CARDIOVASCULAR CONDITIONS

Module Competence:

To promote health, prevent illnesses, diagnose and manage patients suffering from common cardiovascular disorders.

Module Outcomes

By the end of this module, the learner should:

- Manage patients suffering from cardiac disorders using the Nursing Process approach
- Manage patients suffering from vascular disorders using the Nursing Process approach

Content outline:

Cardiac disorders:

Congestive Cardiac failure, Rheumatic heart disease, Valvular disease, Coronary heart disease, Infective endocarditis, Myocardial infarction, Cardiomyopathy

Vascular conditions;

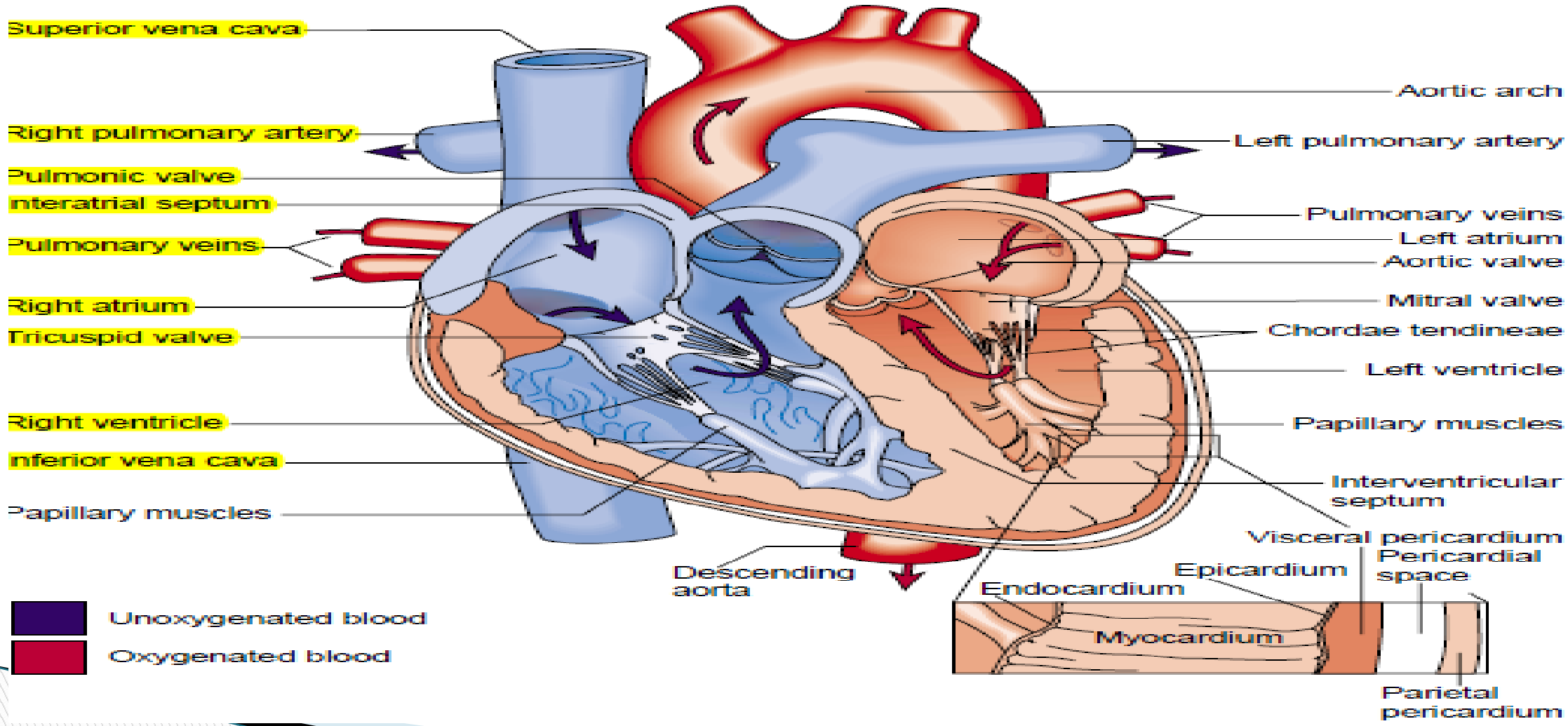
Atherosclerosis, Arteriosclerosis, Aneurysm, Gangrene, Varicose veins, Phlebitis, Deep Venous Thrombosis, Embolism, Hypertension

Cardiovascular diseases

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels and they include:

- **Coronary heart disease** – disease of the blood vessels supplying the heart muscle
- **Cerebrovascular disease** – disease of the blood vessels supplying the brain
- **Peripheral arterial disease** – disease of blood vessels supplying the arms and legs
- **Rheumatic heart disease** – damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria
- Congenital heart disease – malformations of heart structure existing at birth
- **Deep Vein Thrombosis** and Pulmonary Embolism – blood clots in the leg veins, which can dislodge and move to the heart and lungs.

Overview of anatomy of the heart



HEART

- Muscular organ in the mediastinum (between lungs)
- Right and left atria and ventricles
- Pumps blood to tissues to Supply Oxygen & nutrients by contraction (systole) and relaxation (diastole)
- Systole - blood ejected and Diastole - chambers fills with blood
- Normal adult- 60-80 bpm and about 5L in a min
- It has 3 layers: Endocardium - inner layer, Myocardium - middle layer (responsible for pumping action) and Epicardium- exterior layer (visceral pericardium)

Heart ct…

- Heart enclosed in a pericardium (serous pericardium) – has two layers:

- visceral pericardium - attached to epicardium

- parietal pericardium - attached to the great vessels, diaphragm, sternum and vertebral column.

- The space between the two - pericardial space and has about 30 ml of fluid (pericardial fluid) that lubricates the heart in systole

Cardiac signs and symptoms

- Fatigue – earliest symptom
- Chest pain and discomfort. Also other body parts eg left jaw, medial side of the left arm.
- Shortness of breath and Dyspnoea
- Palpitations
- Edema and weight gain - right ventricular failure
- Dizziness and syncope – loss of consciousness

Risk factors to heart disease

- **Non modifiable factors (have no control about):**
  - Positive family history
  -Increasing age
  - Gender– men and post menopause women
  - Race- ?common in African

- **Modifiable factors.(one can have control)**
  - cigarettes smoking, obesity, physical inactivity, hyperlipidemia
  - elevated blood glucose, use of oral contraceptives, hypertension etc

Diagnosis:

Diagnosis of heart diseases is done by:

- physical assessment
- laboratory test and
- imaging and fluoroscopy and ultrasound

Diagnostic tests:

- Electrocardiogram (ECG), X-ray, Angiogram, Heart catheterization, Central venous pressure, Radio-Isotopes, Echocardiography, Phonocardiography

Congestive cardiac failure (CCF) / Heart Failure:

- The inability of the heart to maintain an adequate output of blood from one or both ventricles or It is the inability of the heart to work effectively as a pump.
- A chronic condition that affects the pumping action of the heart muscles

Types of CCF:

1Left sided heart failure

2 Right sided heart failure

Left-sided cardiac failure (left ventricular failure)

- Characterized by reduced Left Ventricle output
- Pulmonary congestion predominates when the left ventricle fails, the left ventricle is unable to adequately pump the blood coming from the lungs. The increased pressure in the pulmonary circulation causes fluid to be forced into the pulmonary tissues.

Clinical manifestation of LVF

- Dyspnea, fatigability, tachycardia, anxiety and restlessness
- Orthopnea - difficulty breathing when lying flat
- Paroxysmal nocturnal dyspnoea - sudden attack of orthopnea at night
- Cough that may be dry & non productive but is often moist
- Some times Hemoptysis
- Adventitious breath sounds e.g. crackles
- Decreased kidney perfusion causes oliguria
- Nocturia
- Reduced CO causes confusion, restlessness, anxiety, light headedness and dizziness

RIGHT VENTRICULAR FAILURE (Right sided heart failure)

- Right side of the heart is unable to adequately empty its blood volume and hence cannot accommodate all the blood that normally returns to it from the venous circulation. This leads to congestion of the viscera and the peripheral tissues predominates.

Causes:

- Hypertension
- Infective endocarditis
- Coronary heart disease
- Congenital heart disease

Risk factors:

- Alcohol use
- Kidney problems
- Diabetes Mellitus

Clinical features:

Depend on the type of heart failure:

- Coughing due to congested lungs that have excess fluid that leaks into the alveoli
- Shortness of breath on exertion, Irregular heart rate, Increased Heart Rate - palpitations
- Fatigue and weakness, hepatomegaly
- Pleural effusion, Edema of the lower extremities when standing, Leg pains and swelling - pitting
- Sudden weight gain from fluid retention in the abdominal cavity - ascites

Investigations

- Physical examination
- Echocardiogram
- CXR
- Urea and electrolytes

Management

Aim is to remove causative factor n reduce work load of the heart:

- Prop up the patient
- Oxygen 100%
- Diuretics – furosemide to reduce fluid accumulation
- Angiotensin-converting enzyme (ACEs) e.g. **Captopril,** enalapril etc to reduce BP
- Aminophylline - bronchodilator
- Vasodilators e.g. nitroglycerine
- Digitalis-digoxin to increase contractility

Management ct…

- Spironolactone as a potassium sparing drug
- Nutrition-low salt diet, low cholesterol diet
- Edema - elevate lower limbs, measure weight daily
- Life style changes - maintain healthy body weight and Smokers to quit.

Complications

- Uremia - poor kidney functions
- Hypokalemia - drugs
- Hyponatremia
- Impaired liver function
- Arrhythmias
- Pleural effusions
- Cardiogenic shock

Nursing care

- Bed rest - increase kidney blood flow
- Advice on diet- Law salt intake, avoid alcohol and smoking and fluid retaining drugs e.g. NSAIDS
- Treat cause
- Prop up in semifowler position
- Give easily digestible food
- Promote some ambulation
- Maintain Input output chart and daily weighing to assess signs of fluid overload eg orthopnea
- Monitor vital signs
- Examining skin turgor and mucous membrane for dehydration

Rheumatic heart disease

- Rheumatic heart disease is a complication of acute rheumatic fever.
- It is inflammation of the endocardium.
- It is a condition in which the **heart valves** have been permanently **damaged** by rheumatic fever

Causes:

- **Streptococcal pyogenes** affect the throat and if not treated, it develops to rheumatic fever which then cause Rheumatic Heart Disease
- It takes 2-4weeks after the streptococcal infection
- There is usually a production of antibodies against your own tissues
- Risk is higher with repeated episodes of acute rheumatic fever.

