Rheumatic heart disease and endocarditis

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(Infection) streptococcus group A → acute, multisystemic,

- Rheumatic Fever (RF) is an immunologically mediated inflammatory disorder, which occurs as a sequel to group A streptococcal pharyngeal infection.
- The illness is so named because of its similarity in presentation to rheumatism.
- RF is the most common cause of heart disease in 5-30 age groups throughout the world.
- It accounts for 12-65% of hospital admissions related to CVD in developing countries.
- Rare <3 years.

3% of patients have pharyngitis caused by strepcoccus may develop rheumatoid fever

- Incidence more during fall ,winter and early spring.

Rheumatic fever Pathogenesis

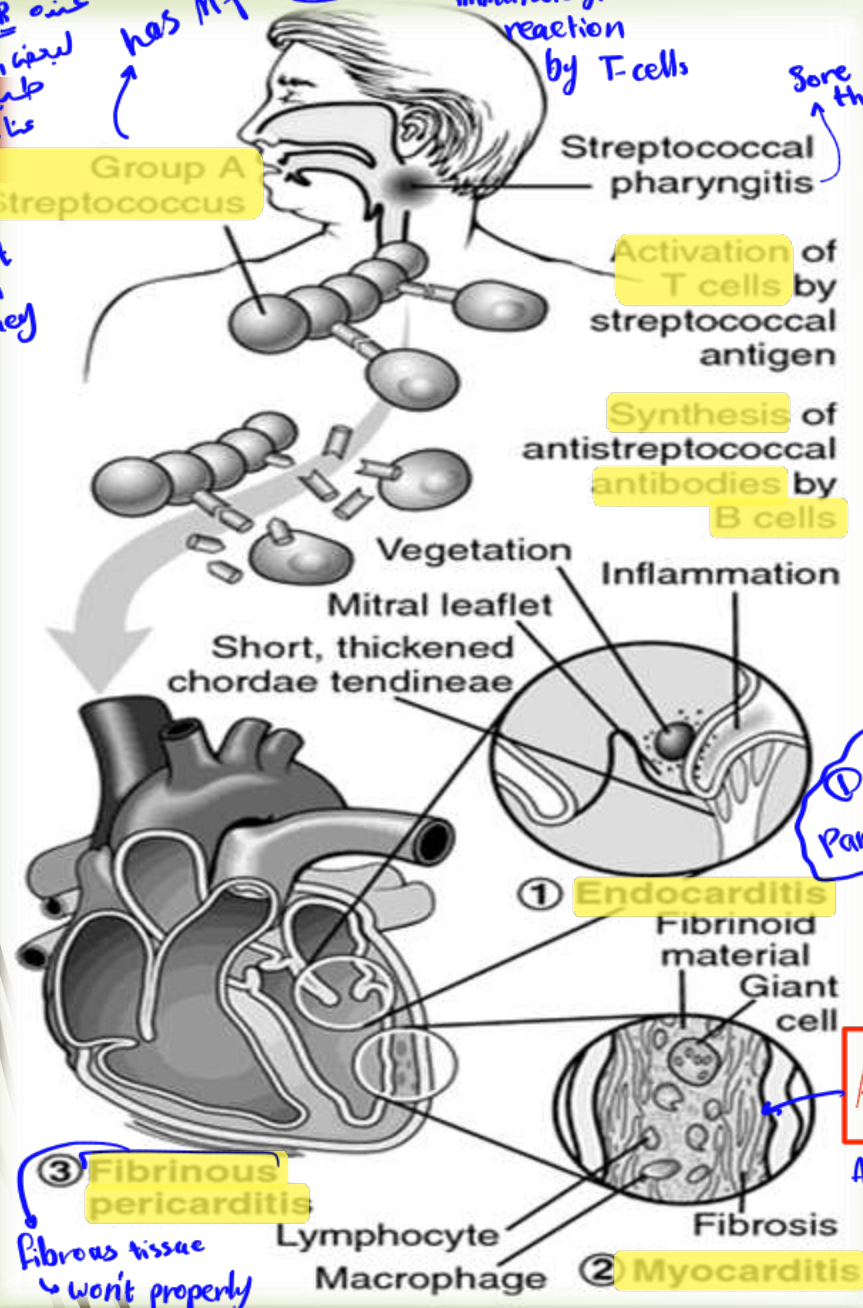
Agent factors

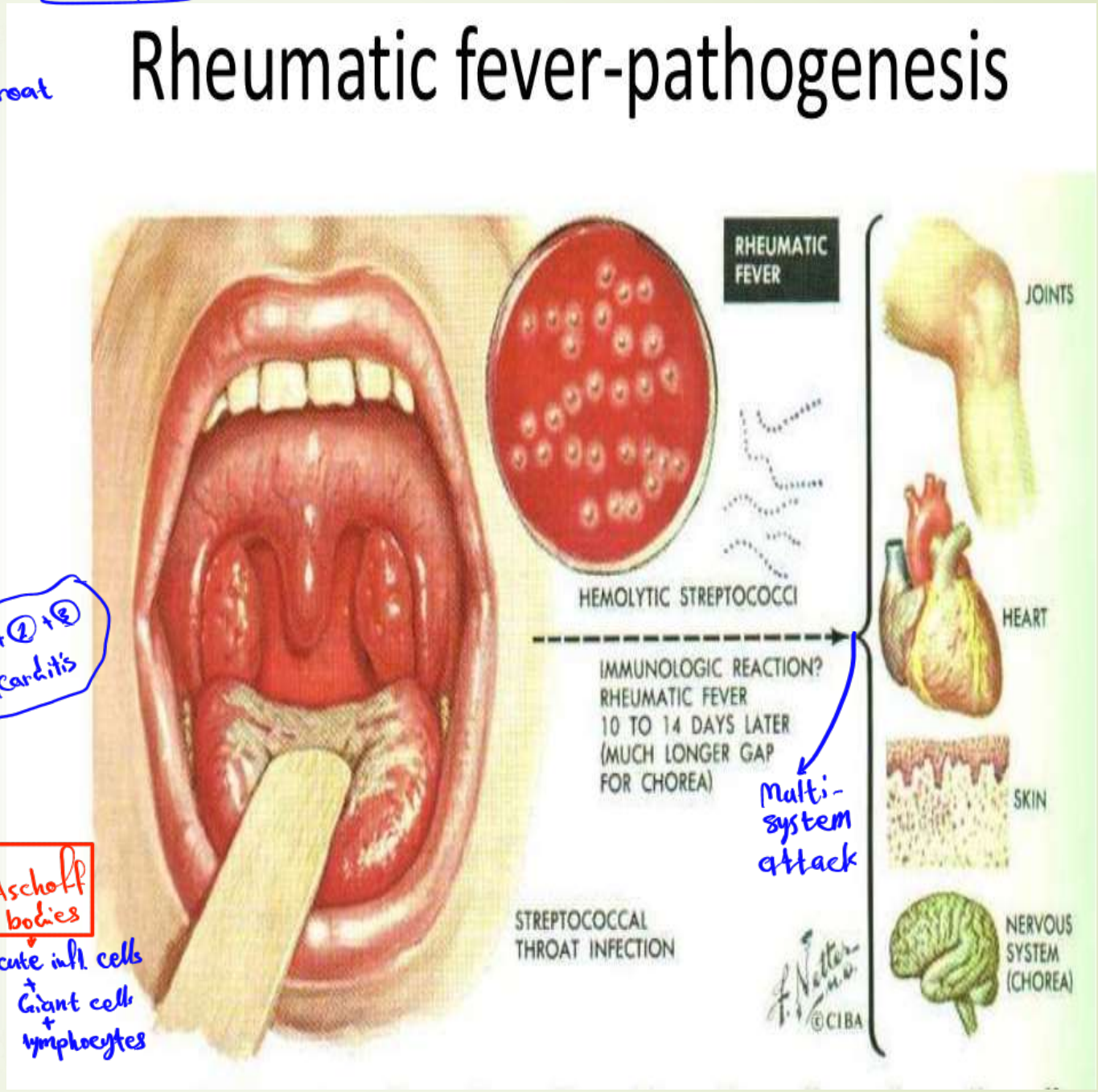
- Streptococcal sore throat.
- Not all strains of Group A Streptococci (GAS) lead to RF. Recently virus (coxsackie B-4) has been suggested as causative agent.
- It must be pharyngeal infection not skin infection.

