from leg/chest used
- Reroutes blood around segment of a coronary artery narrowed by atherosclerosis
 - Saphenous vein or right or left internal mammary artery
- MIDCABG- done without cardiopulmonary bypass
 - Small incisions used to access arteries vs. sternotomy
 - Internal mammary arteries used
 - Cannot use for multivessel disease and for right and left
 - Cannot treat more than 2 vessels during same surgery







TRANSMYOCARDIAL LASER REVASCULARIZATION



Acute Coronary Syndromes

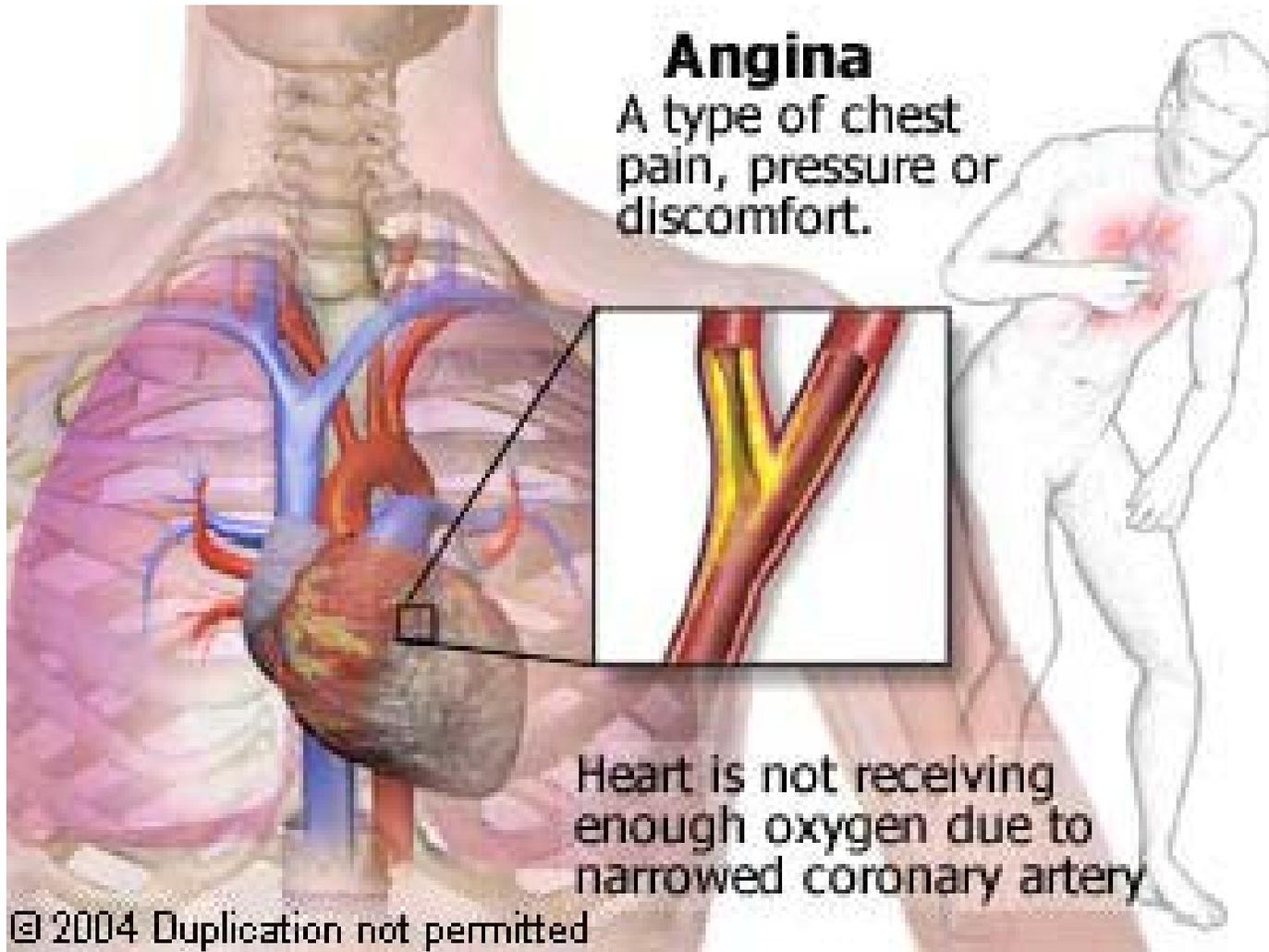
- Group of conditions r/t lack of oxygen to heart muscle
 - Unstable angina
 - Non-Q wave mi
 - ST_segment elevation myocardial infarction
- High risk for myocardial infarction and sudden death

Angina Pectoris

- **Symptom** of ischemia
 - Caused by CAD and heart attack
- ↑ need for oxygen
 - Caused by ↑ heart workload
- Inadequate blood supply
 - Myocardial Ischemia
- Chest pain
 - Until activity stopped
- **NO PERMANENT MYOCARDIAL DAMAGE**

Angina

A type of chest pain, pressure or discomfort.



Heart is not receiving enough oxygen due to narrowed coronary artery

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Angina Pectoris

Signs & Symptoms

- Chest pain
 - Heaviness
 - Tightness
 - Viselike
 - Crushing
- Feeling of impending doom
- Radiation
 - Both arms
 - Left arm(common)
 - Shoulder
 - Neck
 - Jaw or back
- Pale skin
- Diaphoresis
- dyspnea

Angina Pectoris

Types

- Stable
 - Symptoms with moderate exertion
 - Pattern of pain is familiar to patient
 - Managed with nitro and rest
- Variant (Prinzmetal's) Angina
 - Pain same as stable
 - Longer duration
 - Can occur at rest
- Unstable
 - Indicative of worsening CAD
 - Rest does not relieve CP; may occur at rest
 - ↑ frequency of episodes, ↑ severity
- Silent Ischemia
 - May not have CP or s/s of angina
 - Ischemia with or without pain has same prognosis
 - Older adults and DM most often to have

Angina Pectoris

Diagnosis

- EKG
- Stress test
- Stress echocardiography
- Radioisotope imaging
- Coronary angiography
- Biological markers
 - Troponin, creatinine kinase, myoglobin, CRP
 - Myeloperoxidase
 - Albumin-cobalt-binding test(New marker test) – with ECG and troponin; increases accuracy of cardiac dis. dx

Angina Pectoris

Treatment

- Weight Reduction
- Dietary restrictions
- Stress reduction
- Three major medication groups
 - Vasodilators
 - Calcium channel blockers
 - Beta blockers
- USA- Fab four(antiplatelets, statins, ACEI, BB)
 - Synergistic effect to fight plaque

Angina Pectoris

Treatment - Vasodilators

- Drug of choice for angina(Isordil, ISMO)
 - Routes
 - Sublingual, PO, IV, lingual spray, transdermally
 - With SL dose may relieve pain in 1-2 minutes
 - Call 911 after one tab and 5 minutes and no relief of s/s of MI
- Side effects
 - Headache(usually subside 1-2 weeks after tx starts)
 - Light headedness
 - Postural hypotension
 - Tachycardia
 - flushing

Angina Pectoris

Treatment - Vasodilators

- Nursing Implications
 - Monitor BP and apical rate
 - Warn pt of orthostatic ↓ BP
 - Administration
 - 1 tab sl q 5mins X3
 - If not effective – immediate medical treatment
 - Keep in light protected glass bottle
 - Burning/tingling under tongue

Angina Pectoris

Treatment

- Calcium channel blockers (CCBs)
 - Diltiazem (Cardizem)
 - Nifedipine (Procardia)
 - Verapamil (Calan, Isoptin)

Angina Pectoris

Treatment - CCBs

- Side effects
 - Headache
 - Peripheral edema
 - Dysrhythmias
 - Flushing
 - Dizziness
 - AV block

Angina Pectoris

Treatment - CCBs

- Nursing implications
 - Monitor BP & apical rate
 - Hold if BP < 90 systolic
 - Hold if HR < 50

Angina Pectoris

Treatment

- Beta Blockers
- Decrease HR, lower BP, prevent release of renin
 - Propranolol (Inderal)
 - Metoprolol (Lopressor)
 - Atenolol (Tenormin)

Angina Pectoris

Treatment – Beta Blockers

- Side effects
 - Dizziness
 - Bradycardia
 - Hypotension
 - Nausea
 - Confusion
 - Fatigue
 - Agranulocytosis
 - Laryngospasm
 - Impotence
 - Decrease exercise tolerance

Angina Pectoris

Treatment – Beta Blockers

- Nursing Implications
 - Assess HR and BP
 - Hold for HR<60 and SBP<90
 - Administer with food
 - Do not give non cardio selective w/asthma
 - Do not stop abruptly

Angiotensin-converting enzyme inhibitors (ACEIs)

- Block angiotensin to convert into angiotensin II
 - Angiotensin II is a potent vasoconstrictor
 - Reduces peripheral vascular resistance, improves CO, and exercise tolerance
- Reduce BP
- Take BP prior to admin
- Give 1 hour before meals; food delays absorption
- Side Effects:
 - Cough, angioedema, agranulocytosis,

Statins

- Lower cholesterol levels by reducing cholesterol production
- Reduce inflammation and CRP levels
 - improves outcomes of pts with CAD
- Prevent and treat atherosclerosis
- Take in evening
 - When cholesterol synthesis is highest
- Report muscle pain and monitor liver function

Antiplatelets

- Inhibit platelet activation, adhesion, procoagulant activity
- Aspirin, Plavix(clopidogrel), Ticlid(ticlopidine)
- Help prevent cardiac events
- Given to USA, stent placement, heart attack pts.
- Increase risk of bleeding including hemorrhagic stroke

Myocardial Infarction

“Heart Attack”