Diagnosis

- Should be suspected in any child with a **previous history** of rheumatic fever who presents with heart failure / is found to have a heart murmur.
- Throat culture

Clinical features

- Fever
- Pain in the joint
- Involuntary muscle movement
- Non itchy rash - (erythema marginatum)

Management

- Long term antibiotics parenteral - monthly benzathine benzyl penicillin at 600,000 iu IM every 3-4 weeks or oral penicillin v at 250 mg twice a day, ASA ORALLY
- Patient teaching on the disease process and treatment
- Early treatment of streptococcal infection is important by using penicillin drugs
- Investigations—Blood culture to rule out streptococcal pyogene bacteria
- Maintaining of vital signs 4hourly especially temperature
- Analgesics such as paracetamol

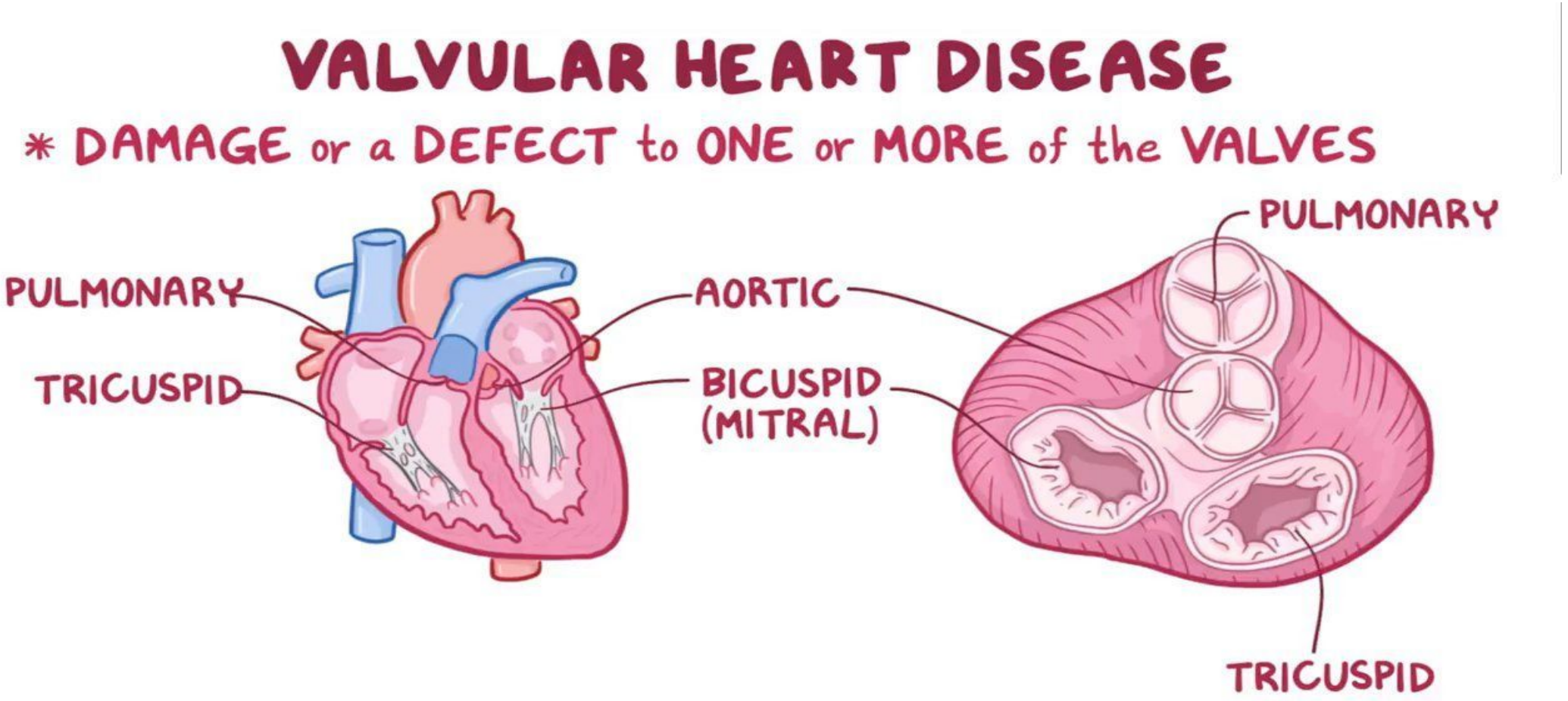
Complications

- Valve stenosis, with varying degrees of regurgitation, atrial dilatation, arrhythmia and ventricular dysfunction.
- Also affects the bony joints, producing polyarthritis
- Leucocytes accumulates in the in the affected tissue and form nodules
- Rheumatic myocarditis and pericarditis respectively.
- Endocarditis has serous results e g valve stenosis. Regurgitation , heart failure

Valvular heart disease

- Valvular heart disease is any cardiovascular disease process involving one or more of the four valves of the heart (the aortic and mitral valves on the left side of heart and the pulmonic and tricuspid valves on the right side of heart.
- The heart consists of 4 chambers--2 atria (upper chambers) and 2 ventricles (lower chambers). Blood passes through a valve as it leaves each chamber of the heart. The valves prevent the backward flow of blood. They act as one-way inlets of blood on one side of a ventricle and one-way outlets of blood on the other side of a ventricle.

The heart valves



Pathophysiology

Heart valve disorders can arise from 2 main types of problems:

- **Regurgitation (or leakage of the valve).** When the valve(s) do not close completely, it causes blood to flow backward through the valve. This reduces forward blood flow and can lead to volume overload in the heart.
- **Stenosis (or narrowing of the valve).** When the valve(s) opening becomes narrowed, it limits the flow of blood out of the ventricles or atria. The heart is forced to pump blood with increased force to move blood through the narrowed or stiff (stenotic) valve(s).

Causes

The causes of heart valve damage vary depending on the type of disease present, and may include the following:

- Changes in the heart valve structure due to aging
- Coronary artery disease and heart attack
- Heart valve infection
- Birth defect
- Syphilis (a sexually-transmitted infection)
- Myxomatous degeneration (an inherited connective tissue disorder that weakens the heart valve tissue)

Signs and symptoms

- Chest pain
- Palpitations caused by irregular heartbeats
- Fatigue, Dizziness
- Low or high blood pressure, depending on which valve disease is present
- Shortness of breath
- Abdominal pain due to an enlarged liver (if there is tricuspid valve malfunction)
- Leg swelling

Diagnosis

- Chest xray
- Echocardiogram
- MRI
- Cardiac catheterization
- Exercise tests or stress tests. Different exercise tests help measure your activity tolerance and monitor your heart's response to physical exertion

Management

- Lifestyle modification
- Control of hypertension
- Surgical repair or replacement of the valves

Mitral Valve Prolapse

- A portion of mitral valve balloons back in the left atria and remains open during systole
- Causes regurgitation of blood to left atrium
- It rarely progresses well. May result to sudden death
- More in women than men

Clinical features

- May be asymptomatic
- Fatigue regardless of activity, lightheadedness, Dizziness
- Syncope, Chest pain for some days, Palpitation
- Anxiety, Shortness of breath

Assessment

- Extra heart sound (mitral click)
- Murmur of mitral regurgitation is heard
- Echocardiography

Management

- Direct control of symptoms
- Anti - Arrhythmia
- Calcium blockers or beta blockers for chest pain that does not respond to nitrates
- Mitral repair or replacement
- Reduce caffeine

Nursing care

- Educate the patient on the symptoms
- Emphasis importance of prophylactic antibiotics before surgery
- Diet control balance
- Activity
- Reporting symptoms
- Avoiding precipitating factors

Mitral regurgitation

- Back flow of blood from left ventricle to left atrium during systole
- Due to problem with one or more leaflets, chordae tendinae, annulus or papillary muscles.
- Left atrium stretches to accommodate the blood. The lung becomes congested and Right Atrium also become strained.

Clinical features

- Chronic may be asymptomatic
- Severe CCF
- Dyspnoea, fatigue, weakness,
- Palpitation and shortness of breath in exertion

Assessment

- Echo
- Pulse maybe regular or irregular due to fibrillation
- Systolic murmur heard as high pitched

Management:

- Same as for CCF
- Valvoplasty- surgical repair

Mitral stenosis

- Narrowing of the Mitral Valve obstructing blood flow from Left Atrium to Left Ventricle due to rheumatic endocarditis
- Valve leaflets thicken, Left Atrium hypertrophies leading to pulmonary congestion hence Right Atrium failure

Clinical Features:

- Dyspnoea, fatigue, hemoptysis, cough, repeated respiratory infection

Mitral stenosis ct…

- **Assessment**- as Mitral Regurgitation

Medical management - Antibiotic prophylaxis

- Anticoagulants, valvoplasty to open the valves

Aortic regurgitation

- Backflow of blood from aorta to Left Ventricle during diastole due to inflammatory lesions of the valves
- May be due to: endocarditis, congenital anomalies, diseases like syphilis, aneurism, failure of replaced valve

Causes:

- Ventricle hypertrophy to accommodate blood
- Increase in Systolic pressure
- Peripheral arterioles dilate reduces diastolic pressure

Aortic regurgitation ct…

Clinical features:

- Palpitation - visible/ palpable at temporal and carotid artery
- Dyspnea, fatigue then signs of Left Ventricular failure
- Widened pulse pressure (i.e. systole - diastole)
- Water-hammer pulse - the pulse strikes the palpating finger sharply & quickly then collapses

Management:

- Valvoplasty, valve replacement is the treatment of choice
- Antibiotic prophylaxis before tooth extraction

Aortic stenosis

- Narrowing of the aortic valve maybe due to infection e.g. Rheumatic disease
- This leads to Left Ventricule hypertrophy
- It may remain asymptomatic for long time

- Definitive management is Valvoplasty or valve repair

Coronary Heart disease

- It is a progressive atherosclerotic disorder of the coronary arteries that result in narrowing or complete occlusion of the vessel lumen
- Atherosclerosis - build up of fats, cholesterol on the artery walls.

