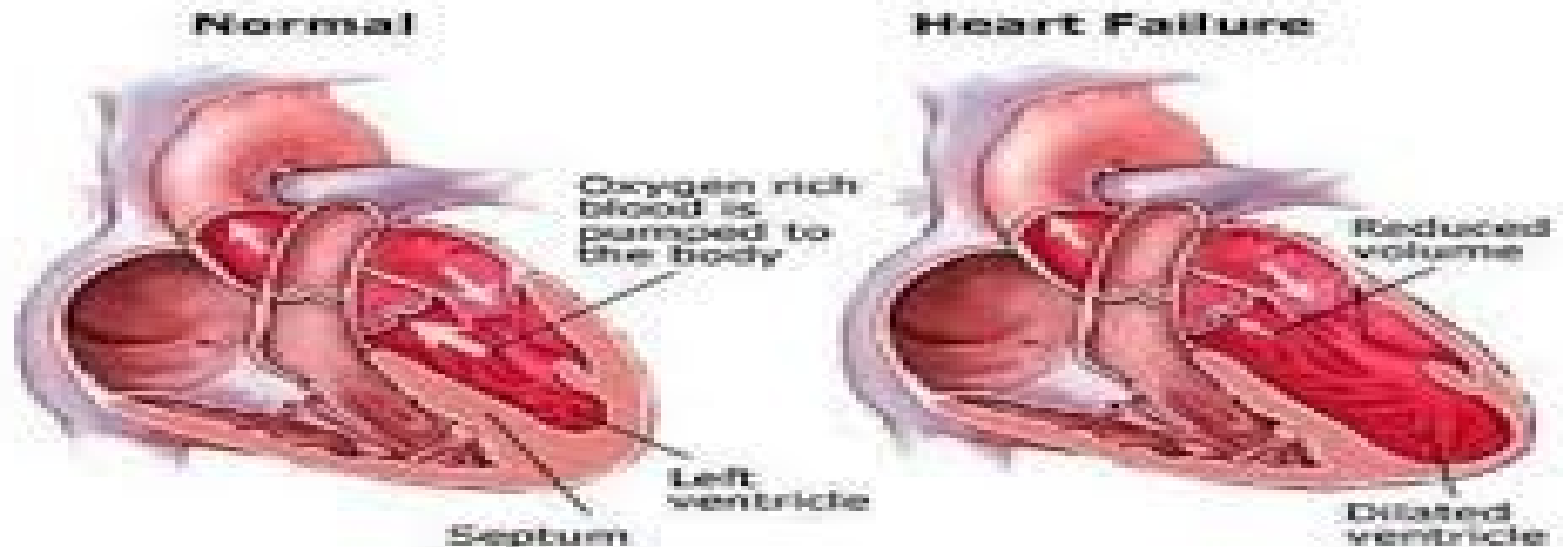


UNIT-V-CARDIOVASCULAR DISORDER

Congestive heart failure

Diagram shown normal and abnormal heart with CHF



Introduction

- The term “heart failure” is often used to describe the clinical changes that occur when the cardiac pump cannot meet the demands of the body.
- This may occur either because the workload imposed on the heart is excessive or because the cardiac pump is weak.
- The heart may be presented with an excessive workload when it is required to pump a larger volume than usual or when it has to pump against a higher resistance.
- These two conditions are known as volume loading and pressure loading.

Definition:

- ❖ Heart failure is a clinical condition that results from impairment of the ventricle to fill with or eject blood.
- ❖ The presentation of pediatric heart failure is diverse because of the numerous underlying cardiac etiologies and varying clinical settings (eg, age at presentation).