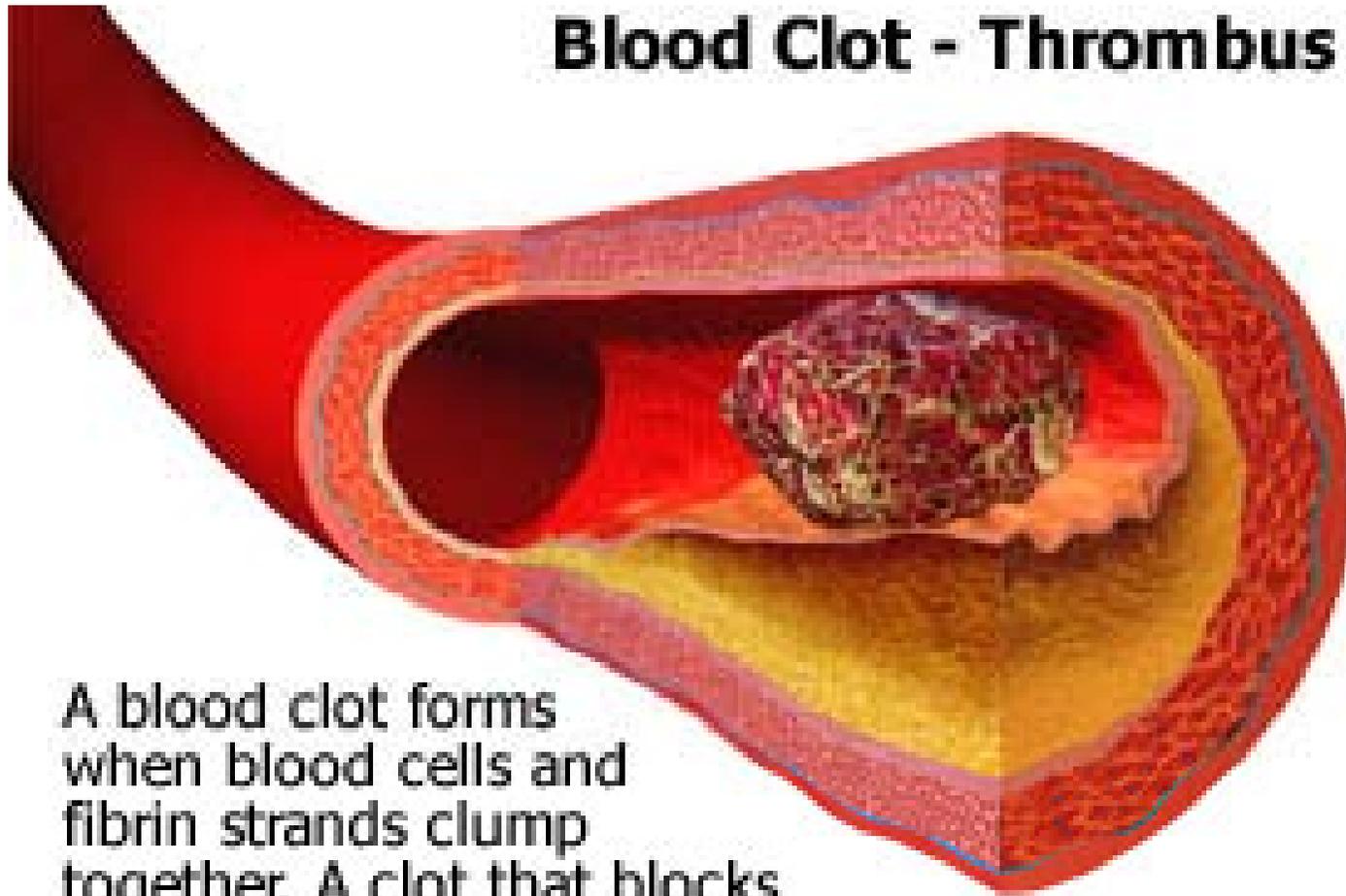
- Results in death of heart muscle
- Permanently destroys myocardial cells
- Occurs from partial/complete block of coronary artery
 - Decreases blood supply to cells of heart
- Damage depends on amount /location of blockage
- Part of heart no longer functions as it should
 - Ability to contract, relax, propel blood impaired
- Men >40 with atherosclerotic development
- Women who smoke or use BCP > risk
 - Can occur at any age in either sex

Myocardial Infarction

Pathophysiology

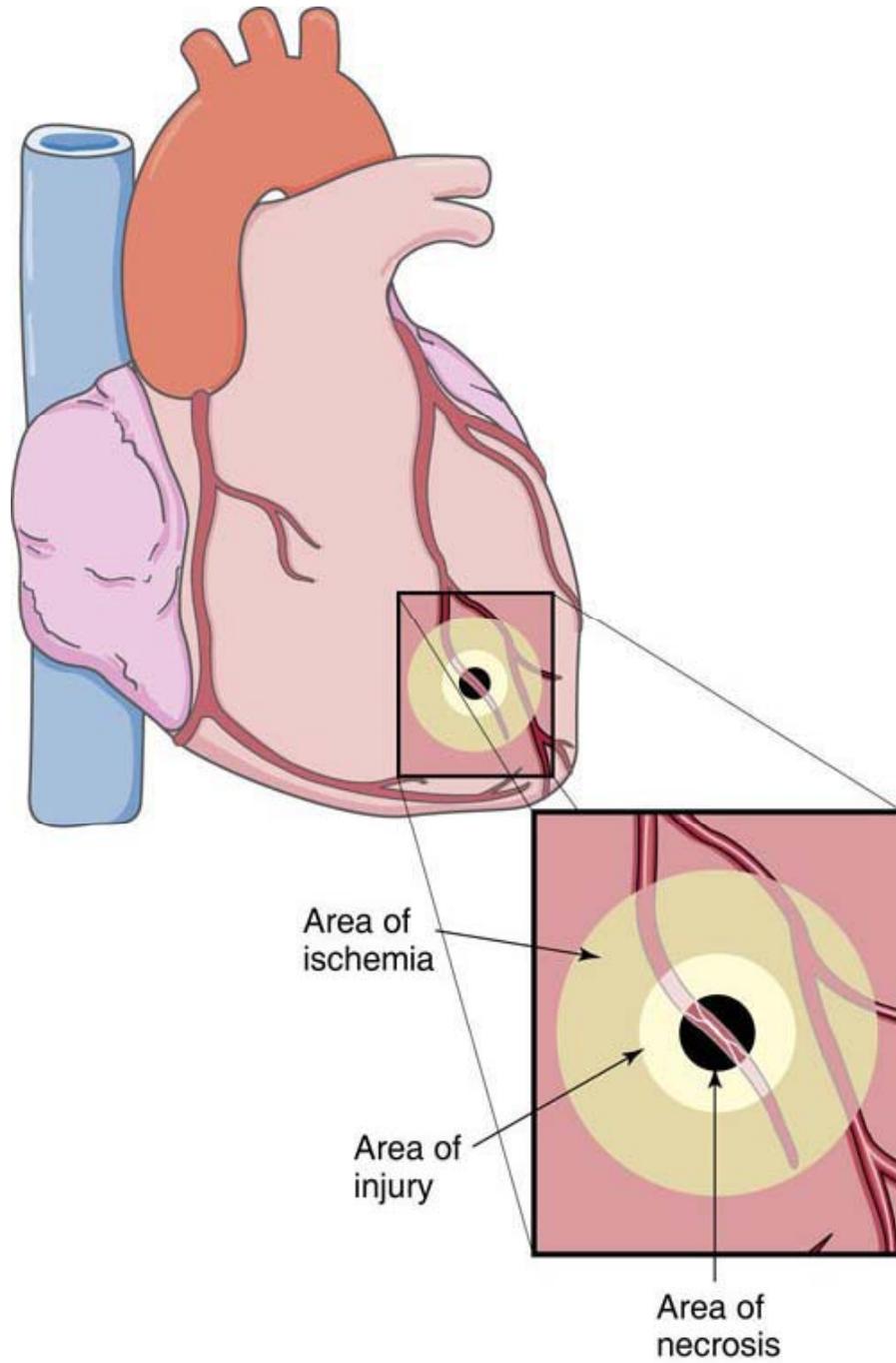
- Effects not immediate
 - Takes several hours before complete necrosis/infarction occurs
 - Subendocardial layer affected- most sensitive to hypoxia
 - Depressed myocardial contractility
- Sympathetic NS effects
 - Increased HR
 - Increases myocardial O₂ demand
 - Can increase infarction size
- **Size of infarction depends on how quickly blood supply can be restored**