Predisposing factors:

- Family history, Gender (males more than females), Diet, sedentary lifestyle i.e. smoking
- Aging, Hypertension, Diabetes Mellitus,
- Obesity, Increased levels of bad cholesterol

Coronary Heart disease ct…

Clinical features:

- Chest pain
- Light headedness
- Increased heart rate
- Shortness of breath
- Sometimes nausea

Coronary Heart disease ct…

Management:

- Admission is important
- Administer oxygen [measure SPo2]
- Frequent monitoring of vital signs especially heart rate, BP.
- Balance between activity and rest
- Treatment - nitro-glycerine under the tongue
- Pain killer - morphine orally
- Reduce modifiable risk factors e.g. obesity, smoking.
- Investigations – ECHO to asses for dysrhythmias

Infective endocarditis

- Infection of the heart endothelium or valves (endocardium)
- Develops in people with heart structural disorders, common in elderly
- Can follow invasive procedures that causes bacteremia especially those involving mucosal surface
- Also common in IV drug abusers

Pathophysiology

- Involve direct invasion by bacteria (streptococci, staphylococci, pneumococci, enterococci)
- The infection causes deformity of the valves and the chord tendinae.
- Also caused by fungi and rickettsia

Causes/Risk factors

- Streptococcus viridans [50-60%] of the cases, Staphylococcus aureus [30%] of the cases
- History of bacterial endocarditis
- Prosthetic heart valves
- Mitral valves prolapse or thickened leaflets, Hypertrophic cardiomyopathy, Congenital malformation e.g. ventricular septal defects, patent ductus arteriosus - blood flows from a high pressure zone to a low pressure zone eroding the endocardium, platelets adhere to the affected area and form a vegetation
- Acquired Valvular dysfunction, Immunosuppressive medication, People who abuse I.V drugs

Possible route of entry of microorganisms

- Through oral route during dental procedures
- Through skin rashes , lesions, or abscesses
- Through genitourinary route
- Through surgery or invasive procedures

Clinical features

- The features due to toxic effect of the infecting agent, valve damage or embolization of the vegetative fragments
- Malaise, anorexia, weight loss, back and joint pain, cough
- Intermittent Fever, chills, night sweats, fatigue
- Splinter hemorrhages (reddish-brown streaks or lines) under finger nails and toe nails.
- Patechiae on the conjuctiva and mucous membrane
- Heart murmurs and cardiomegaly
- Headache, stroke
- Cardiac murmurs

Management

Aim is to eradicate the causative agent:

- Involve IV antibiotic. penicillin for six weeks is the drug of choice.
- Fungal endocarditis managed using antifungal eg amphoterin B
- ECHO—show evidence of endocardial involvement
- Surgical management for repair or replacement
- Rest balanced with activity.

complications

- Heart failure
- Stroke--- CVA
- Valvular stenosis and regurgutation
- Myocardial damage
- Embolism
- Hemodynamic deterioration

Prevention

- Prophylaxis before and sometimes after invasive procedures e.g. Dental extraction, tonsillectomy, GIT surgery, Prostatic surgery, Incision and drainage, Vaginal hysterectomy, Urethral catheterization - Patient given 2g amoxicillin.
- Nurses to ensure hygiene and aseptic techniques used during invasive procedures
- Catheters removed as soon as they are not necessary

Nursing management

- Temperature monitoring—indicates effectiveness of therapy
- Monitor vital signs
- Assess signs of organ damage e.g. stroke, meningitis, heart failure, glomerulonephritis.
- Assess all invasive line for signs of infection e.g. redness, warmth, swelling, tenderness, drainage..
- Iv drug administration
- Emotional support to the patient and family
- Educate the family on prevention strategies
- Pre and post operative care to the patient.

MYOCARDIO INFARCTION (MI)

- Irreversible cellular injury and necrosis
- Major branch of coronary artery blocks, leads to sudden death
- Reduced blood flow due to atherosclerosis, embolus or thrombus.
- No adequate perfusion - also called heart attack, and coronary occlusion

Pathophysiology

- Cardiac cell withstand ischemia for 20 min before necrosis begins
- Contractile function stops in the area of necrosis
- Degree of altered function depends on the area of the heart affected
- Most affects left ventricle.
- Time is of essence to improve the quality of life
- Described according to where they occur - Inferior, anterior, lateral and posterior infarction

Causes

- Coronary occlusion
- Major reduction in blood circulation in certain areas of the heart
- Coronary artery dissection
- Coronary emboli
- Coronary artery spasms
- Hemorrhage into atherosclerotic plaque
- Systemic arterial hypotension - anemia, hypotension, Thyrotoxicosis, psycho stimulants

Clinical features

- Chest Pain - cardinal sign, +++ most severe one has ever experienced, substernal, accompanied with nausea vomiting and diarrhea and dizziness
- Pain present despite medication
- May radiate to the back, jaw, left arm not relieved by rest
- Palpitations
- Breathlessness
- Syncope
- Bradycardia
- Anxiety due to fear of impending death

Clinical features ct…

- Fever due to inflammation process
- Decreased urine output due to cardiogenic shock
- Pulmonary edema
- Sudden death due to ventricular fibrillation and asystole.
- Death occur within 1 hour
- Initially BP is high due to impaired myocardial dysfunction, then drops due to reduced CO
- Left ventricular failure
- Pulsus alternus (alternating strength of pulse)
- 3th heart sound S3, Murmurs due to incompetent valves

Investigations

- ECG
- Chest X-ray
- Blood lab - Urea creatinine and electrolytes
- ESR-erythrocyte sedimentation rate. May rise
- Glucose, may rise Lipids levels
- Serum enzymes changes due to damage of cardiac cells. Enzymes leak into circulation

Management

- First aid (pre-hospital care)
- Any person presenting with spontaneous angina or angina for the first time should be managed of acute MI
- Aim - relief pain
  - Restoration of myocardial flow through
  - CPR
  - Oxygen
  - Prevention of shock and complications

Hospital management

- Admit in cardiac care unit (ccu)
- Correct arrhythmias and give thrombolytics eg streptokinase 1.5 m.u in 100mls NS to decrease mortality
- Reassure the patient, do defibrillation
- Give Oxygen
- Put on IV line
- Strong analgesics- diamorphine-5-10mg IV
- Glycerine trinitrate 0.5 mg sq
- Stool softeners
- Oral ASA 75-300mg

Hospital management ct…

- Heparin 5000iu until mobility is evidence
- Monitor ECG
- Detect and treat complications
- Continuous TPR and BP
- Input and output chart monitoring
- 24hr bed rest

Surgical management

- Percutaneous coronary intervention
- Coronary artery bypass grafting

Complications:

- Arrhythmias- causes 5-10% death
- Pain, Atrial fibrillation-digoxin is the treament of choice
- Thrombosis, Hypertension, Heart failure
- Cardiogenic shock, Pericarditis
- Rupture of interventricular septum

Cardiomyopathy

- Cardiomyopathy, or heart muscle disease, is a type of progressive heart disease in which the heart is abnormally enlarged, thickened, and/or stiffened. As a result, the heart muscle's ability to pump blood is less efficient, often causing heart failure and the backup of blood into the lungs or rest of the body. The disease can also cause abnormal heart rhythms
- Cardiomyopathy is a disease of the heart muscle that makes it harder for your heart to pump blood to the rest of your body Or Cardiomyopathy is a group of diseases that affect the heart muscle.

Cardiomyopathy ct…

Cause:

- Idiopathic
- Infectious disease
- Genetic conditions
- Systemic connective tissue diseases
- Long-term high blood pressure
- Nutritional deficiencies,
- Cardiovascular disease
- Heart tissue damage from a previous heart attack

Cardiomyopathy ct…

Risk factors:

Modifiable Risk Factors:

- Tobacco use
- High blood cholesterol or triglyceride levels
- Lack of exercise
- Obesity
- Stress

Non-modifiable Risk Factors:

- Family history of heart disease
- Older age
- Diabetes
- High blood pressure

Cardiomyopathy ct…

Classification:

- **Dilated Cardiomyopathy (DCM):** This is the most common type of cardiomyopathy. In this disorder, the left ventricle becomes enlarged (dilated) and can't effectively pump blood as the pumping ability of heart's main pumping chamber (left ventricle) becomes less forceful.

DCM Causes:

- **Primary** – Idiopathic
- **Secondary:** Electrolyte abnormalities, Endocrine abnormalities, Hypertension, Infectious causes, Ischemia, Nutritional abnormalities, Valvular heart disease

Cardiomyopathy ct…

Classification ct…

- **Hypertrophic Cardiomyopathy:** This type involves abnormal thickening of the heart muscle, particularly affecting the muscle of the heart's main pumping chamber (left ventricle).

- **Restrictive Cardiomyopathy:** The heart muscle in people with restrictive cardiomyopathy becomes rigid and less elastic, meaning the heart can't properly expand and fill with blood between heartbeats.

- **ARRHYTHMOGENIC RT-VENTRICULARDYSPLASIA:** In this type of cardiomyopathy, the muscle in the lower right heart chamber (right ventricle) is replaced by scar tissue. This can lead to heart rhythm problems.

Cardiomyopathy ct…

Symptoms:

- Breathlessness
- Swelling of the legs, ankles and feet
- Bloating of the abdomen due to fluid buildup
- Cough while lying down
- Fatigue
- Irregular heartbeats
- Chest pain
- Dizziness

Cardiomyopathy ct…

Diagnostic Evaluation:

- Chest X-ray
- Echocardiogram
- Electrocardiogram (ECG)
- Treadmill stress test
- Cardiac catheterization
- Cardiac magnetic resonance imaging (MRI)
- Cardiac computerized tomography (CT) scan
- Blood tests
- Genetic testing or screening

Cardiomyopathy ct…

Medical Management

- Vasodilators (These drugs acts as blood vessel dilator) - Nitrates
- Beta-Blockers (Decrease work load in heart) - Propranolol 20-40 mg
- Calcium channel blocker (They improve coronary blood flow) – Nifedipine, Verapamil
- Anticoagulant Drugs – Heparin
- Opiate Analgesic (For reduce pain) - Morphine sulphate
- Thrombolytic Drugs - Streptokinase, Urokinase

Cardiomyopathy ct…

- Surgery for Cardiomyopathy - Septal Myectomy -A surgeon removes part of the thickened septum that's bulging into the left ventricle.
- Heart Transplant - A heart transplant is a last resort treatment for people who have end-stage of heart failure

Cardiomyopathy ct…

Complications:

- Heart failure
- Blood clot
- Valve problems
- Cardiac arrest and sudden death

Prevention:

- Avoiding the use of alcohol
- Controlling high blood pressure, high cholesterol
- Eating a healthy diet
- Getting regular exercise
- Getting enough sleep
- Reducing stress.