- ❖ Underlying causes include:
 - congenital heart disease (usually in the first months of life),
 - acute rheumatic fever
 - myocarditis
 - infective endocarditis
 - acute glomerulonephritis (renal failure)
 - severe anemia,
 - very severe pneumonia and severe malnutrition.
- Heart failure can be precipitated or worsened by fluid overload, especially when giving salt-containing IV fluids

pathophysiology

- Congestive heart failure is not a disease entity. It is a syndrome of an overworked myocardium. It may be due to a problem that results in.
- 1. volume overload of the right or left ventricle as may occur with a large left to right shunt, peripheral arteriovenous fistulas, valvular insufficiency, excessive intravenous infusions.

Conti...

- 2. a pressure overload of either ventricle as may occur with an obstruction of the circulation caused by severe aortic stenosis, pulmonary stenosis.
- 3. myocardium that does not function adequately as seen with myocarditis, hypoxemia, acidemia, hypocalcemia. this may occur when a child has hyperthyroidism, severe anemia, obstructive respiratory disease.

Clinical manifestation

- ❑ Symptoms of heart failure vary with age
- ❖ **Infants** – The most common symptoms are
 - tachypnea and diaphoresis during feeds,
 - easy fatigability, irritability,
 - decreased volume of feeds, and poor weight gain.
- ❖ **Young children** – the symptoms may be mistaken for common childhood illnesses
 - They include gastrointestinal symptoms (abdominal pain, nausea, vomiting, and poor appetite)
 - failure to thrive, easy fatigability, and recurrent or chronic cough with wheezing.

❖ **Older children –**

- exercise intolerance, anorexia, wheezing, dyspnea,
- edema, palpitations, chest pain, or syncope.

Physical examination

- ❖ **Tachycardia**-presence of a heart rate value greater than expected for age
 - Infants (<2 years): >160 BPM
 - Children between 2 to 6 years: >140 BPM
 - Children between 6 to 12 years: >120 BPM
 - Adolescents and adults: >100 BPM
- ❖ Pulmonary congestion
 - ✓ Tachypnea
 - ✓ retractions,
 - ✓ use of accessory respiratory muscles,
 - ✓ in infants, grunting with nasal flaring.

❖ Systemic congestion

- Hepatomegaly - most common finding
- jugular venous distension- (not generally observed in infants and young children)
- peripheral edema

❖ Poor perfusion

- cool and mottled extremities,
- decreased capillary refill,
- decreased peripheral pulses,
- lowered systemic blood pressure.

Diagnosis

- The diagnosis of heart failure is based on
 - ✓ characteristic signs
 - ✓ physical findings
 - ✓ Laboratory studies
 - ✓ Imaging studies

Imaging

- Chest x-ray : visualize organs through radiation
 - Congestion in lungs-left sided HF
 - Look for enlarged heart
- Echocardiogram : diagnosis through sound waves
 - heart pumping ability (ejection fraction)

Blood test

look for heart failure substance

- B -type natriuretic peptid(BNP) – secreted in response to stretch
- cardiac muscles

Management

Goals of therapy

- To relieve symptoms
- Decrease morbidity (including the risk of hospitalization),
- Slow the progression of heart failure
- Improve patient survival

- **Oxygen:**
 - ✓ If the child has respiratory distress, or has central cyanosis.
- **Diuretics: treats congestion (remove excess fluid)**
 - ✓ Give furosemide (frusemide): a dose of 1 mg/kg should cause increased urine flow within 2 hours.
 - ✓ For faster action, give the drug iv.
 - ✓ If the initial dose is not effective, give 2 mg/kg and repeat in 12 hours, if necessary.
 - ✓ Thereafter, a single daily dose of 1–2 mg/kg orally is usually sufficient
- **Digoxin: control rapid rates(decrease heart rate)**
 - ✓ After evaluation by a cardiologist.