Blood Clot - Thrombus

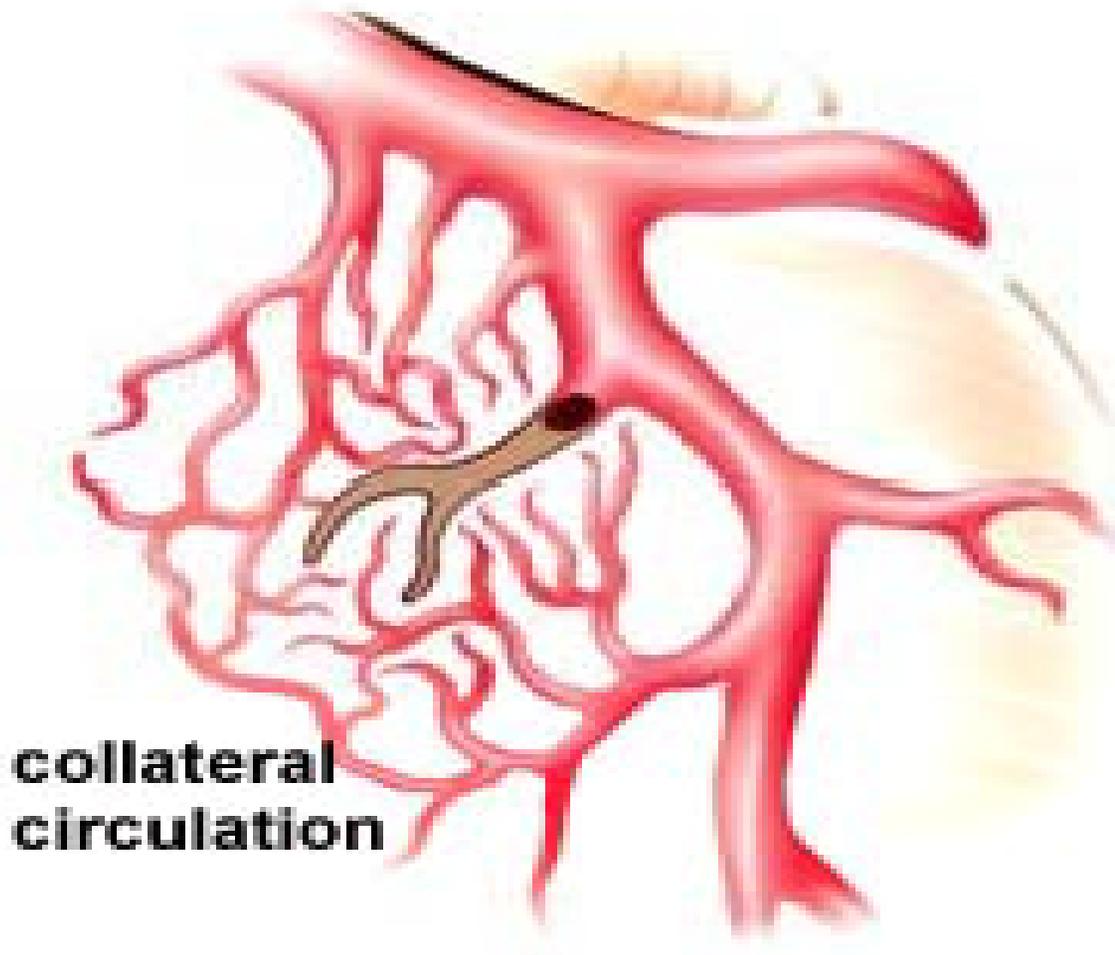


A blood clot forms when blood cells and fibrin strands clump together. A clot that blocks blood flow is called a thrombus.

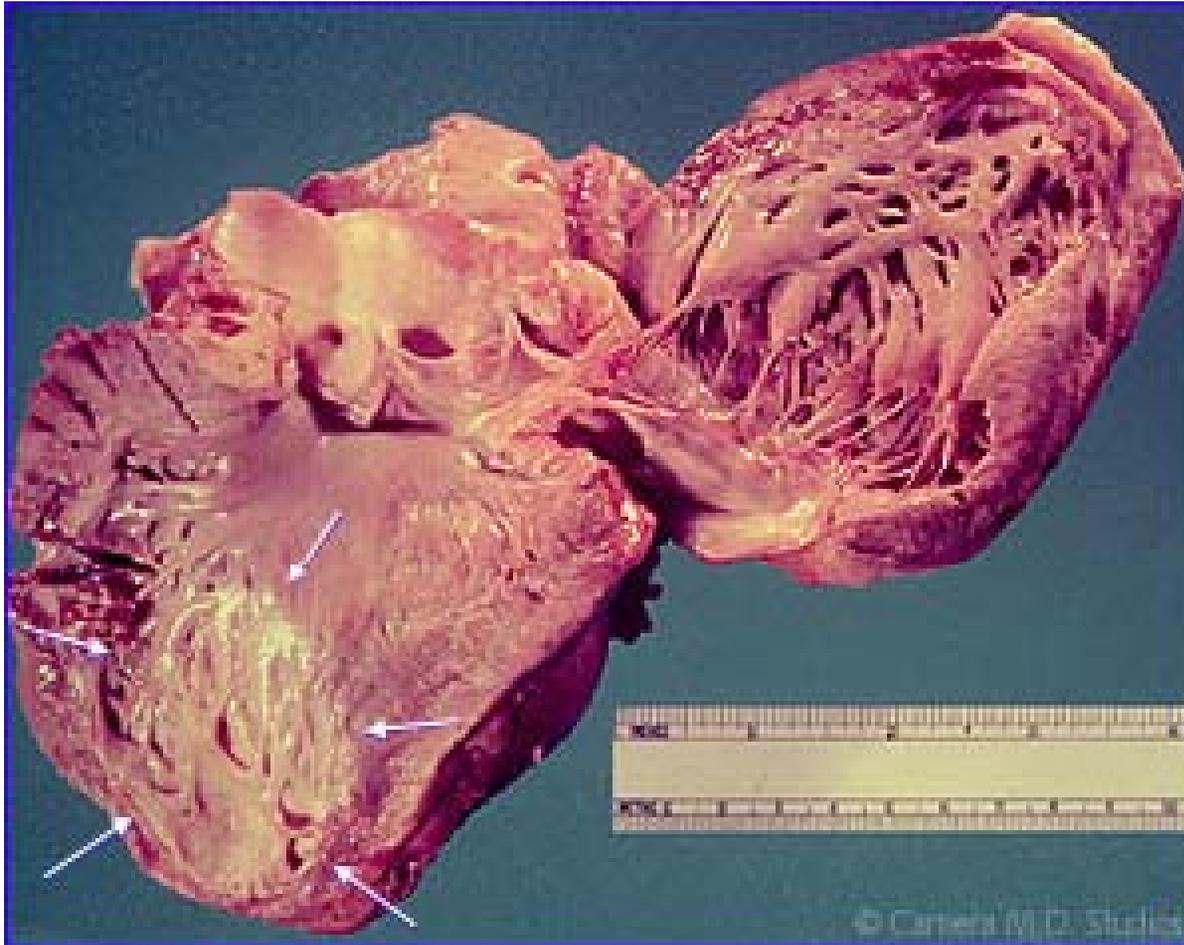
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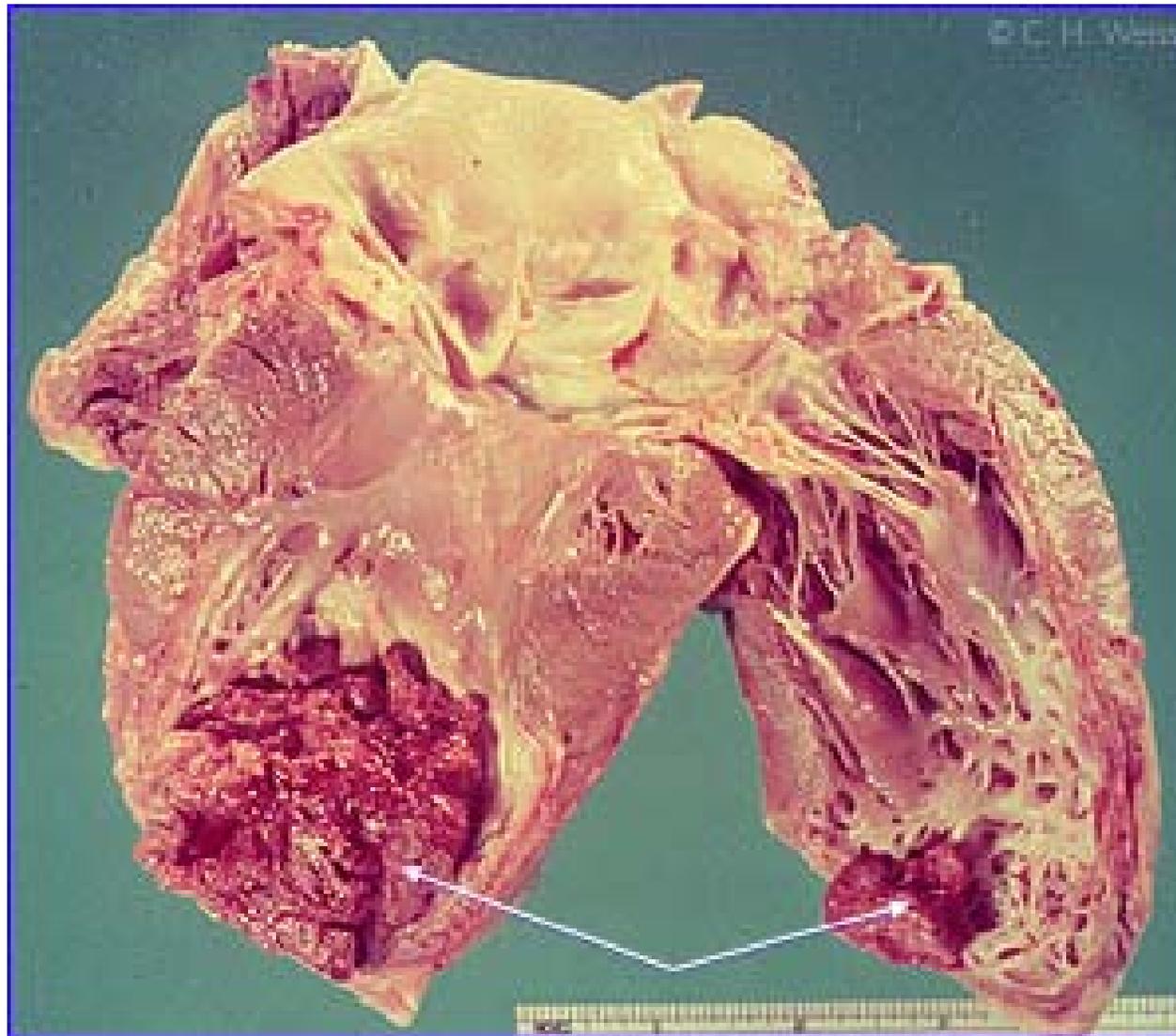
Collateral Circulation