VASCULAR CONDITIONS:

ATHEROSCLEROSIS / ARTERIOSCLEROSIS

Atherosclerosis:

- Is a disease of the arteries in which fatty plagues develop on their inner walls, eventually obstructing blood flow and interfering with absorption of nutrients.
- Atherosclerosis is a slow, progressive disease that may begin as early as childhood, and may start with damage or injury to the inner layer of an artery

Atherosclerosis / Arteriosclerosis ct..

Arteriosclerosis:

- Is hardening of arteries with loss of elasticity within the middle layer of the small arteries, causing impaired blood supply to the organs and severe elevation of blood pressure.
- It is associated with some degree of atheroma and old age.
- Although the processes of atherosclerosis and arteriosclerosis differ, rarely does one occur without the other
- **Atheroma** is the buildup of materials that adhere to arteries, which include: fat, cholesterol, calcium etc.

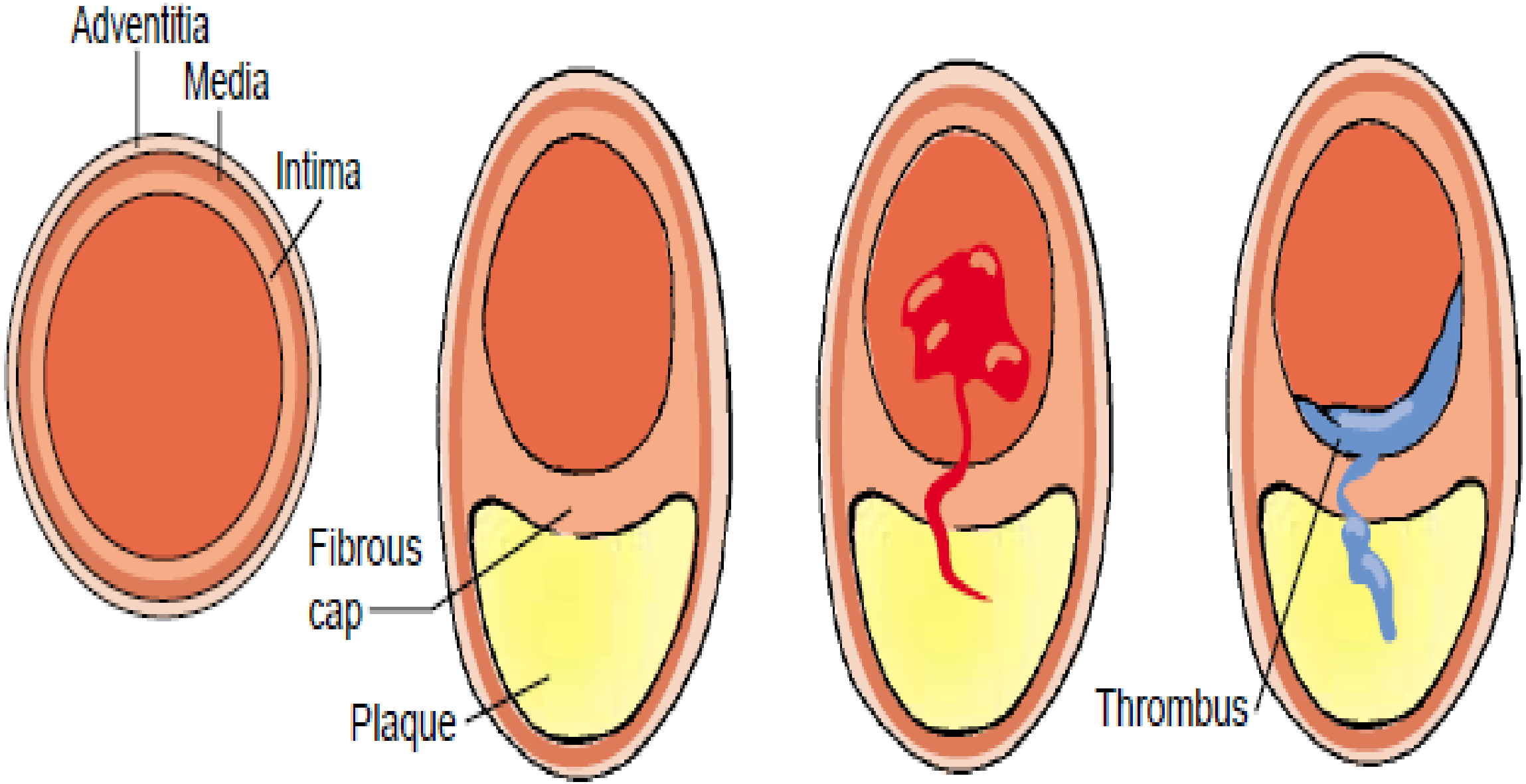
Pathophysiology

- Cholesterol and calcium can collect in your arteries and form plaque. The buildup of plaque makes it difficult for blood to flow through your arteries. This buildup may occur in any artery in your body, including your heart, legs, and kidneys.

- It can result in a shortage of blood and oxygen in various tissues of your body. Pieces of plaque can also break off, causing a blood clot. If left untreated, atherosclerosis can lead to heart attack, stroke, or heart failure.

Pathophysiology

- Fatty streaks deposited in the intima of the arterial wall. This leads to inflammatory response.
- T- lymphocites ingests the lipids and die, this causes the smooth cells to proliferate and form fibrous cap over the dead fatty core. These deposits, called **atheromas or plaques** protrudes into the lumen, narrowing the vessels and obstructing the blood flow.
- The plaque remains stable and resist the pressure from blood flow and the vessel movement. If the cap is thin, the lipid core may rupture, allowing formation of thrombus that can block blood flow leading to sudden death.
- Inadequate supply of Oxygen to the myocardium causes death of the muscle - this is called **ischemia. Ischemia** causes angina pectoris. If it is severe, it leads to Myocardial infarction.


Adventitia
Media
Intima
Fibrous
cap
Plaque
Thrombus

Atherosclerosis ct…

Causes

- High blood pressure
- High cholesterol
- High triglycerides, a type of fat (lipid) in your blood
- Smoking and other sources of tobacco
- Insulin resistance diabetes
- Obesity
- Inflammation from an unknown cause or from diseases such as arthritis, lupus, psoriasis or inflammatory bowel disease

Atherosclerosis ct…

Clinical features:

Symptoms of moderate to severe atherosclerosis depend on which arteries are affected:

- If you have **atherosclerosis in your heart arteries**, you may have symptoms, such as chest pain or pressure (angina).
- If you have atherosclerosis in the **arteries leading to your brain**, you may have signs and symptoms such as sudden numbness or weakness in your arms or legs, difficulty speaking or slurred speech, temporary loss of vision in one eye, or drooping muscles in your face. These signal a transient ischemic attack (TIA), which, if left untreated, may progress to a stroke.

Atherosclerosis ct…

Clinical features ct..

- If you have atherosclerosis **in the arteries in your arms and legs**, you may have signs or symptoms of peripheral artery disease, such as leg pain when walking (claudication) or decreased blood pressure in an affected limb.
- If you have atherosclerosis in the **arteries leading to your kidneys**, you develop high blood pressure or kidney failure.

Atherosclerosis ct…

Diagnosis:

- Blood tests: Blood sugar and Cholesterol levels
- C-reactive protein (CRP)
- Echocardiogram
- Ankle-brachial index (ABI) - atherosclerosis in the arteries of legs and feet
- Cardiac catheterization and angiogram This test can show if your coronary arteries are narrowed or blocked.

Atherosclerosis ct…

Management:

- Lifestyle changes, such as eating a healthy diet and exercising, are the first treatment for atherosclerosis and may be all that you need to treat your atherosclerosis.
- Give bed rest
- Provide warmth to cold extremities, Elevate the feet
- Moderate regular exercises for the limbs
- Skin care
- Low fat diet
- Stop smoking

Atherosclerosis ct…

Management ct…

But sometimes, medication or surgical procedures may be needed - to slow or reverse the effects of atherosclerosis.

Medications:

- Vasodilators- nifedipine
- Nicotinic acid- antilipemic to decrease serum lipids
- Antiplatelet;- aspirin
- Thrombolytic
- Anticoagulant - heparin

Atherosclerosis ct…

Management ct…

Surgery or other procedures: Incase of severe symptoms or a blockage, one of the following surgical procedures may be performed:

- **Angioplasty and stent placement**: also called percutaneous coronary intervention (PCI) - helps open a clogged or blocked artery by insertion a catheter into the diseased artery.
- **Fibrinolytic therapy**: If you have an artery that's blocked by a blood clot - use a clot-dissolving drug to break it apart.
- **Coronary artery bypass surgery**: this type of open-heart surgery, a healthy blood vessel is taken from another part of the body to create a bypass around the blocked artery, redirecting blood flow. Sometimes the bypass is a graft made of synthetic material.

Atherosclerosis ct…

Prevention of Atherosclerosis

- Stop smoking
- Exercise most days of the week
- Maintain a healthy weight
- Manage stress

Aneurysms

- An aneurysm is the enlargement of an artery caused by weakness in the arterial wall. It is the weakening of an artery wall that creates a bulge or distention of the artery.
- Most aneurysms do not show symptoms and are not dangerous, however, at their most severe stage, some can rupture, leading to life-threatening internal bleeding.

Effects of aneurysm

- Aneurysms affect a variety of arteries. The most significant aneurysms affect the arteries supplying the brain and the heart.
- An aortic aneurysm affects the body’s main artery.
- The rupture of an aneurysm causes internal bleeding.
- The risk of an aneurysm developing and rupturing varies between individuals.
- Some types of aneurysm may need surgical treatment to prevent rupture.