Stages of heart failure in infants and children and recommended therapy

stage	Description	Therapy
A	• Increased risk of developing HF, • Normal cardiac function and chamber size	None
B	• Abnormal cardiac morphology or function, • No symptoms of HF, past or present	• ACE inhibitors for patients with systemic ventricular dysfunction
C	• Structural or functional heart disease, • past or current symptoms of HF	• low dose digoxin and diuretics for symptom control
D	• Patients with end-stage HF requiring specialized interventions	• Intravenous diuretics • positive pressure ventilation • mechanical circulatory support, • heart transplantation

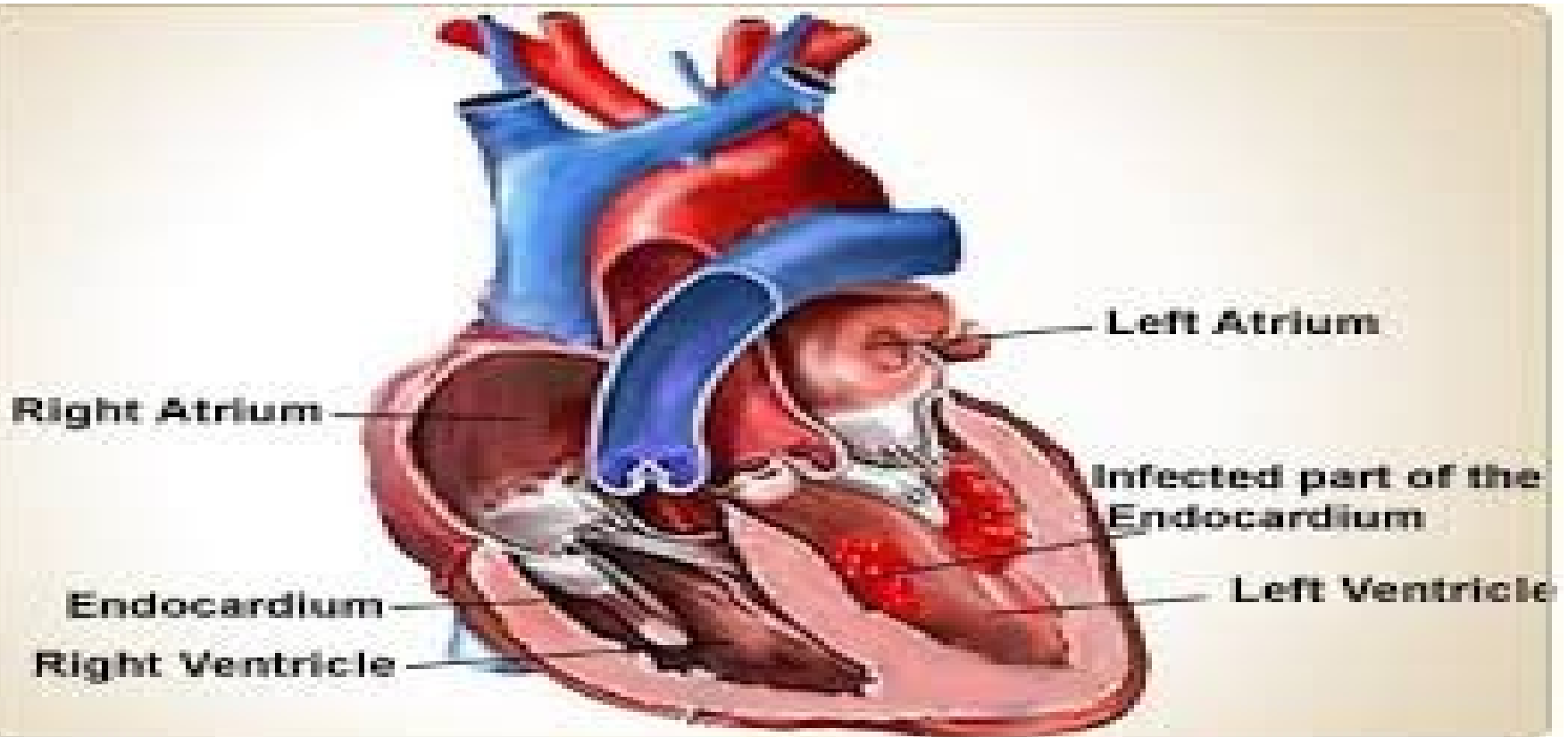
Nursing management

- **Lifestyle modifications:** congestive heart failure is diagnosed, treatment should be started immediately. Perhaps the most important and yet most neglected aspect of treatment involves lifestyle modifications.
- **Aerobic exercise**, once discouraged for congestive heart failure patients, has been shown to be beneficial in maintaining overall functional capacity, quality of life, and perhaps even improving survival. Improving

Conti...