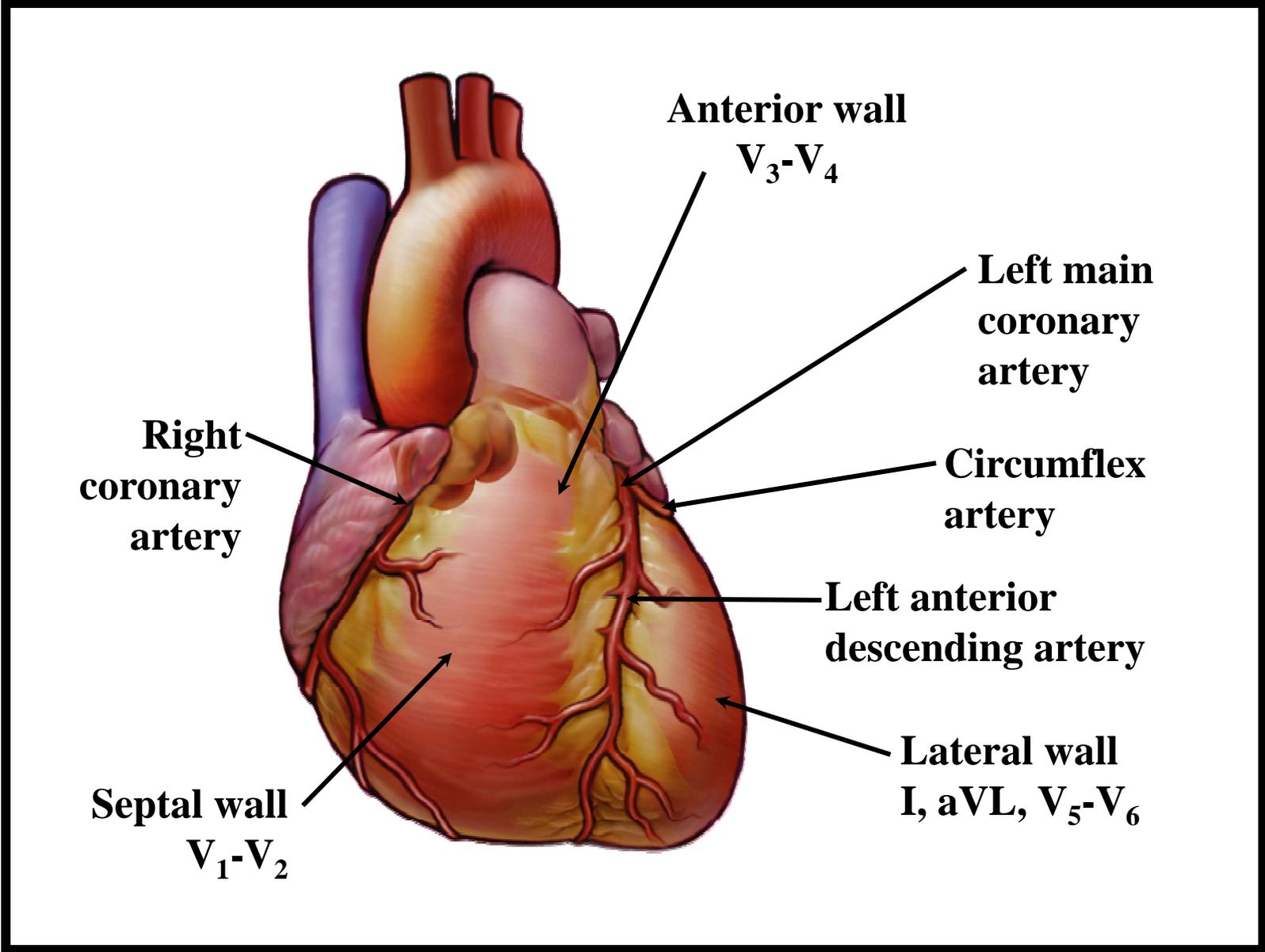
Myocardial Infarction

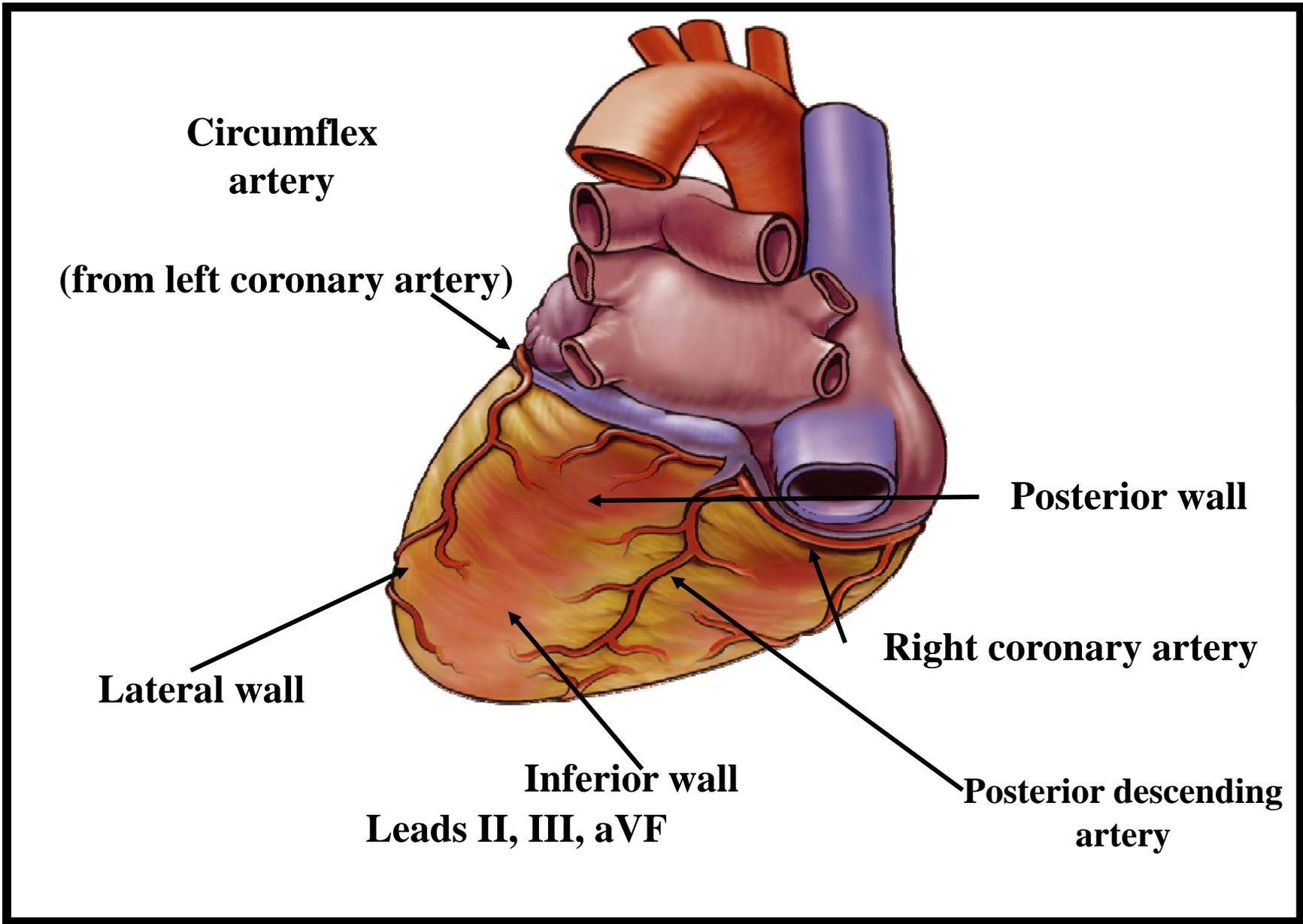


The arrows point to the site of a heart attack, where the heart muscle has died from oxygen deprivation. Normally, the area would look pink.



In some heart attacks, a condition called mural thrombus occurs. Blood that is no longer pumping through the heart starts clotting, eventually turning into a fibrous tissue that marks the exact location of the heart attack.







Coronary arteries are the network of blood vessels that supply the heart. In this photograph, the left coronary artery has been injected with a red dye, and the right coronary artery with white.