Risk factors

- Smoking
- High blood pressure
- Poor diet
- Sedentary life style
- Obesity

Pathophysiology

- Usually caused by atherosclerosis (thickening of the arterial walls), aneurysms also may be the result of infection (constant pressure of the circulating blood within the artery, the weakened part of the arterial wall becomes enlarged, leading ultimately to serious and even fatal complications from the compression of surrounding structures or from rupture and hemorrhage.

Aneurysms ct…

TYPES:

Aneurysm can take two main shapes:

- Fusiform aneurysms bulge all sides of a blood vessel
- Saccular aneurysms bulge only on one side

Aortic aneurysm

- The aorta is the large artery that begins at the left ventricle of the heart and passes through the chest and abdominal cavities.
- The normal diameter of the aorta is between 2 and 3 centimeters (cm) but can bulge to beyond 5 cm with an aneurysm.

Aneurysms ct…

Types ct…

Aortic aneurysm ct…

- The most common aneurysm of the aorta is an abdominal aortic aneurysm (AAA). Without surgery, the annual survival rate for an AAA of over 6 cm is 20 percent.
- AAA can rapidly become fatal, but those that survive the transfer to a hospital have a 50 percent chance of overall survival.
- Less commonly, a thoracic aortic aneurysm (TAA) can affect the part of the aorta running through the chest

Aneurysms ct…

Cerebral aneurysm

- Aneurysms of the arteries that supply the brain with blood are known as intracranial aneurysms. Due to their appearance, they are also known as “berry” aneurysms.
- A ruptured aneurysm of the brain can be fatal within 24 hours. Forty percent of brain aneurysms are fatal, and around 66 percent of those who survive will experience a resulting neurological impairment or disability.
- Ruptured cerebral aneurysms are the most common cause of a type of stroke known as subarachnoid hemorrhage (SAH).

Aneurysms ct…

- **Types ct…**

Peripheral aneurysm:

- An aneurysm can also occur in a peripheral artery. Types of peripheral aneurysm include:

- Popliteal aneurysm: This happens behind the knee. It is the most common peripheral aneurysm.

- Splenic artery aneurysm: This type of aneurysm occurs near the spleen.

- Mesenteric artery aneurysm: This affects the artery that transports blood to the intestines.

- Femoral artery aneurysm: The femoral artery is in the groin.

Aneurysms ct…

- **Types ct…**

- Carotid artery aneurysm: This occurs in the neck.

- Visceral aneurysm: This is a bulge of the arteries that supply blood to the bowel or kidneys.

- Peripheral aneurysms are less likely to rupture than aortic aneurysms.

Aneurysms ct…

Symptoms

Most aneurysms are clinically silent. Symptoms do not usually occur unless an aneurysm ruptures.

- However, an un-ruptured aneurysm may still obstruct circulation to other tissues. They can also form blood clots that may go on to obstruct smaller blood vessels. i.e thromboembolism. It can lead to ischemic stroke or other serious complications.
- Rapidly growing abdominal aneurysms are sometimes associated with symptoms. Some people with abdominal aneurysms report abdominal pain, lower back pain, or a pulsating sensation in the abdomen.

Aneurysms ct…

Symptoms ct…

- Similarly, thoracic aneurysms can affect nearby nerves and other blood vessels, potentially causing swallowing and breathing difficulties and pain in the jaw, chest and upper back.
- Symptoms can also relate to the cause of an aneurysm rather than the aneurysm itself. For example, in the case of an aneurysm caused by vasculitis or blood vessel inflammation, a person may experience fever, malaise or weight loss.

Aneurysms ct…

Risk factors for an aneurysm to rupture

- Not all aneurysms will rupture. Aneurysm characteristics such as size, location, and growth during follow-up evaluation may affect the risk that an aneurysm will rupture. In addition, medical conditions may influence aneurysm rupture.
- Risk factors include:
- **Smoking**.
- **High blood pressure**. .
- **Size**.
- **Location**.
- **Growth**. Aneurysms that grow, even if they are small, are at increased risk of rupture.
- **Family history**. The greatest risk occurs in individuals with

Aneurysms ct…

Risk factors for an aneurysm to rupture

- Not all aneurysms will rupture. Aneurysm characteristics such as size, location and growth during follow-up evaluation may affect the risk that an aneurysm will rupture. In addition, medical conditions may influence aneurysm rupture. **Risk factors include:**
- Smoking
- High blood pressure
- Size
- Location
- Growth - Aneurysms that grow, even if they are small, are at increased risk of rupture
- Family history - The greatest risk occurs in individuals with multiple aneurysms who have already suffered a previous rupture

Diagnosis

- Computed tomography (CT scan)
- Magnetic resonance imaging (MRI)
- Angiography

Aneurysms ct…

Management of Aortic Aneurysm

Medications and preventive measures may form part of conservative management, or they may accompany active surgical treatment.

- **A ruptured aneurysm needs emergency surgery. Without immediate repair, patients have a low chance of survival.** The decision to operate on an un-ruptured aneurysm in the aorta depends on:
- The age, general health, coexisting conditions and personal choice of the patient

Aneurysms ct…

- The size of the aneurysm relative to its location in the thorax or abdomen, and the aneurysm’s rate of growth
- The presence of chronic abdominal pain or risk of thromboembolism, as these may also necessitate surgery

Aneurysms ct…

Complications

- The first signs of a previously undetected aneurysm could be complications upon rupture. Symptoms tend to result from a rupture rather than the aneurysm alone
- Most people living with an aneurysm do not experience any complications. However, in addition to **thromboembolism** and **rupture of the aorta**, complications can include:
- **Severe chest or back pain**: Severe chest or back pain may arise following the rupture of an aortic aneurysm in the chest.
- **Angina**: Certain types of aneurysm can lead to angina, another type of chest pain. Angina can lead to myocardial ischemia and heart attack.
- **A sudden extreme headache**: in brain aneurysm

Aneurysms ct…

Complications of raptured aneurysm in brain:

- **Rebleeding -** Once it has ruptured, an aneurysm may rupture again before it is treated, leading to further bleeding into the brain, and causing more damage or death.
- **Change in sodium level -** Bleeding in the brain can disrupt the balance of sodium in the blood supply and cause swelling in brain cells. This can result in permanent brain damage.
- **Hydrocephalus -** Subarachnoid hemorrhage can cause hydrocephalus. Hydrocephalus is a buildup of too much cerebrospinal fluid in the brain, which causes pressure that can lead to permanent brain damage or death. Hydrocephalus occurs frequently after subarachnoid hemorrhage because the blood blocks the normal flow of cerebrospinal fluid. If left untreated, increased pressure inside the head can cause coma or death.

Aneurysms ct…

- **Vasospasm** - This occurs frequently after subarachnoid hemorrhage when the bleeding causes the arteries in the brain to contract and limit blood flow to vital areas of the brain. This can cause strokes from lack of adequate blood flow to parts of the brain.
- **Seizures -** Aneurysm bleeding can cause seizures (convulsions), either at the time of bleed or in the immediate aftermath. While most seizures are evident, on occasion they may only be seen by sophisticated brain testing. Untreated seizures or those that do not respond to treatment can cause brain damage.

GANGERENE

A type of tissue death caused by a lack of blood supply or by a serious bacterial infection.

- Gangrene commonly affects the arms and legs, including the toes and fingers, but it can also occur in the muscles and in organs inside the body, such as the **gallbladder**.

- **NB: GANGRENE IS ONE OF COMPLICATION OF PERIPHERAL ARTERY DISEASE**

Gangrene ct….

Types Of Gangrene

- **Dry gangrene** is a form of coagulative necrosis that develops in ischemic tissue, where the blood supply is inadequate to keep tissue viable. It is not a disease itself but a symptom of other diseases.
- Dry gangrene is often due to peripheral artery disease but can be due to acute limb ischemia. Dry gangrene is the end result of chronic ischemia without infection.
- **ISCHEMIA:** inadequate blood supply to an area or tissue
- **INFARCTION:** death of tissues due to reduced blood supply e.g extended ischemia leads to myocardial infarction

Gangrene ct….

- Occurs gradually (slowly) and progresses slowly
- Dry gangrene is the end result of chronic ischemia without infection - once gangrene has developed, the affected tissues are not salvageable.
- Over time, dry gangrene may develop into wet gangrene if an infection develops in the dead tissues.

Gangrene ct….

Risk Factors:

- **Diabetes -** High blood sugar hardens the walls of the arteries leading to narrowing and obstructed blood supply**.**
- **Arteriosclerosis -** occurs when arteries grow thick and stiff and restrict blood flow to organs and tissues in the body.
- **Tobacco addiction -** Nicotine causes your blood vessels to constrict or narrow, which limits the amount of blood that flows to your organs. Over time, the constant constriction results in blood vessels that are stiff and less elastic. Constricted blood vessels decrease the amount of oxygen and nutrients your cells receive.
- **Blood vessel disease -** Hardened and narrowed arteries (atherosclerosis) and blood clots also can block blood flow to an area of your body.
- **Severe injury or surgery -** Any process that causes trauma to the skin and underlying tissue, including an injury or frostbite, increases the risk of developing gangrene, especially if there is an underlying condition that affects blood flow to the injured area.

Gangrene ct….

Sign And Symptoms Of Dry Gangrene

- The tissues becomes cold and black
- Then the tissues begins to dry off and finally fall off
- Then it develops brown discoularation,then becomes black


Dry Gangrene

Dry Gangrene

Wet Gangrene:

- Wet gangrene results from an untreated (or inadequately treated) infection in the body where the local blood supply has been reduced or stopped by tissue swelling, gas production in tissue, bacterial toxins, or all of these factors in combination.
- Wet or moist gangrene develops as a complication of an untreated infected wound. Swelling resulting from the bacterial infection causes a sudden stoppage of blood flow. Cessation of blood flow facilitates invasion of the muscles by the bacteria and multiplication of the bacteria because disease-fighting cells (white blood cells) cannot reach the affected part.
- Gangrene is referred to as wet if there's a bacterial infection in the affected tissue. Swelling, blistering and a wet appearance are common features of wet gangrene. It mainly affects bowels

Gangrene ct….

Causes of Wet Gangrene

- A combination of an injury and bacterial infection e.g. in Burns, diabetic wound etc.