- **Provision of normal growth and development:** Children who have congestive heart failure rest sufficiently. It is important to fulfill their psychosocial and cognitive needs.
- **Supporting and educating the parents:** Before child is discharged from hospital, the parents must be taught the kinds and amounts of medication to be given, their action and side effect.

Infective endocarditic



Introduction

- Infective endocarditis (IE) is an infection of the endocardium and/or heart valves that involves thrombus formation, which may damage the endocardial tissue and/or valves.
- Although uncommon in children, it is important to identify and treat IE because of its significant morbidity and mortality.
- Prompt diagnosis, rapid treatment, and recognition of complications are imperative for optimal patient outcomes.
- IE is also referred to as bacterial endocarditis because bacteria are the predominant microbial pathogens.

Epidemiology

Risk factors and incidence —

- Prior to 1970, rheumatic heart disease (RHD) was the major predisposing cardiac risk factor for IE in children .
- In developed countries, a substantial decline in the incidence of RHD, it has made it uncommon.
- Children with CHD, especially those with cyanotic heart disease, are at a greater risk for IE than the general pediatric population.
- About 35 to 50 percent of children with IE have CHD
- In the absence of CHD, an indwelling CVC is a major risk factor for pediatric IE

Pathogenesis

- ❖ IE is the result of a series of complex interactions among
 - ✓ blood-borne pathogens,
 - ✓ damaged endothelium,
 - ✓ fibrin, and platelets
- The endocardial surface is initially injured by shear forces associated with turbulent blood flow in children with congenital heart disease (CHD), or indwelling central venous catheters in children without CHD.
- At the site of endothelial damage, fibrin, platelets, and occasionally red blood cells are deposited and initially form a non infected thrombus.

Conti...

- Transient bacteremia (which occurs in normal children) or fungemia results in adherence of microbial pathogens to the injured endocardium and thrombus.
- Subsequent fibrin and platelet deposition over the infected vegetation result in a protective sheath that isolates the organisms from host defenses and permits rapid proliferation of the infectious agent.

Etiology

- Although a variety of microorganisms can cause IE, streptococci and staphylococci species are the most common pathogens associated with IE in children
- The most common pathogens are:
 - Staphylococcus aureus -57%
 - Viridans group streptococci
 - Coagulase-negative staphylococci
 - Group A streptococcus
- Fungal endocarditis is rare and is typically caused by Candida species. Indwelling catheters and high glucose concentrations in parenteral nutrition have contributed to the occurrence of fungal endocarditis,

- The infection is located in the valves and inner lining of the heart and occurs most frequently as a complication of congenital or rheumatic heart disease, although it may also be found in children without cardiac problems. Children who have cardiac lesion that cause a high velocity of blood to be injected into a blood vessel or heart chamber are especially prone to develop this infection.

- This turbulent blood prone to develop this infection. This turbulent blood flow leads to endocardial or intima erosion. Bacteremia in children who have tetralogy of fallot.aortic stenosis and patent ductus arteriosus is especially likely to progress to infective endocarditis with vegetative formation.

Conti..

- These vegetations are abnormal outgrowths of microorganism and deposits of fibrin and platelet thrombi at the sites of erosion on the endocardium. They may also break off and form emboli, which may travel to the lungs, central nervous system, skin, spleen. infective endocarditis is not likely to develop in children who have cardiac lesions that result in a low velocity blood flow

Clinical manifestation

- The clinical presentation of pediatric IE is variable.
- It is dependent upon:
 - The extent of the local cardiac disease
 - Degree of involvement of other organs (eg, embolization),
 - The causative agent.
- IE is generally classified as a
 - sub acute
 - acute process.