Myocardial Infarction

Complications

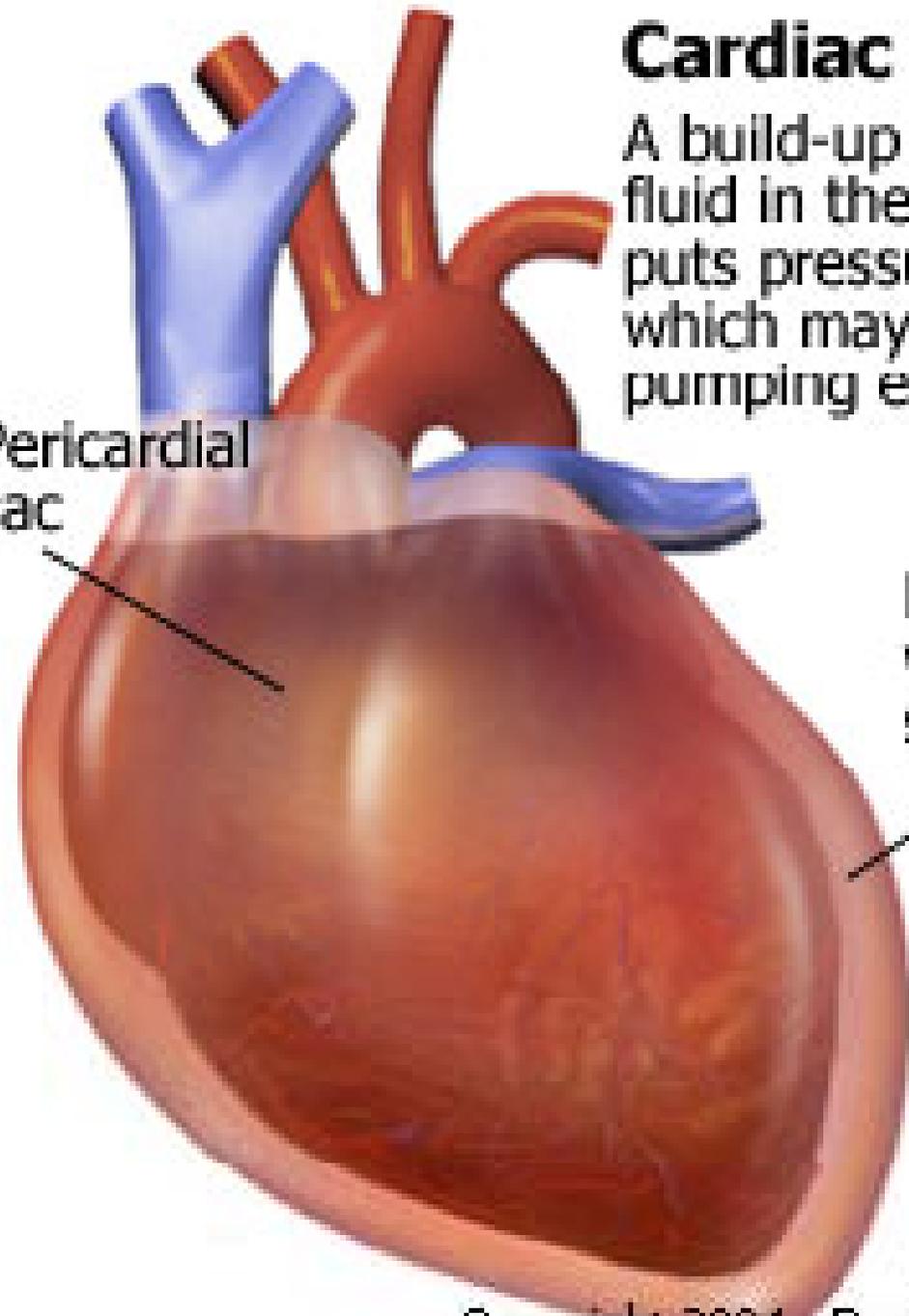
1. Dysrhythmias
2. Cardiogenic shock
3. Heart failure/Acute pulmonary edema
4. Ventricular aneurysms
5. Cardiac tamponade/pericarditis

Cardiac Tamponade

A build-up of blood or other fluid in the pericardial sac puts pressure on the heart, which may prevent it from pumping effectively.

Pericardial
sac

Fluid build-up
within pericardial
sac



Myocardial Infarction

Signs & Symptoms

- Pain
 - Begins suddenly
 - Continued at rest and with NTG
 - “Crushing or viselike”
 - May radiate
- Dyspnea
- Restlessness
- Dizziness
- Feeling of impending doom
- Nausea & vomiting
- Diaphoresis
- Cold, ashen skin
- Crackles & wheezes
- Rapid HR
- Irregular HR
- Extra heart sound
 - S3 or S4
 - May indicate imminent ventricular failure

Women and Heart Health

- Leading cause of death in US
- 6x die from heart disease vs. breast cancer
- Kills more women than all cancer in 65 yr old group
- African American > risk than Caucasian
- Acute MI older than men
- Higher mortality, more complications (VFIB) vs. men
- Classic s/s, but also atypical
 - Extreme fatigue, epigastric pain, jaw pain, indigestion, nausea, vomiting, dyspnea, SOB, cramping in chest

Myocardial Infarction

Gerontological Implications

- Silent MI
 - No pain
 - Don't ignore s/s
 - Shortness of breath fainting
 - Fatigue restlessness
 - Fast or slow heart rate
- Over 85 yrs(atypical presentation), also with DM
 - More collateral circulation
 - Fewer complications
- Revascularization and statin therapy
 - Angioplasty/bypass surgery
 - Improves quality of life without increasing mortality
 - Statins reduce mortality in >80 yrs old

Myocardial Infarction

Diagnostic Tests

1. History
2. Serial ECG
3. Serial cardiac troponin I
4. Myoglobin
5. Serial CK – MB
6. Magnesium levels
7. PT/PTT

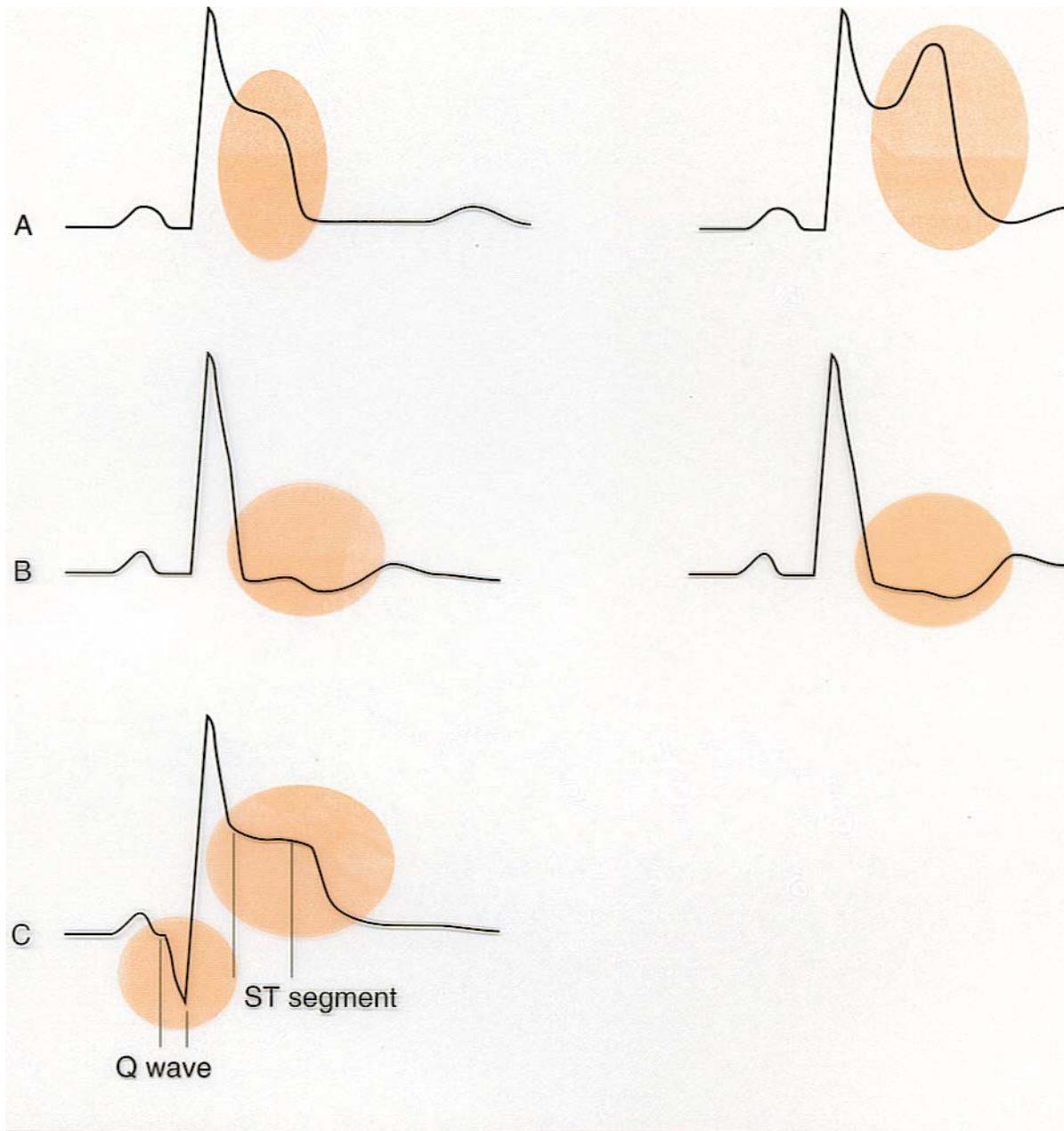
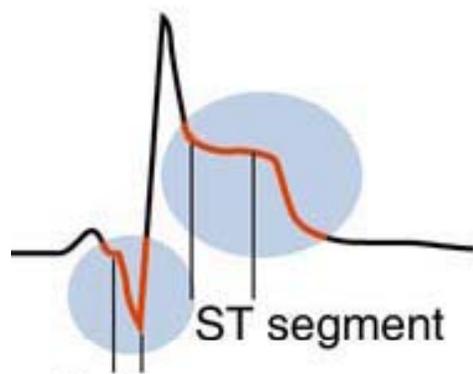
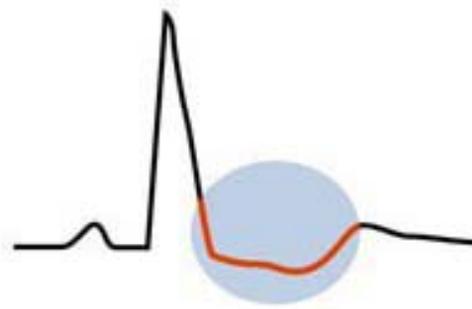
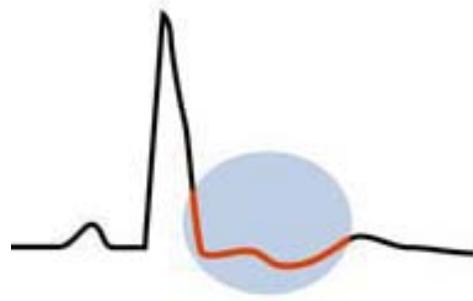
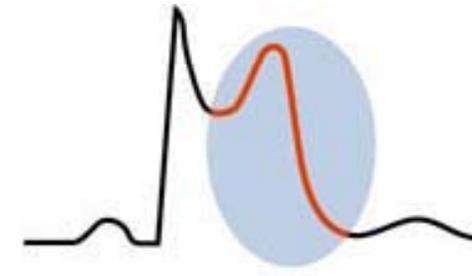
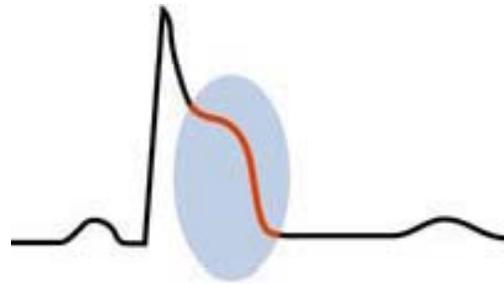


Figure 18-3. ECG changes during myocardial infarction. (A) ST segment elevation—injury (B) ST segment inverted—ischemia. (C) Large Q wave—ST segment elevation—necrosis.