Host and environmental factors

- Age: Adolescents 5-15 years but the initial attack is at younger age.
- No gender predilection.
- Common in 3rd world countries.
- Environmental factors-- over crowding, poor sanitation, poverty, poor housing.
- A family history and lower socioeconomic status are additional factors

Rheumatic fever-pathogenesis





CLINICAL MANIFESTATIONS

- The infection often precedes the presentation of rheumatic fever by 2 to 6 weeks.

to get an immune response.

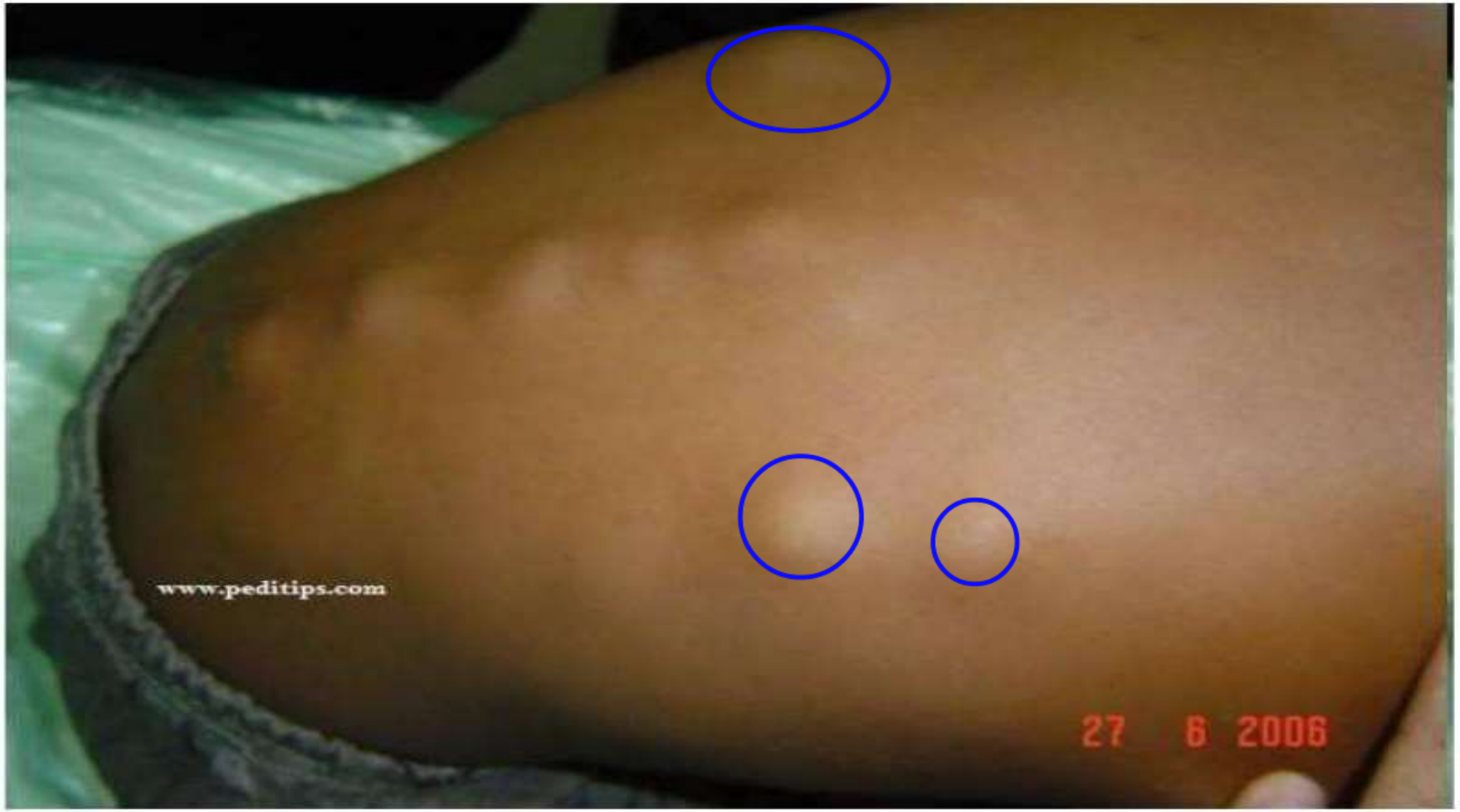
- Acute rheumatic fever is diagnosed using the **revised Jones criteria**, which consist of clinical and laboratory findings.