Subacute presentation

- is characterized by a prolonged course of low-grade fever and nonspecific complaints including
 - ✓ fatigue,
 - ✓ arthralgias,
 - ✓ myalgias,
 - ✓ weight loss,
 - ✓ exercise intolerance and diaphoresis.
- The presence of these symptoms in a patient at risk for IE should raise the possibility of potential diagnosis.
- The less virulent pathogens, such as viridans group streptococci and coagulase-negative staphylococci, are usually the causative agents for sub acute IE.

Acute IE

- is a rapidly progressive and fulminant disease.
- These patients typically have high spiking fevers, and appear severely ill.
- An acute presentation is commonly seen in patients with IE due to *Staphylococcus aureus* (*S. aureus*), which can cause
 - rapid destruction of heart valve tissue,
 - abscess formation,
 - embolic phenomena,
 - and a rapidly progressive deterioration in hemodynamic status.

- Many of the basic dermatologic manifestations develop in untreated patients.
 - Osler nodes (tender pea sized Intradermal nodules in the pads of the fingers),
 - Janeway lesions (painless or hemorrhagic lesions on palms and soles)
 - bleeding beneath the nails (splinter hemorrhages).

JANEWAY LESIONS & OSLEAR NODES



Diagnosis

- The diagnosis of IE is based upon
 - careful history and physical examination
 - blood culture and laboratory results
 - echocardiogram.
- The gold standard for diagnosis is appropriately collected blood culture.
- Take 3 to 5 separate samples even during afebrile periods.
- In patients with no prior antibiotic treatment, culture identifies etiologic agents in 90% of cases.

- Additional information can be obtained from
 - echocardiography,
 - raised ESR
 - leukocytosis
 - mild normoctytic anemia
 - and microscopic hematuria (may have RBC casts)

Differential diagnosis

- Recurrence of rheumatic fever
- Malaria
- Tuberculosis

Complication

- Heart failure due to perforation of the valve
- Extension of infection beyond the endothelium may result in a fistula tract or perivalvular infection
- Metastatic infection due to septic emboli resulting in
 - ✓ osteomyelitis,
 - ✓ Pneumonia
 - ✓ distal abscesses in the kidneys, spleen, brain or soft tissues.
- Glomerulonephritis as a result of an immune-mediated secondary process.

Treatment

- Any patient with diagnostic possibility of infective endocarditis should be treated in a hospital.
- Medical management should provide both specific treatment of the infection and supportive treatment for congestive heart failure.
- In patients with acute IE, blood cultures should be obtained as quickly as possible so empiric antibiotic therapy can be started.

- Initial empiric antibiotic should be effective for both Gram-positive and Gram negative organism
 - combine cloxacillin (100 mg /kg per 24 hours), ampicillin (300 mg/kg per 24 hr, IV) and gentamicine (3 to 4 mg / kg per 24 hours IV).
- Adjustment of drugs can be done depending on blood culture results.
- Therapy should continue for 4 to 6 weeks (except gentamicin for 2 weeks).
- ❖ Patients who fail medical therapy with persistent vegetations despite antibiotic therapy may be candidates for surgical intervention.

Prevention

- The prevention of infective endocarditic involves appropriate treatment of infection in high risk children, proper general dental care and oral hygiene and antimicrobial prophylaxis.
- Oral amoxicillin can be given 1 hour before dental procedures and surgery of the upper respiratory tract.
- Intramuscular or IV ampicillin plus gentamicin is recommended before surgery of the genitourinary and gastrointestinal system.