Q wave

ST segment

Myocardial Infarction

Initial Treatment

- ASA 325mg @ onset of chest pain
- Oxygen
 - SaO₂ >94%
- CCU
- Cardiac monitor
- Bedrest
- Prompt medical intervention

Myocardial Infarction

Treatment - Medications

- Antiplatelets
- Analgesics
- Nitrates
- Thrombolytics
- Anticoagulants
- Beta blockers
- ACE inhibitors
- Statins
- Antidysrhythmics

Myocardial Infarction

Treatment -

- Acute phase-meals
 - Small easily digestible meals
 - Caffeine restricted
 - Room temp fluids
- Initially low sodium clear liquids
- Cardiac diet
 - Low cholesterol, low fat, low sodium
- Weight loss
 - To reduce cardiac work load
- Smoking should be avoided
 - Educate on hazards of smoking
 - Refer to smoking cessation program

Ventricular Aneurysm Repair

- May occur after an MI
 - Persistent angina, s/s heart failure, left ventricular failure, tachydysrhythmias
- Incision made into heart once on CPB
 - aneurysm resected leaving fibrous border
 - Ventricle wiped clean and irrigated
 - Ensures all thrombi are removed
 - Closed with sutures or patched with graft
 - Any air that entered ventricle is aspirated

Myocardial Infarction

Nursing Interventions

- Monitor pain, VS, SaO₂, labs, urine output, circulation
- Semi-fowler's position
 - Improves breathing
- Support arms with pillows
- Avoid Valsalva maneuver
- Provide emotional support
- Patient education
 - Disease, meds, diet, activity, rehab
 - Prevention of complications
 - Smoking cessation

Myocardial Infarction

Cardiac Rehabilitation

- Initiated after acute s/s resolved
- Goal
 - Improve cardiac function
 - Return to as normal life as possible
- Started in hospital
 - Protocol for type and amount of self care
- Continued as outpatient
 - Focuses on returning to prehospital level of activity and function
 - Maintain optimal physical fitness and continue healthy lifestyle(exercise and wt loss)

Peripheral Vascular System

- Peripheral Vascular Disease(PVD)
- Either arterial or venous in origin
- Very common in older patients and Diabetics

Arterial Thrombosis and Embolism

- Acute arterial occlusions sudden and dramatic
- Thrombus(adheres to vessel wall)
 - Injury to arterial wall
 - Sluggish blood flow
 - Plaque formation
 - Secondary to atherosclerosis
- Embolism(when thrombus breaks off and travels)
 - Occludes an arterial vessel too small to allow it to pass
 - Causes
 - Dysrhythmias
 - Prosthetic heart valves
 - Rheumatic heart disease

Thrombosis & Emboli

- Six P's of acute arterial occlusion
 - Pain
 - Pallor
 - Pulselessness
 - Paresthesia(numbness)
 - Paralysis
 - poikilothermia
- Numbness
- Decreased movement
- Pale
- Cool
- Progression to necrosis/gangrene
 - Within hours
 - Without treatment

Interventions

- Protect and save affected limb
- Anticoagulant therapy
 - IV heparin is drug of choice
 - No effect on existing clots
 - Coumadin – after 3-7 days
- Thrombolytic therapy
 - Dissolve clot
- Embolectomy or thrombectomy
 - Severe occlusion

Peripheral Arterial Disease

- Chronic, progressive narrowing
- Leads to obstruction of arterial vessels
 - Lower extremities most commonly affected
- Atherosclerosis most common cause
- Organic or functional
 - Organic caused by structural changes from plaque or inflammation in blood vessels
 - Functional is short-term localized spasm in blood vessel as in Raynaud's Disease
- 8-12 million people have PAD

Peripheral Arterial Disease

Pathophysiology

- Impedance of blood flow distal to blockage
 - Decreased nutrition
 - Cellular waste accumulation
 - Development of ischemia
 - Necrosis and gangrene
 - Thrombus and emboli become major problems

Peripheral Arterial Disease

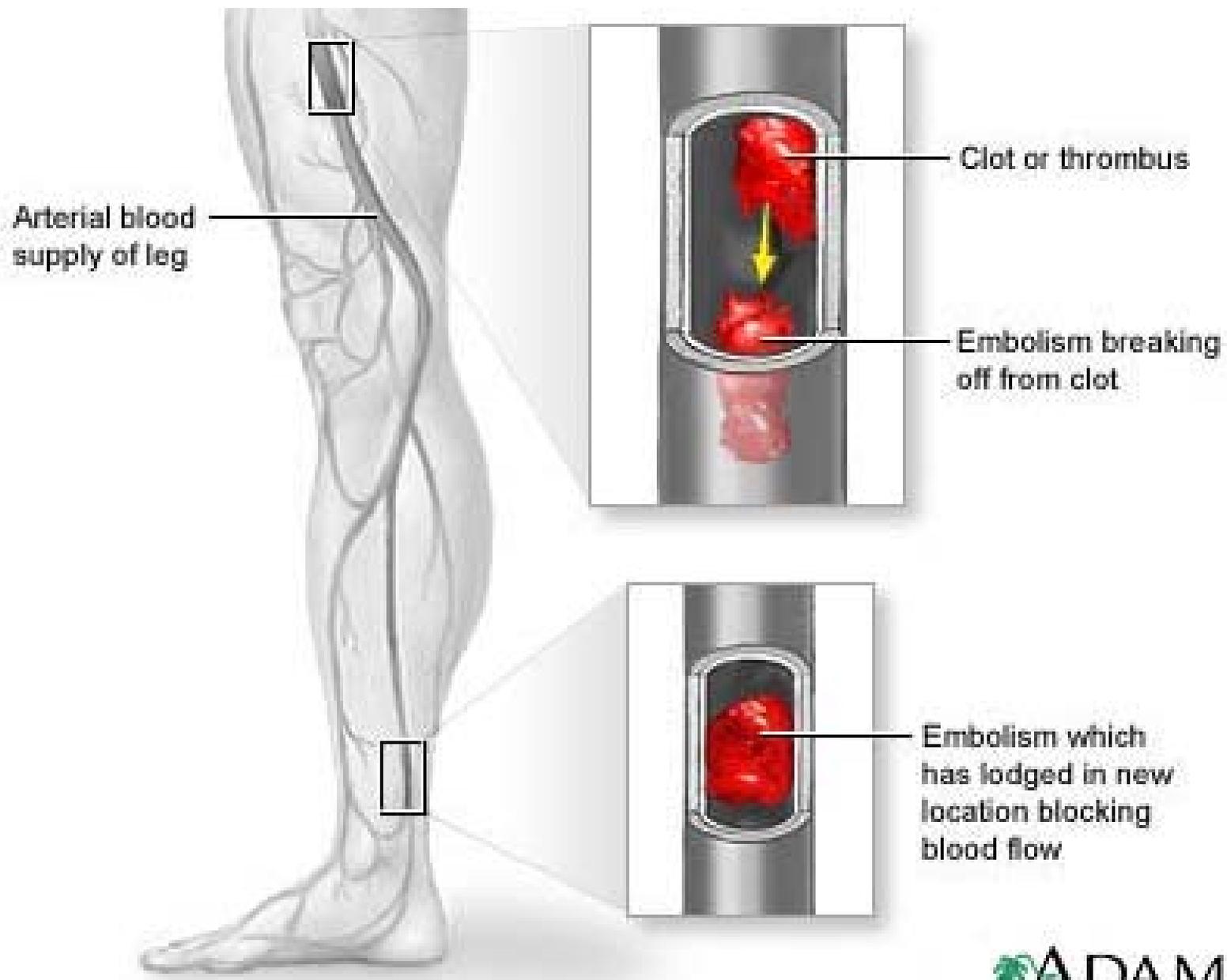
Pathophysiology (cont.)

- Compensatory mechanisms
 - Peripheral vasodilatation
 - Anaerobic metabolism
 - Development of collateral circulation

Peripheral Arterial Disease

Signs & Symptoms

- Often no s/s , especially in women
- Occur late in disease process
 - Produces changes in extremity
- Intermittent claudication
 - Due to ↓ blood supply to muscles
- Skin color changes
- Cool extremities
- Diminished or absent pulses
 - Loss of circulation leads to tissue death and
gangrene



Peripheral Arterial Disease

Diagnostic Tests

- Ankle-brachial index
 - Normally equal
- Doppler ultrasound
- MRI
- Angiography

Peripheral Arterial Disease

Treatment

- Conservative treatment
 - Diet
 - Low calorie, low fat, low cholesterol
 - Medications
 - Lipid lowering agents
 - Vasodilators

Peripheral Arterial Disease

Treatment (cont.)