Sign and Symptoms of Wet Gangrene:

- Swelling and pain
- Fever and feeling unwell
- Red, brown, purple, blue, greenish-black or black skin
- Blisters or sores with a bad-smelling discharge (pus)
- A crackling noise when you press on the affected area
- Thin, shiny or hairless skin
- A line between healthy and damaged skin

Wet Gangrene ct…

- Symptoms of wet gangrene include:
- Swelling and pain
- Fever and feeling unwell
- Red, brown, purple, blue, greenish-black, or black skin
- Blisters or sores with a bad-smelling discharge (pus)
- A crackling noise when you press on the affected area
- Thin, shiny, or hairless skin
- A line between healthy and damaged skin

Wet Gangrene

Wet gangrene

Intestine

What are the Types of Gangrene?

1. Dry Gangrene:

Dry gangrene develops due to impaired blood flow to the affected region, usually caused by poor blood circulation.

2. Wet Gangrene

In wet gangrene, there is swelling and blistering of the tissue and pus discharge, which is why it is called as wet gangrene.

For More Information:
Visit: www.epainassist.com

Wet Gangrene ct…

Types Of Wet Gangrene:

Gas Gangrene

- Gas gangrene is a type of wet gangrene caused by the bacteria known as Clostridia (Anaerobic bacteria), mainly Clostridium perfringens and several other species of clostridia
- Gas gangrene is a life-threatening infection of muscle tissue that can
- Gas gangrene can develop after certain types of surgery or injuries

Gas Gangrene ct…

Types Of Gangrene:
Gas Gangrene ct…

- Bacteria gather in an injury or surgical wound that has no blood supply. The bacteria infection causes toxins to form in the tissues, cells, and blood vessels of the body. These toxins then releases gas and causes tissue death.
- Gas gangrene typically affects deep muscle tissue.
- Infection develops deep inside the body and the bacteria responsible begin releasing gas

NB: Clostridium perfringens is a Gram-positive, rod-shaped, anaerobic, spore-forming pathogenic bacterium

Gas Gangrene ct…

- The history in patients with gas gangrene depends on the precipitating factors of the infection.
- Most patients with **post-traumatic gas gangrene** have sustained serious injury to the skin or soft tissues or have experienced open fractures.
- Patients with **postoperative gas gangrene**have frequently undergone recent surgery of the GI or biliary tract.
- In contrast, the history is usually unremarkable in patients with **occult malignancy–associated spontaneous gas gangrene**. It is associated with poorly cleansed wounds. It sometimes results from surgery in which the blood supply has become damaged.

Gas Gangrene ct…

Certain injuries have a higher risk of causing gas gangrene, including:

- Muscle injuries
- Severely damaged tissues
- Wounds that are very deep
- Wounds that are contaminated with stool or dirt, especially those that might occur on a farm

Gangrene ct….

Clinical Manifestation of Gas Gangrene:

- Wound is infected and bloody discharge may ooze from the affected tissue, Frothy fluid with foul smell may escape from the wound, Vesicles filled with red watery fluid appear and crepitus (crackling) produced by the gas in the tissue may be felt
- Tender wound, severe pain, fever not exceeding 38.3^C and the skin will crackle like bubble wrap when pressed. Surrounding skin initially appears normal or white and tense but later become brown or black in color
- Rapid pulse and respiration, Anorexia, diarrhea and vascular collapse may occur. Death from TOXEMIA is frequent

Contrasting Features of Dry and Wet Gangrene

Feature	Dry Gangrene	Wet Gangrene
Site	Commonly limbs	More common in bowel
Mechanisms	Arterial occlusion	More commonly venous obstruction, less often arterial occlusion
Macroscopy	Organ dry, shrunken and black	Part moist, soft, swollen, rotten and dark
Putrefaction	Limited due to very little blood supply	Marked due to stuffing of organ with blood
Line of demarcation	Present at the junction between healthy and gangrenous part	No clear line of demarcation
Bacteria	Bacteria fail to survive	Numerous present
Prognosis	Generally better due to little septicaemia	Generally poor due to profound toxaemia

Gangrene ct….

Diagnosis:

- **History -** injury, chronic diseases (such as diabetes), surgery, cigarette smoking, and exposure to extreme cold.
- **Physical examination -** of the affected area is performed to look for signs of gangrene.
- **Blood test –** WBC, Culture and
- X-ray, CT scan and/or MRI
- Arteriogram **angiogram**

Gangrene ct….

Management Of Gangrene:

Treatment for all cases of gangrene usually involves:

- Medical treatment
- Surgery
- Supportive care
- Rehabilitation (occasionally)

- **Admit the patient**

Gangrene ct….

Treatment ct…

Dry gangrene treatment:

- **Surgery** that removes the dead tissue(s), such as a toe
- **Antibiotics** to prevent infection of remaining viable tissue.
- The patient may also receive **anticoagulants** to reduce blood clotting
- **Supportive care** can consist of surgical wound care and rehabilitation for reuse of the digits or limb.

Gangrene ct….

Treatment ct…

- **Wet Gangrene** is a medical emergency and needs immediate treatment.
- **SURGICAL DEBRIDEMENT** (surgical removal of the dead and dying tissue). In some patients, debridement will not be adequate therapy and amputation of a limb may be needed.
- Intravenous antibiotics need to be administered (usually a combination of two or more broad-spectrum antibiotics, one of which is effective in killing anaerobic bacteria like Clostridium perfringens and another antibiotic effective against methicillin-resistant Staphylococcus aureus (MRSA).

Gangrene ct….

Management ct..

- **Rehabilitation therapy** for patients with amputation
- **Hyperbaric oxygen therapy** (oxygen therapy given under pressure with the patient inside a chamber) - improves tissue oxygen supply and can inhibit or kill anaerobic bacteria.

Gangrene ct….

GAS GANGRENE:

- Antibiotics
- Surgery to remove all dead and infected tissue

If gas gangrene is suspected, treatment must begin immediately.

High doses of antibiotics, typically penicillin and clindamycin, are given, and all dead and infected tissue is removed surgically. About one of five people with gas gangrene in a limb requires amputation.

Treatment in a high-pressure oxygen (hyperbaric oxygen) chamber may also be helpful, but such chambers are not always readily available.

Preventive measures:

- Manage your health conditions. If you have diabetes, keep your blood sugar levels under control. Check your hands, feet, and legs regularly for signs of injury, slow wound healing, or other skin problems. Follow your doctor’s advice on living with other conditions that affect your blood flow like peripheral artery disease or Raynaud’s phenomenon.
- Watch your wounds - get medical care immediately if you see signs of infection.
- Don’t smoke - Tobacco can damage your blood vessels.
- Keep a healthy weight - Extra pounds can put pressure on your arteries, blocking blood flow.

VARICOSE VEINS

- Varicose veins are large, swollen veins that often appear on the legs and feet. They happen when the valves in the veins do not work properly(so dilated that valves don’t close to prevent backflow of blood) so the blood does not flow effectively.
- Varicose veins can form anywhere in the body, but they are most often located in the legs.

- They are caused by incompetent venous valves

Varicose Veins ct..

PATHOPHYSIOLOGY

- Varicose veins are caused by weakened valves and veins in your legs.
- Normally, one-way valves in your veins keep blood flowing from your legs up toward your heart.
- When these valves do not work as they should, blood collects in your legs, and pressure builds up. The veins become weak, large and twisted.

Varicose Veins ct..

TYPES:

- **Saphenous varicose veins**: these involve the saphenous veins in the legs, which swell significantly larger than their intended size and bulge out from the skin. The veins appear very large and rope-like. This type of varicose veins can be colorless but are just as noticeable because they protrude out.
- **Reticular varicose veins:** these spread like a mesh and cover a wider area on the skin. They are typically thicker and appear in red, green or purple hues. They don't necessarily bulge out but they can be unsightly.
- **Spider Veins**: these are smaller in size, red or blue in color and are common anywhere on the body. They typically spread in a web shape rather than a mesh shape and are also thinner and smaller than other varicose veins.

Varicose Veins ct..

Types ct…

- **Spider Veins**: these are smaller in size, red or blue in color and are common anywhere on the body. They typically spread in a web shape rather than a mesh shape and are also thinner and smaller than other varicose veins.

They are grouped into two:

- **Primary:** without involvement of deep veins
- **Secondary:** resulting from obstruction of the deep veins

NB: In both there is reflux of venous blood in the veins in which result in stasis of blood. If any superficial vein is affected the patient may not have symptoms but may be troubled

Varicose Veins ct..

Risk factors:

- **Age -** Aging causes wear and tear on the valves in your veins that help regulate blood flow, eventually, causing the valves to allow some blood to flow back into your veins where it collects instead of flowing up to your heart.
- **Sex -** Women are more affected due to hormonal changes before periods, during pregnancy or menopause as female hormones tend to relax vein walls. Hormone treatments, such as birth control pills, might increase your risk of varicose veins.
- **Pregnancy.** During pregnancy, the volume of blood in your body increases to support the growing fetus, but also predispose to varicose veins as a side effect.

Varicose Veins ct..

Risk factors ct..

- **Family history -** If other family members had varicose veins, the greater chance.
- **Chronically increased intra-abdominal pressure** due to obesity, pregnancy, chronic constipation, or a tumor
- **Standing or sitting for long periods of time and Constricting garments –** poor venous return.

Varicose Veins ct..

Signs and Symptoms:

Sometimes Varicose veins may not cause any pain but signs may include:

- Veins that are dark purple or blue in color
- Veins that appear twisted and bulging; they are often like cords on your legs

When painful signs and symptoms occur, they may include:

- An achy or heavy feeling in your legs
- Burning, throbbing, muscle cramping and swelling in your lower legs
- Worsened pain after sitting or standing for a long time
- Itching around one or more of your veins
- Skin discoloration around a varicose vein

Varicose Veins ct..

Diagnosis:

- Simple physical examination
- Doppler (Duplex) ultrasound to determine the cause - The picture shows the blood flow and helps the vascular specialist locate any damaged valves that might be causing the varicose veins
- AIR plethysmography - a non-invasive test that can quantify venous reflux and obstruction by measuring volume changes in the leg.
- Venography - evaluating Valvular reflux

Varicose Veins ct..