Acute Rheumatic Fever

Acute rheumatic fever

- Rheumatic fever is a non suppurative (indirect) acute inflammatory complication of group A streptococcal pharyngeal infections,
- characterized mainly by carditis, arthritis and chorea appearing alone or in combination
- Carditis is the only long-term complication
- All the others resolve

Etiology and incidence

- It is frequent in children aged between 5 and 15 years, rare among < 3 years and adults , because they are susceptible to Group A streptococcal pharyngitis.
- Streptococcal skin infection does not result in acute rheumatic fever.
- Acute rheumatic fever is the most common cause of **acquired heart disease** in children living in developing countries.
- Acute rheumatic fever is preventable
- **Prompt** and **proper** treatment of streptococcal pharyngitis can eliminate the risk for acute rheumatic fever.

Risk factor:

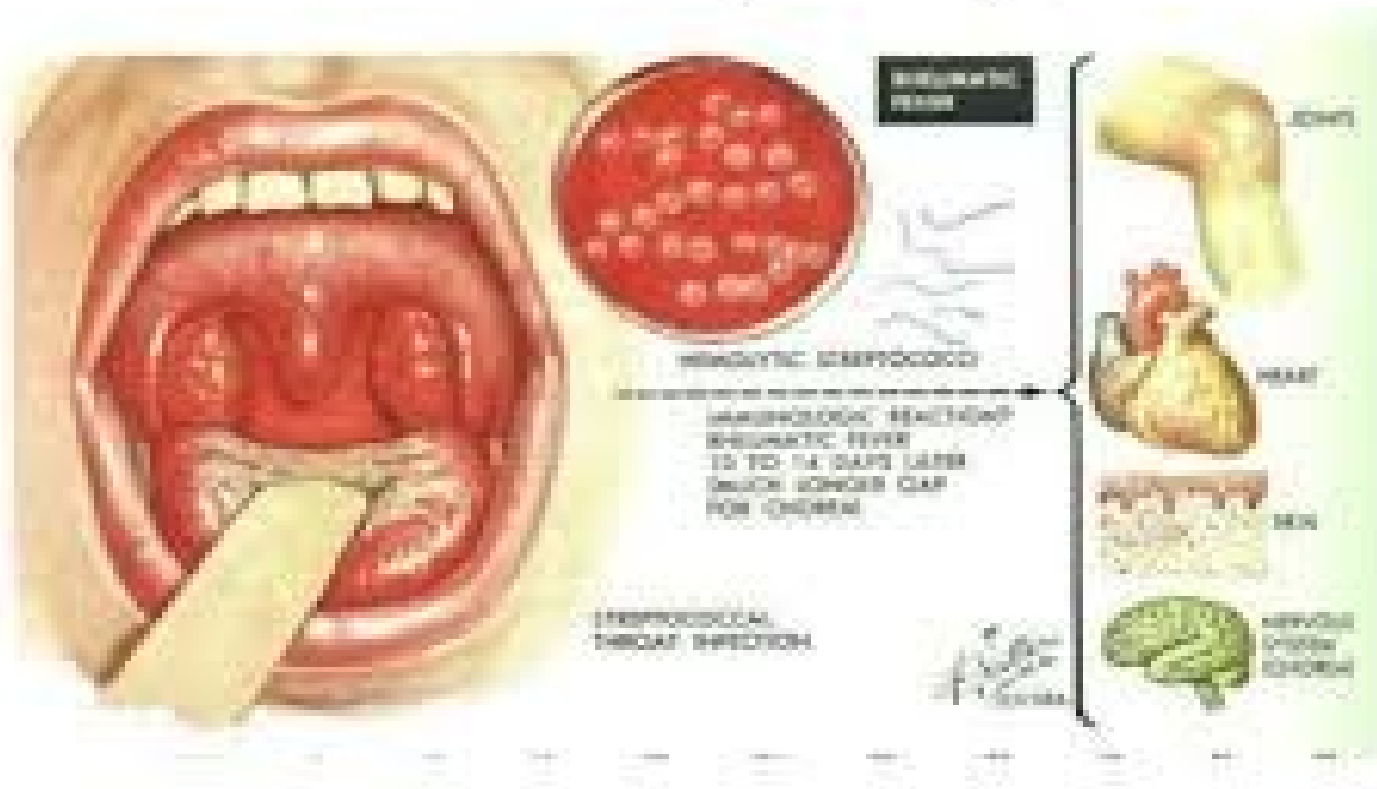
- ✓ Climate (high temperature),
 - ✓ poverty,
 - ✓ crowding,
 - ✓ poor housing conditions and
 - ✓ inadequate health services are the major risk factor for the frequent occurrence of acute rheumatic fever in developing countries