- One major and two minor, or two major with evidence of recent group A streptococcal disease strongly suggest the diagnosis of acute rheumatic fever.

Major Criteria in the Jones System for Acute Rheumatic Fever

Sign	Comments
Polyarthritis	Common; swelling, limited motion, tender, erythema
	•migratory, large joints, no residual deformity, rapid response to aspirin (if aspirin given,24 to 48hrs joint pain will disappear ;thus used as diagnostic test)
Carditis	Common; pancarditis, valves, pericardium, myocardium
	•Murmur (mitral or aortic regurgitation-endocardium involved) •Heart failure •Cardiac enlargement (myocardium involvement) •Pericardial rub or effusion(pericardium involvement)
Chorea (Sydenham disease)	Uncommon; presents long after infection has resolved; more common in females, Spasmodic, unintentional, jerky choreiform movements, speech affected, fidgety, late manifestation
Erythema marginatum	Uncommon; pink macules, ring or crescent shaped, transient patches over trunk and limbs, elicited by application of local heat; nonpruritic
Subcutaneous nodules	Uncommon; Painless, hard nodules beneath skin, over bony prominence, tendons and joints, present over extensor surface of elbows, knees, knuckles, and ankles or scalp and spine. associated with repeated episodes and severe carditis;

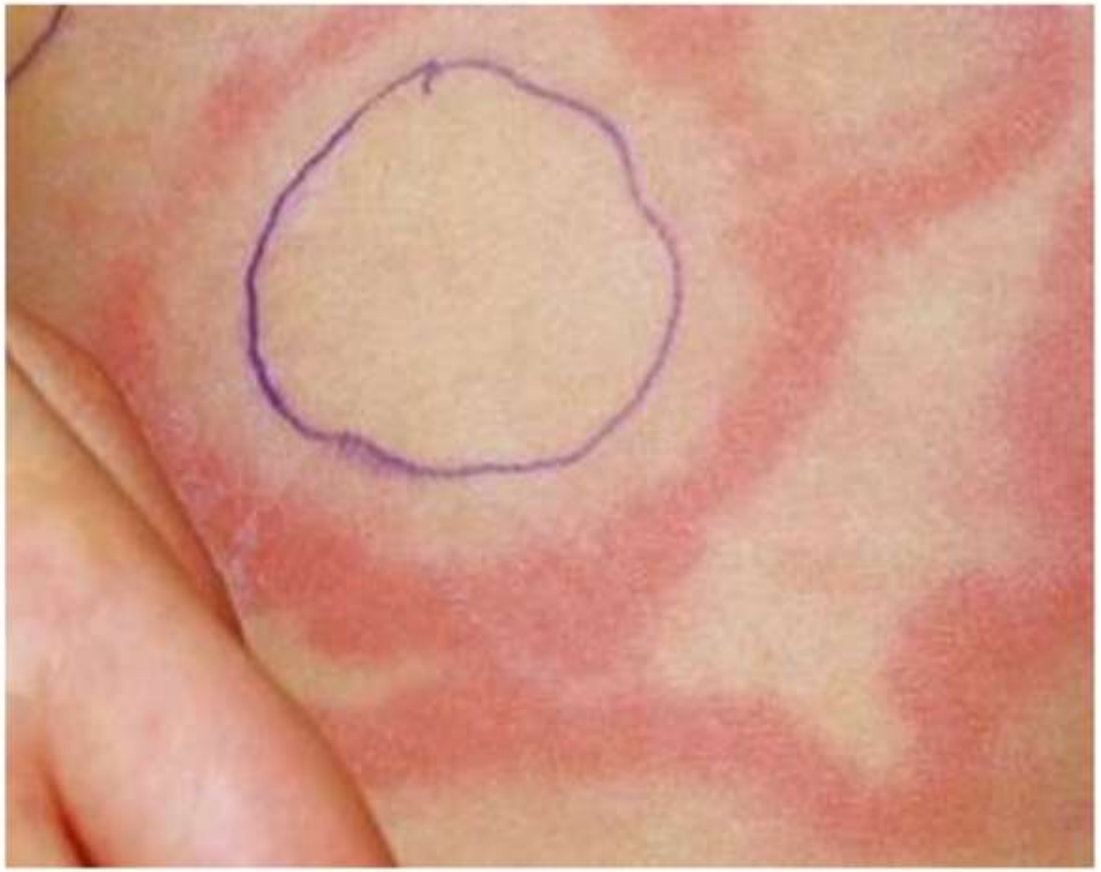
Rheumatic fever-diagnosis



Subcutaneous nodules

(nodules of rheumatoid arthritis are larger)