Management:

- The choice of treatment depends on symptoms and patient preferences, potential for complications, presence or absence of deep venous insufficiency and the characteristics of the affected veins can also help guide treatment.

- Treatment options for varicose veins include: **conservative management and interventional therapies such as thermal ablation endovenous sclerotherapy and surgery**

Varicose Veins ct..

Management ct…

- Conservative management is a type of medical treatment defined by the avoidance of invasive measures such as surgery or other invasive procedures, usually with the intent to preserve function or body parts. It includes:
- Lifestyle modifications - avoidance of prolonged standing/ sitting/ straining, exercise, wearing nonrestrictive clothing, modification of cardiovascular risk factors and interventions to reduce peripheral edema, elevation of the affected leg, weight loss and phlebotonics - oral and topical therapies that may increase venous tone, improve capillary hyper permeability, and decrease blood viscosity with the goal of decreasing symptoms of chronic venous insufficiency. They include flavonoids or other compounds LIKE Diosmiplex

Varicose Veins ct..

Interventional management:

- **Thermal Ablation** – this destroys damaged veins using an external laser or via endovenous catheter using a laser. Heat from the laser or radio waves coagulates the blood in the vein, resulting in closure of the vein and redirection of blood flow to functional veins
- **Endovenous Sclerotherapy**: Endovenous sclerotherapy involves using ultrasound guidance to inject superficial veins with an agent that causes inflammation of the endothelium, resulting in fibrosis and occlusion in the vein. Sclerotherapy is typically used for small (1 to 3 mm) and medium (3 to 5 mm) veins or to treat recurrent varicose veins after surgery; however, there is not a precise diameter used to make treatment decisions
- **Surgery** to tie (ligation) and stripping off the great or small saphenous vein is done after the failure of conservative therapy.

Varicose Veins ct..

Nursing Management:

- Elevate the foot of the bed and Exercising - to improve venous return
- Teach prevention techniques - Advice patient on importance of avoiding very tight socks and pants, avoid knee-length stockings, standing or sitting for a long period of time, constrictive clothing and apply anti-embolic stockings as directed, avoid excess weight gain, avoid crossing of legs when sitting and avoid high heels
- HEALTH EDUCATION; on diet - high fiber and low-salt diet to prevent constipation / straining on defecation which can cause compression and dilatation of both superficial and deep veins in the legs
- HOME BASED CARE - encourage exercises

Varicose Veins ct..

Postop nursing care:

- Maintain firm elastic pressure over whole limb
- Regular movement and exercise of legs
- FOB up 6-9” above heart level
- Monitor for complications: hemorrhage, infection, nerve damage, DVT
- Analgesics
- Patient education: medication, activity, watch for bleeding

PHLEBITIS

- Is the inflammation of a vein, caused by any insult to the blood vessel wall, impaired venous flow or coagulation abnormality.
- Thrombophlebitis refers to the formation of a blood clot in the vein that is affected by phlebitis.

Phlebitis ct..

Pathophysiology:

- Inflammation may precede or follow formation of the clot. Because movement of the blood through veins depends upon contractions of the muscles, prolonged inactivity (such as bed rest after a surgical procedure or during convalescence from a serious illness) may lead to insufficient movement of the blood through the veins, with resultant formation of clots and inflammation. The condition most often affects the legs. There may be pain at the site of the blockage or throbbing pain throughout the leg

Phlebitis ct..

Signs and symptoms:

- Low grade fever to high fever
- Drainage of pus from the site
- Palpable cords along the course of the vein may be a sign of a superficial clot or superficial thrombophlebitis
- Redness and swelling of the involved limb with pain and tenderness
- Difficulty in walking.

Phlebitis ct..

At-risk groups:

You're more at risk of superficial thrombophlebitis if you:

- Have varicose veins
- Smoke
- Overweight
- Take the contraceptive pills – they slightly increase your risk of blood clots
- Are pregnant
- Have had a previous blood clot or another problem with the vein

Phlebitis ct..

At-risk groups ct…

- have recently had injections or a drip put into the vein
- have a condition that causes the blood to clot more easily, such as thrombophilia inflammation of the smaller arteries (polyarteritis) or a high concentration of red blood cells in your blood (polycythaemia)

Phlebitis ct..

Causes:

- Local trauma or injury to the vein
- Prolonged inactivity - long driving or plane rides
- Insertion of intravenous catheters (IV) in hospitals or IV induced phlebitis
- Post-operative period - especially orthopedic procedures
- Prolonged immobility, as in hospitalized or bed-ridden patients
- Varicose veins.
- Underlying cancers or clotting disorders
- Disruption of normal venous system drainage because of removal of lymph nodes for example, after mastectomy for breast cancer
- Intravenous drug use
- Patients with burns

Phlebitis ct..

Diagnosis:

- Unilateral extremity swelling, which may be associated with pain, warmth, redness, discoloration
- Ultrasound
- Ct scan
- MRI

Phlebitis ct..

Management:

- Raise the leg to help reduce swelling, or the foot of the bed
- Use of compression stockings to help reduce swelling
- Keep active to keep the blood circulating
- Press a cold flannel over the vein to ease any pain
- Analgesic and anti-inflammatory

Note: if patient has been on anticoagulant (blood-thinning) medicine, should not take aspirin or ibuprofen unless advised by the doctor

- Rub an anti-inflammatory cream or gel on the area if the affected area is only small

Deep Veinous Thrombosis (DVT)

- Deep vein thrombosis (DVT) is formation of a blood clot (thrombus) in one of the deep veins - mainly in the legs.
- Deep veins lead to the vena cava, the body's largest vein, which runs directly to your heart.
- DVT usually occurs in your pelvis, thigh, or calf, but it can also occur less commonly in your arm, chest, or other locations.
- DVT can cause sudden swelling, pain or a sensation of warmth.

DVT ct…

Causes:

- Injury to the blood vessel leading to phlebitis by accidents, operations, Intravenous injections etc
- Increased viscosity of blood eg In surgical operations, Labor, polycythemia
- Stasis of blood flow in elderly and inactive post-op patients
- Use of knee pillows, Tight bandages on legs
- CCF

DVT ct…

Risk factors:

- Endothelial damage
- Venous stasis e.g. due to obesity, immobility
- Coagulopathy
- Cancer
- Pregnancy
- Oral contraceptives
- Polycythemia
- Septicemia

DVT ct…

Signs and symptoms:

- Deep venous thrombosis often does not cause symptoms or causes only minimal symptoms. When symptoms occur, they include:
- Swelling, Redness, Warmth, Pain or tenderness in the calf or thigh muscles and may be present only when the affected area is touched or when standing or walking.
- Homans sign - pain in the culf after dorsiflexion but is not specific for DVT.

DVT ct…

Management:

- Anticoagulant therapy - unfractionated heparin sc, warfarin oral anticoagulant, fractionated heparin (low molecular weight) has longer half life than unfractionated
- Thrombolytic therapy - unlike heparins, thrombolytics (fibrinolytics) causes the thrombus to lyse or dissolve. They include streptokinase, urokinase, staphylokinase, alteplase etc.
- They reduce damage of the veins than the heparins, but they increase bleeding tendencies x3 than heparin
- Surgical removal of the thrombus

DVT ct…

Contra indications of anticoagulant therapy:

- Lack of cooperation from patient
- Current bleeding in GIT, respiratory, reproductive, genitourinary system
- Aneurisms
- Severe trauma
- Alcoholism
- Recent or impending surgery, Recent delivery
- Severe hepatic and renal disease
- Recent cerebrovascular hemorrhage
- Infection
- Open ulcerative wounds

DVT ct…

Absolute contraindication of thrombolytics:

- Prior intracranial hemorrhage (ICH)
- Known malignant intracranial neoplasm
- Ischemic stroke within 3 months
- Suspected aortic dissection
- Active bleeding (excluding menses)
- Significant closed head trauma or facial trauma within 3 months
- Intracranial or intraspinal surgery within 2 months
- Severe uncontrolled hypertension (unresponsive to emergency therapy)
- For streptokinase, prior treatment within the previous 6 months

DVT ct…

Prevention:

- Early movement and massage of lower limbs to prevent slowing of circulation
- Early ambulation and exercise post-operatively
- Supportive elastic/crepe bandage for phlebitis
- Firm elastic stockings
- Use of heparin post surgery (Anticoagulant)

DVT ct…

Complications of DVT:

- Pulmonary emboli from dislodged thrombi
- Valvular destruction
- Chronic venous occlusion
- Venous obstruction - edema

DVT ct…

Nursing management:

- Observe for bleeding tendencies - need for protamin sulfate heparin antidote
- Observe for thrombocytopenia - prothrombin time (PT) and INR
- Drug interaction

EMBOLISM

EMBOLISM is the obstruction of the blood vessel by a travelling blood clot or any travelling matter. It is the process by which unattached material (emboli) such as a blood clot, fat or cholesterol deposit, gas, tissue or foreign material travels within the bloodstream and occludes flow within a vessel

Emboli is the detached material that travels through the bloodstream, lodges in a blood vessel and blocks it.

A thrombus is a blood clot that forms in a vein.

An embolus is anything that moves through the blood vessels until it reaches a vessel that is too small to let it pass. When this happens, the blood flow is stopped by the embolus.

Embolism ct…

- An embolus is often a small piece of a blood clot that breaks off (thrombo embolus). It may also be fat, air, amniotic fluid, a tumour or a foreign substance such as talc, iodine, cotton or a tiny piece of catheter tube.

Embolism ct…

Causes:

- **The primary cause of embolism** is **deep vein thrombosis**, a condition in which blood clots form in the large veins of the lower extremities, such as in the thigh or lower leg. If the blood clot breaks free from the wall of the vein, it can travel through the bloodstream and cause an embolism by blocking an artery.

NB: Thrombi -a blood clot formed in situ within the vascular system of the body and impeding blood flow. An embolus is often a small piece of a blood clot that breaks off (thromboembolus).

Other causes:

Atherosclerosis (buildup of plaque on the walls of the coronary arteries; atherosclerosis is a type of arteriosclerosis

Endocarditis (inflammation of the lining and valves of the heart)

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Risk factors:

- People can develop a DVT or pulmonary EMBOLISM after immobilization of the leg in a cast or after prolonged bed rest without moving the legs.