Pathogenesis

- The exact pathogenesis remains unexplained but the most accepted is an abnormal immune response to some still unidentified component of Group A streptococci.
- The antibodies produced against the streptococci antigen cross react and cause immunologic damage to
 - the heart valves, muscle and pericardium (pancarditis), joint synovium (arthritis), nervous tissue (Sydenham chorea), skin (erythema marginatum) and subcutaneous tissue (subcutaneous nodule).

Conti...

Rheumatic fever-pathogenesis



Clinical manifestations

- Acute rheumatic fever is characterized by group A streptococcal infection followed by clinical manifestations.
- The four minor manifestations are:
 - Arthralgia
 - Fever
 - Elevated acute phase reactants [erythrocyte sedimentation rate (ESR), C-reactive protein (CRP)]
 - Prolonged PR interval

- The five major manifestations are:
 - Migratory arthritis (predominantly involving the large joints)
 - Carditis and valvulitis (eg, pancarditis)
 - Central nervous system involvement (eg, Sydenham chorea)
 - Erythema marginatum
 - Subcutaneous nodules

❑ **Arthritis:**

- usually is the earliest symptomatic manifestation of ARF
- Typically inflammation is present in multiple joints(knees, ankles, elbows, and wrists) are affected most commonly and each joint is inflamed for no more than one week.
- Joint involvement is more common and more severe in teenagers and young adults than in children
- The onset of arthritis in different joints usually overlaps, giving the appearance that the disease "migrates" from joint to joint (migratory polyarthritis)

❑ **Carditis**

- Rheumatic fever causes a pancarditis, affecting the pericardium, epicardium, myocardium, and endocardium.
- The presence of valvulitis is established by auscultatory findings together with echocardiographic evidence of mitral or aortic regurgitation.
- Mitral regurgitation is the most common early valvular manifestation and may be accompanied by aortic regurgitation

Conti...

❑ chorea

- Sydenham chorea (also known as chorea minor) is a neurologic disorder consisting of abrupt, non rhythmic involuntary movements, muscular weakness, and emotional disturbances
- The movements frequently are more marked on one side, are occasionally unilateral (hemichorea), and cease during sleep
- Chorea can present up to **eight months** after streptococcal infections; this is a longer latent period than other rheumatic manifestations

❑ **Erythema marginatum**

- ❑ Is an evanescent, pink or faintly red, non-pruritic rash involving the trunk and sometimes the limbs but not the face .
- ❑ The lesion is also known as "erythema annulare" since the margin of the lesion is usually continuous, making a ring
- ❑ A hot bath or shower may make them more evident

❑ **Subcutaneous nodules**

- firm, painless lesions ranging from a few millimeters to 2 cm in size.
- occur more frequently on the extensor surface of large joints (elbow, wrist and knee) and spine.
- rheumatic fever nodules occur most commonly on the olecranon,
- the least common manifestation (less than 5 percent of patients)