- Thrombolytic therapy
 - Used with thrombus or emboli
- Surgical treatment
 - PTA
 - Peripheral artherectomy
 - Intravascular stents

Raynaud's Disease

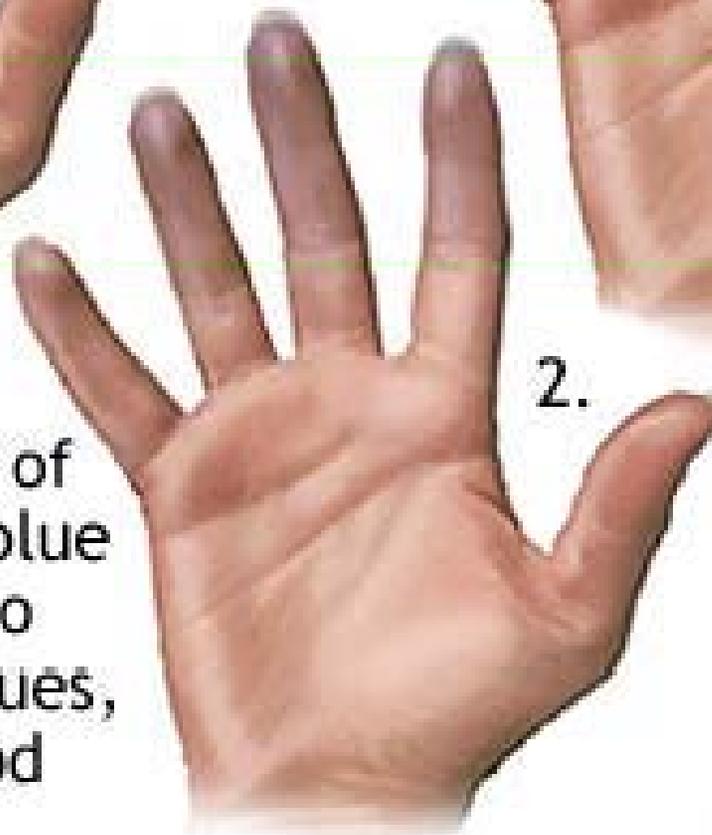
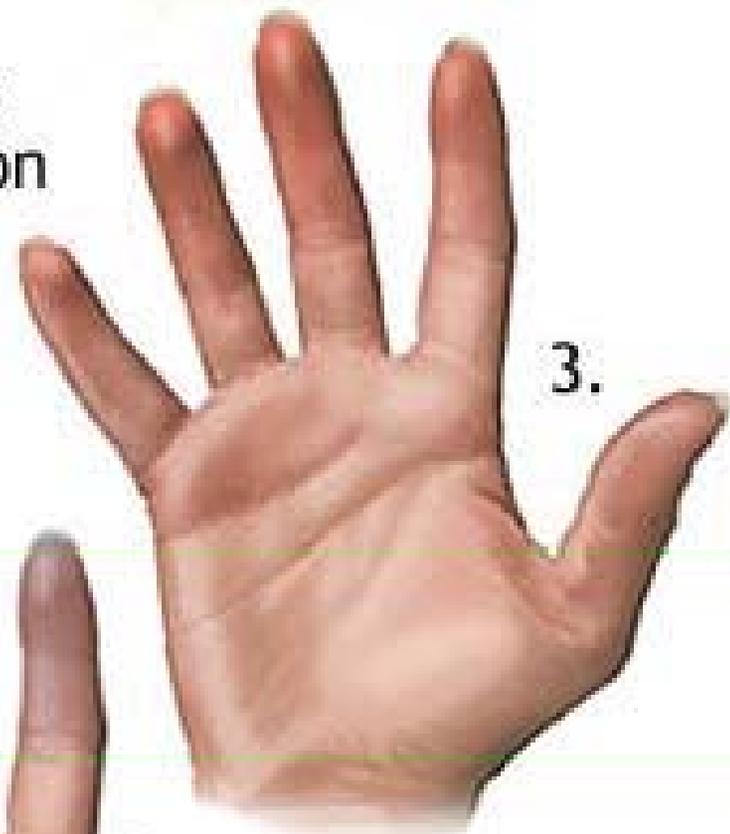
- Vasoconstrictive response causing ischemia
- Primarily affects hands
 - Feet, ears, nose may be affected
- Intermittent attacks for 2 years
 - To make diagnosis
- More common in women
- Spasms of small arteries
 - Usually in response to cold exposure
 - Prevent arterial blood from perfusing fingertips/toes
 - Unilateral or bilateral and in all digits

Raynaud's Disease

Signs & Symptoms

- Intense pain
- Hyperemia
 - Intense reddening of skin
- Phases of skin blanching
- Disease progression over time
 - Continued constriction
 - Severe decreased blood flow
 - Necrosis & gangrenous

Raynaud's phenomenon



Fingers become white due to lack of blood flow, then blue as vessels dilate to keep blood in tissues, finally red as blood flow returns

Raynaud's Disease

Treatment

- Conservative
 - Keep extremities warm(gloves)
 - Avoid smoking, alcohol, caffeine
 - Reduce stress
 - Vasodilators
 - Nifedipine (Procardia)
 - Long acting nitrates
- Surgical intervention
 - Sympathectomy

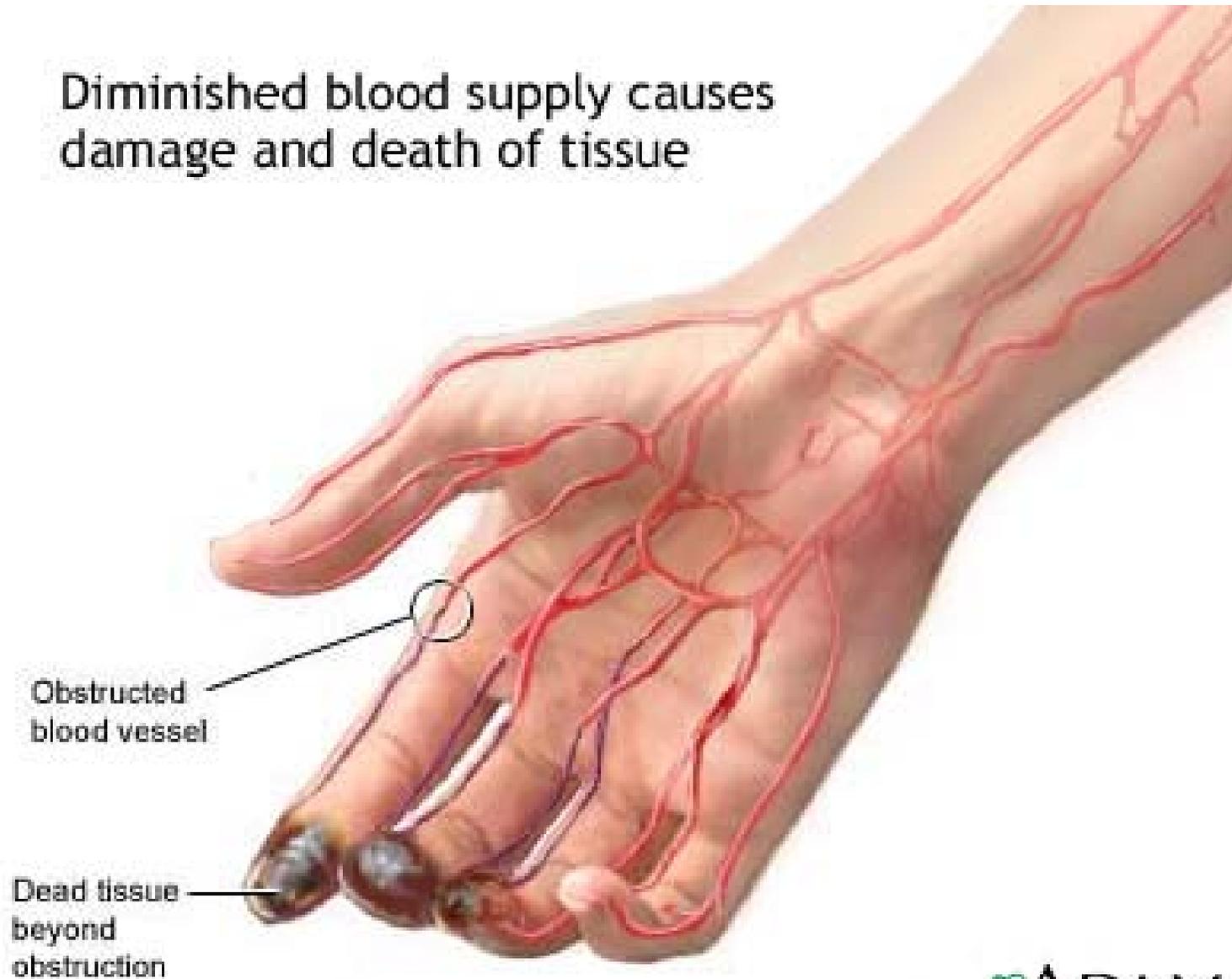
Buerger's Disease (Thromboangiitis Obliterans)

- Chronic inflammation
 - Small & medium arteries & veins
 - Lower extremities
- Definite link to smoking
 - Possible autoimmune response to tobacco
- Common in smoking males
 - 25 - 40yrs of age

Buerger's Disease (cont.)