Other factors associated with embolism include:

- Cancer, previous surgery, a broken leg or hip, and genetic conditions affecting the blood cells that increase the chance of blood clot formation. Being overweight or obese, Smoking cigarettes.
- Taking birth control pills (oral contraceptives) or hormone replacement therapy, having diseases such as stroke, paralysis, chronic heart disease or high blood pressure
- Having had recent injury or trauma to a vein, having had severe injuries, burns or fractures of the hips or thigh bone

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TYPES OF EMBOLISM

Based on location -

Pulmonary embolism: A blockage of the blood vessel of the lung. The blood clots causing pulmonary embolism usually originates in deep veins of legs or sometimes in deep veins of other body parts (due to DVT). These clots migrate to the lung and block the artery. It can even cause death.

Brain embolism: A blockage of the blood vessel of the brain. It can cause a brain stroke. It usually results from the blood clots formed in the heart.

Retinal embolism: A blockage formed within the blood vessel of the retina (eye). It can cause sudden blindness of the eye.

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BASED ON BLOCKAGE/EMBOLI

- **Thromboembolism**: It is caused by embolus formed of the blood clot. It is the most common type of embolism.
- **Air embolism**: It is caused by embolus formed of air bubbles.
- **Fat embolism**: It is caused by embolus formed of fatty material. It is formed when a fat or bone marrow particle gets stuck in a blood vessel.
- **Amniotic embolism**: It is caused by embolus formed of amniotic fluid material. Amniotic fluid is a protective fluid for a fetus formed during pregnancy. The particles from amniotic fluid can cause lung blockage in a pregnant lady.

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BASED ON BLOCKAGE/EMBOLI ct…

- **Septic embolism**: It is caused by embolus formed of infectious agents like bacteria or infected materials like pus formed by them. It occurs when a person is suffering from bacterial or other infections.

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SIGN AND SYMPTOMS OF EMBOLISM

- Pain or swelling in legs.
- Chest pain.
- Difficulty in breathing.
- Dizziness.
- Cough.
- Tingling sensation or numbness in arms or legs.
- Changes in pulse and heartbeat.

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DIAGNOSIS OF EMBOLISM

- Blood tests.
- Imaging techniques like X-ray, ultrasound, CT scan and MRI.
- Doppler studies and venograms of the legs can be used to detect deep vein thrombosis.
- Color Doppler studies and angiography of brain, heart and lungs can detect arterial blockage due to embolus.

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Diagnosis ct…

PULMONARY EMBOLISM CAN BE DIAGNOSED BY

- A **computerised tomography pulmonary angiography** (CTPA) to see the blood vessels in your lungs. This is when you are injected with a dye that helps to show your blood vessels. Then a scanner uses X-rays to build a detailed picture of the blood flow in your lungs.
- A **ventilation-perfusion scan, also called a V/Q scan or isotope lung scanning**, to examine the flow of air and blood in your lungs. You will be asked to inhale a slightly radioactive gas and given an injection of slightly radioactive material. The radioactivity in this test is considered low risk to adults, however women who are, or might be, pregnant should tell the radiographer. If the scan shows parts of your lungs have air in them but no blood supply, this may be the result of a pulmonary embolism.

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Management:

Medications d**epends on the underlying cause and severity:**

- **Anticoagulants** such as warfarin (Coumadin), heparin, and thrombin inhibitors, which thin the blood and prevent the formation or growth of blood clots
- **Antiplatelets** medications such as aspirin and clopidogrel (Plavix), which prevent the formation of new clots
- **Painkillers and sedatives -** which can make you more comfortable
- **Thrombolytics -** which quickly dissolve large blood clots in severe or life-threatening cases of embolism

Embolism ct…

Management ct…

Procedures to treat embolism

If blood flow is completely or almost completely blocked, these procedures may be opted for:

- **Angioplasty:** in which the blocked blood vessel is widened by inflating a balloon-like catheter in the vessel. A small mesh tube called a stent may be placed inside the blood vessel to keep it open.
- **Arterial bypass**: in which the blocked artery is bypassed with a vessel harvested from another part of your body or with manufactured tubing.

Embolism ct…

Management ct…

- **Embolectomy:** in which the blood clot is removed with a catheter or open surgery. A catheter is a flexible tube inserted into a vein in the upper thigh or arm and then guided though the veins to reach the blood clot.
- **Intravenous filter placement:** to stop future clots from traveling upstream.

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Preventive measures of embolism

- Use of compression clothing such **as compression stockings** is helpful in preventing deep vein thrombosis which in turn can prevent pulmonary embolism. The compression stocking presses the legs allowing the blood to flow easily from the veins of legs.
- **Leg elevation or keeping the leg raised** during travel and nighttime sleep and massaging the legs are efficient ways to lower the chances of deep vein thrombosis and pulmonary embolism.
- **ENCOURAGE AMBULATION**: Moving as soon as possible after surgery can help prevent pulmonary embolism

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Prevention ct…

- A surgery known as thrombectomy can be used to remove the clot which prevents the embolism.
- Regular exercise such as walking and stretching along with proper diet and hydration are recommended to avoid risk of embolism.
- administration of blood thinner medicines such as aspirin or heparin. These are given before and after surgery to prevent blood clots resulting from surgery and to a person suffering from heart disease, high blood pressure, and during stroke.

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Nursing care:

- Monitor vital signs
- Prevent venous stasis. Encourage ambulation and active and passive leg exercises to prevent venous stasis.
- Manage pain - administer analgesics as prescribed
- Turn patient frequently and reposition to improve ventilation-perfusion ratio.
- Manage oxygen therapy. Assess for signs of hypoxemia and monitor the pulse oximetry values.
- Relieve anxiety. Encourage the patient to talk about any fears or concerns related to this frightening episode

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- HOSPITALIZED immobile patients especially fracture patients are put on anti coagulants eg heparin

Complications of embolus

- Pulmonary embolism can also lead to pulmonary hypertension, a condition in which the blood pressure in your lungs and in the right side of the heart is too high. When you have obstructions in the arteries inside your lungs, your heart must work harder to push blood through those vessels, which increases blood pressure and eventually weakens your heart.

HYPERTENSION:

- Hypertension or high blood pressure is a chronic medical condition in which the systemic arterial blood pressure (tension in the arteries) is elevated.
- A systolic blood pressure greater than 140 mmHg and a diastolic pressure greater than 90 mmHg over a sustained period, based on the average of two or more blood pressure measurements taken in two or more contacts with the health care provider after an initial screening.

Hypertension ct..

Types:

- Primary (essential) - about 90–95% of cases are termed primary hypertension which refers to high blood pressure for which no medical cause can be found.
- Secondary - the remaining 5–10% of cases are termed as secondary hypertension as their cause is known. Most are caused by other conditions that affect the kidneys, arteries, heart or endocrine system

Classification

- Hypertension stage I - 140-159/90-99
- Hypertension stage II >160/>100
- Hypertension stage III >180/>110

Risk factors

- Age-systemic blood pressure rises with age
- Gender- males are more affected
- Race- black more affected
- Diet- high lipids and salts
- Smoking
- Family history
- Diabetic hx
- Pre-existing vascular disease
- Alcohol
- stress

Causes

- Adrenocortical diseases eg. Conns's disease- hypersecretion of aldosterone, Cushin's syndrome- hypersecretion of glucocorticoids
- Phaeochromocytoma-catecholamine secreting tumors
- Narrowing of the renal arteries
- Renal disease-glomerulonephritis, pyonephritis, polycystic disease
- Severe polycythemia-high RBCs
- Narrowing of aorta
- Increased CO eg in thyrotoxicosis,anxiety

Causes ct…

- Renin angiotensin aldosterone system. Renin is an enzyme secreted by the kidneys (also the brain and blood vessels). It cleaves angiotensinogen to angiotensin I , which is a precursor Angiotensin converting enzyme (ACE) from the lungs , converts angiotensin I to angiotensin II which is a potent vasoconstrictor and a stimulator of aldosterone synthesis and secretion.
- Stress
- Oral contraceptives stimulates angiotensinogen system
- Chronic high sodium intake
- Genetic factors -family history

Clinical features

- Occipital headache esp. morning on arising
- Dizziness, fatigue
- Palpitation
- Angina
- Dyspnoea on slight exertion
- Blurring vision due to retinal changes egeg hemorrhage and papilloedema(swelling of optic disc
- Epixtasis
- Left ventricular hypertrophy
- Pathologic changes in kidney.
- Cerebrovascular involvement may lead to stroke(CVA) or transient ischaemic attack(TIA). May present with hemiplegia,alteration of speech and vision, sudden falls

Investigations

- Thorough history
- Correct BP measurement
- Fundoscopy to check the retina with an ophthalmoscope
- Lab test eg, urinaalysis, BUN, creatinine, blood glucose,
- Echocardiography
- ECG
- Plasma choresterol
- Plasma urea and electrolytes
- S4 heart sound represents atria contraction against Apical heave - LV hypertrophy

Diagnosis

- Done through diastolic pressure:
  - mild 90-104mmHg
  - moderate 105-114mmHg
  - on 3 separate readings.
  - severe above 115mmHg (3 readings not necessary)

Management

- Beta blockers eg atenolol, propranolol
- Diuretics eg lasix
- Angiotensin converting enzyme antagonists eg enalapril
- Angiotensin II receptor antagonists eg losartan 50-100mg OD
- Calcium antagonists - verapamil, nifedipine
- Direct acting vasodilators eg hydralazine
- Centrally acting vasodilators – methyldopa, alpha receptor blocker

Complications

- Cerebral hemorrhage- can lead to CVA
- Coronary thrombosis
- Retinal hemorrhage
- Renal failure
- Malignant hypertension
- Aneurysm

Nursing care

- Bed rest
- Medication –antihypertensive
- Dietary consideration and restrict fats and salts
- Weight control
- Counseling and education e g to stop smoking
- Encourage exercise
- Stress management
- Risk factor management

Hypertensive crisis

- Hypertensive emergency- hypertension that requires immediate lowering of blood pressure to prevent damage of vital organs.eg MI, cerebral hemorrhage, aneurism
- Drugs of choice-intravenous vasodilators eg sodium nitropruside
- Hypertensive urgency- the BP must be lowered within a few hours. Managed with oral doses of antihypertensives eg diuretics