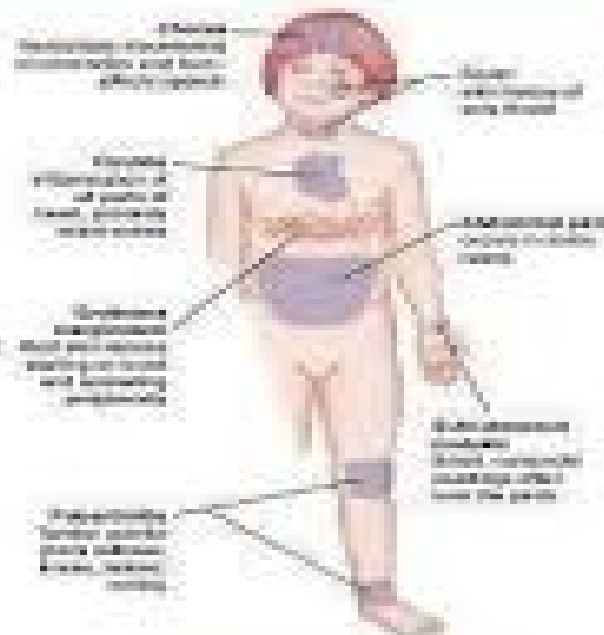
Conti....



Rheumatic Fever - Assessment

■ Major

- Carditis
- Polyarthrititis
- Chorea
- Erythema marginatum
- Subcutaneous nodules



■ Minor

- Arthralgia
- Fever
- Laboratory Findings:
 - ↑ Erythrocyte sedimentation rate
 - ↑ C-reactive protein
 - Prolonged PR interval

Jones Criteria

Diagnosis

- ❖ No single clinical feature or test is diagnostic of acute rheumatic fever.
- ❖ So the modified Jones criteria which consist of 5 major and 4 minor plus evidence of preceding streptococcal infection is used for diagnosis.
- ❖ To diagnose acute rheumatic fever the following should be present:
 - 2 major or 1 major and 1 minor criterion plus evidence of preceding streptococcal infection
- ❖ Exception
 - Chorea, plus evidence of preceding streptococcal infection

Treatment

- **The primary goal of the medical regimen are**
- 1.suppression of the acute inflammatory process
- 2.Eradication of the streptococcal infection
- 3.prevention of disease recurrence.

Treatment of acute rheumatic fever consists of

- ❖ antibiotic therapy
- ❖ heart failure management
- ❖ and anti-inflammatory therapy

Antibiotic therapy

- ❖ Treatment should proceed as delineated for management of streptococcal pharyngitis, whether or not pharyngitis is present at the time of diagnosis
 - 10 days course of amoxicillin or a single i.m. injection of benzathine penicillin G- 6000,000 u IM daily for 10 days..

Heart failure

- Bed rest
- Carditis with heart failure give Prednisolone 2 mg/kg/day for 2 to 4 weeks depending on patient response
Digoxin and diuretic

Anti-inflammatory drugs

- ❖ To control the clinical features
 - **Arthritis** - aspirin 80 to 100 mg/kg per day in
 - **Carditis without heart failure** - aspirin 80 to 100 mg/kg/day in 4-6 divided doses for 4 weeks.
- ❖ **Chorea** -most recover without treatment
 - chlorpromazine and phenobarbital are helpful.

Prevention

Prevention of initial and recurrent attacks of rheumatic fever depends on control of group A streptococcal tonsillopharyngitis

Primary Prevention

- prevention of initial attack of rheumatic fever is accomplished by prompt diagnosis and antibiotic treatment of group A streptococcal tonsillopharyngitis

Prevention...

Secondary prevention

- Prevent recurrences so as to reduce the damage to heart valves and the risk of chronic rheumatic heart disease.
- requires continuous antimicrobial prophylaxis, rather than recognition and treatment of acute group A streptococcal pharyngitis episodes. for patients with well-documented history of rheumatic fever

Nursing management

- Nurse in the hospital takes a nursing history, assists in evaluating clinical findings, either collects or assists in collecting specimens for laboratory evaluation.
- Providing complete bed rest
- Fluids are encouraged to prevent dehydration.
- Providing proper nutritious food to child.
- Pain from carditis or polyarthrititis is decreased by the administration of anti-inflammatory agents eg; aspirin