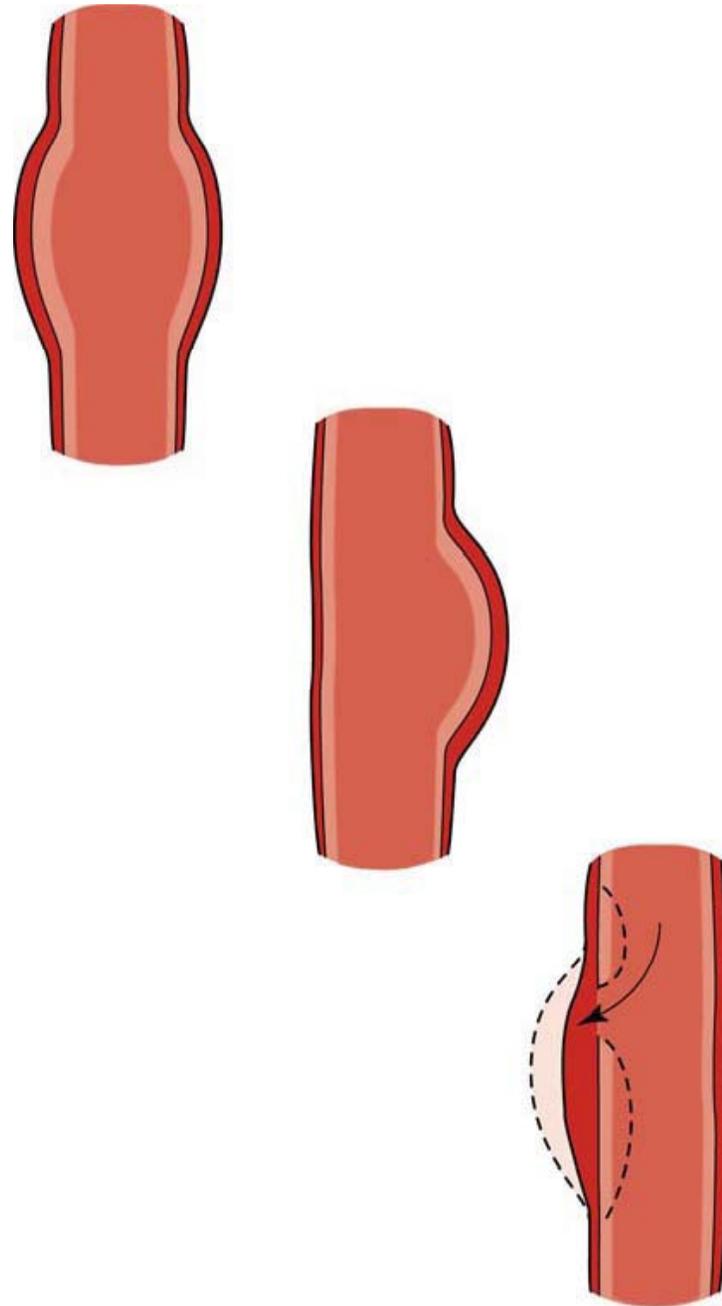
- Signs & symptoms
- Inflammation and irritation contribute to vasospasms
 - Vasospasms lead to obstruction of blood flow
 - Hypoxic tissue, ischemic pain occurs
 - Intermittent claudication
 - Numbness
 - Decreased sensation
 - Cool extremities
- Treatment
 - Stop smoking
 - Calcium channel blockers(promotes vasodilation)

Diminished blood supply causes
damage and death of tissue



Aneurysms

- Pathophysiology
 - Bulging or dilatation of weakened arterial wall
- Etiology
 - Cause unknown (weak arterial wall)
 - Atherosclerosis, trauma, congenital
- Risk factors
 - Hereditary
 - Men
 - > 50yrs of age
 - hypertension



Aneurysms

Signs & Symptoms

- Few if any s/s
- Back or flank pain-classic symptom
- Abdominal pain
- Full feeling
- Abdominal bruit
- Palpable pulsating mass in abdomen
- Severe sudden back/abdominal pain
 - May indicate rupture
 - Mortality very high

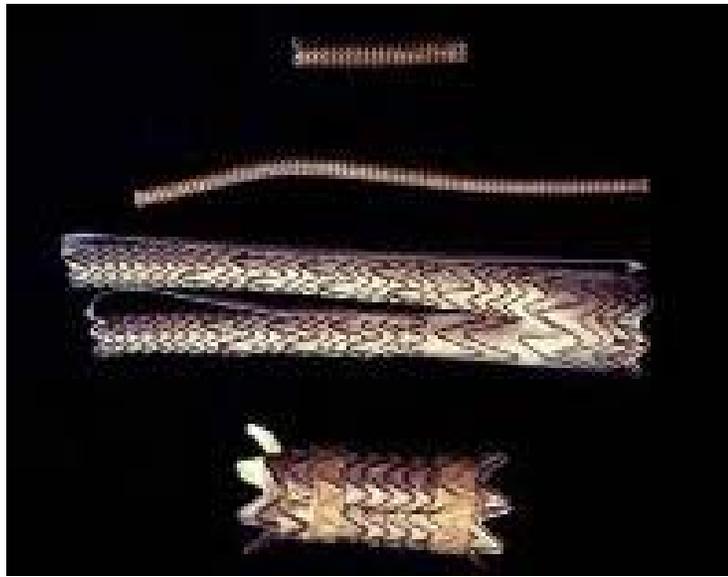
Diagnostic tests

- CT Scan
- Abdominal US
 - Confirm presence
- Small aneurysms watched for further growth
- Aortography
 - When surgery considered to determine size and location of existing aneurysm

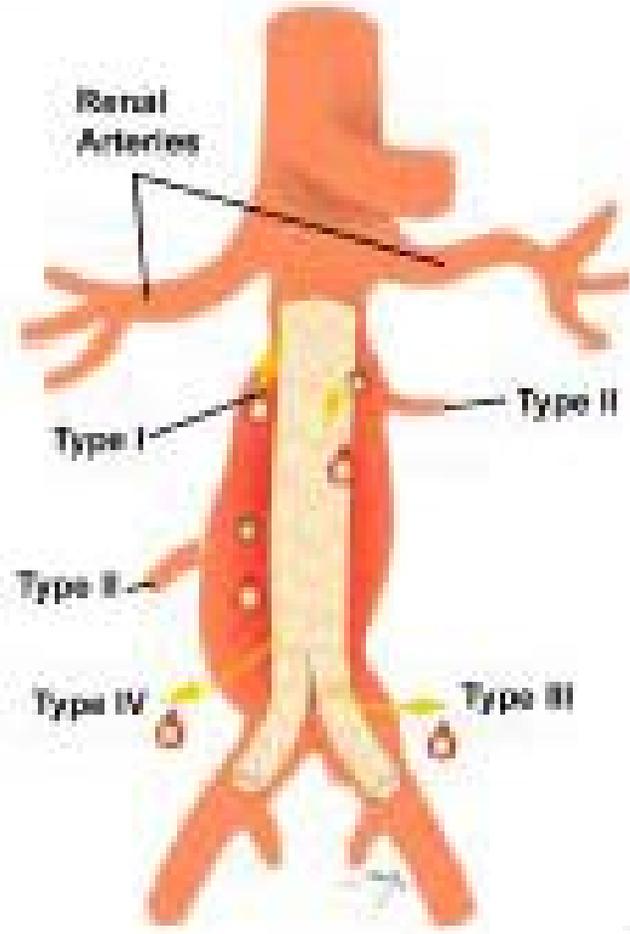
Aneurysms

Treatment

- Lower BP
 - Antihypertensives
- Surgery
 - Bypass graft indicated
 - Severe pain
 - Circulatory compromise
 - > 5 cm (risk of rupture greater)



Aortic Stent Grafts



Varicose Veins

Pathophysiology

- Structural defect in vessel wall
- Incompetent vessel valves
 - Causes dilation of vessel
- Tends to be familial
- Venous dilation
 - Elongated & tortuous dilated veins



Varicose Veins

Treatment

- Improve circulation, relieve pain, avoid complications
 - Conservative tx:
 - Weight loss
 - Increase activity
 - Avoid tight clothing
 - Elastic compression stockings
- Surgical treatment
 - Injection sclerotherapy
 - Vein stripping
 - Closure procedure
 - Radio frequency energy to close off vein

Venous Insufficiency

- Chronic condition
- Damaged or aging valves interfere with blood return to heart, pooling of blood occurs

Venous Stasis Ulcers

- Pathophysiology
- End result of chronic venous insufficiency
 - Dysfunctional venous valves
 - Prevents or reduces venous return
 - Increased venous pressure, leads to venous stasis
- Congestion leads to changes in lower extremities
 - Brown discoloration of leg and foot- medial malleolus
 - Surrounding skin hardened, leathery
- Stasis ulcers occur from increased

Venous Stasis Ulcers

Treatment

- Ace wraps
- Bedrest
- Extremity elevation
- Do not cross legs/keep dependant
- Avoid long periods of standing/sitting
- Exercise and walk during non acute phase
- Ulcers
 - Topical antibiotics
 - Unna Boot
 - Skin grafting

Vascular Surgery

- Impairments may be acute/chronic
 - Involve arteries, veins, lymphatic vessels
 - With severe intermittent claudication or when limb is at risk for amputation, vascular grafting may be done

Types of surgical interventions

- 1. Embolectomy and thrombectomy
- 2. Vascular bypasses and grafts
 - AV shunts/fistulas
 - easy circulatory access for HD
- 3. Endarterectomy
- 4. Angioplasty
- 5. Stents

Lymphatic System

- Returns fluid from tissues in body to blood stream-
 - pumpless, with one-way valves
 - Any interruption causes edema to form
- Lymphangitis
 - Inflammation of lymphatic channels
 - Infection can occur in arms or legs
 - Can cause sepsis and be fatal
 - Staph or strep
- Signs & Symptoms
 - Pain, redness at site
 - Chills & fever

Lymphangitis

Treatment

- Antibiotic therapy
- Heat
- Elevation
- Pneumatic pressure devices
- Monitor size of extremity
- Check for skin breakdown

Peripheral Arterial Disease

Stages

- Stage I
 - Asymptomatic
- Stage II
 - Claudication
- Stage III
 - Rest pain
- Stage IV
 - Necrosis/gangrene