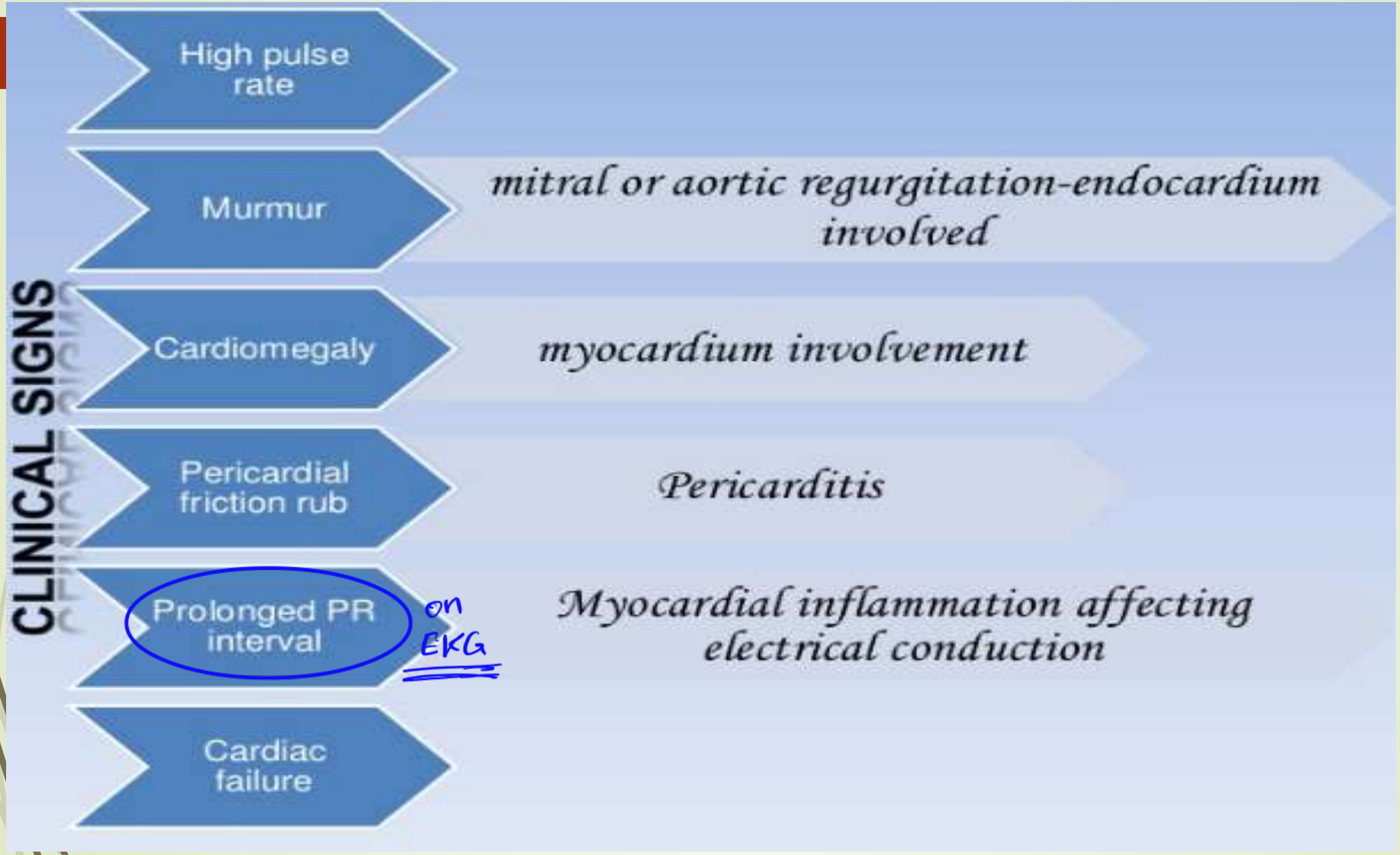
Rheumatic fever-diagnosis



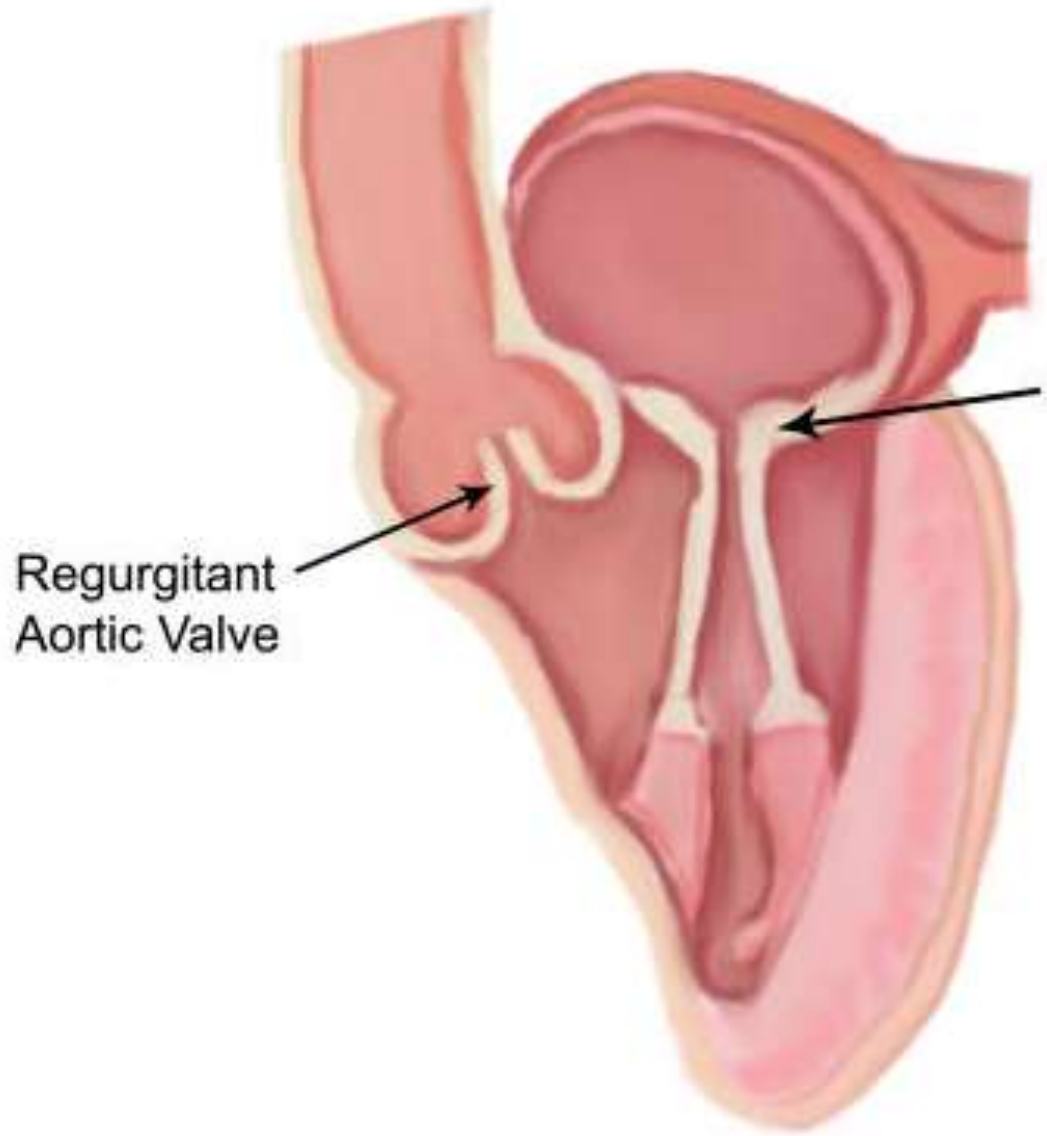
Erythematous patches with central clearing

Pale

Erythema marginatum


CLINICAL SIGNS
High pulse rate
Murmur
mitral or aortic regurgitation-endocardium involved
Cardiomegaly
myocardium involvement
Pericardial friction rub
Pericarditis
Prolonged PR interval
on EKG
Myocardial inflammation affecting electrical conduction
Cardiac failure

Rheumatic Mitral Stenosis



Mitral stenosis
↳ Most causative agent
↳ Rheumatic fever.

MITRAL REGURGE

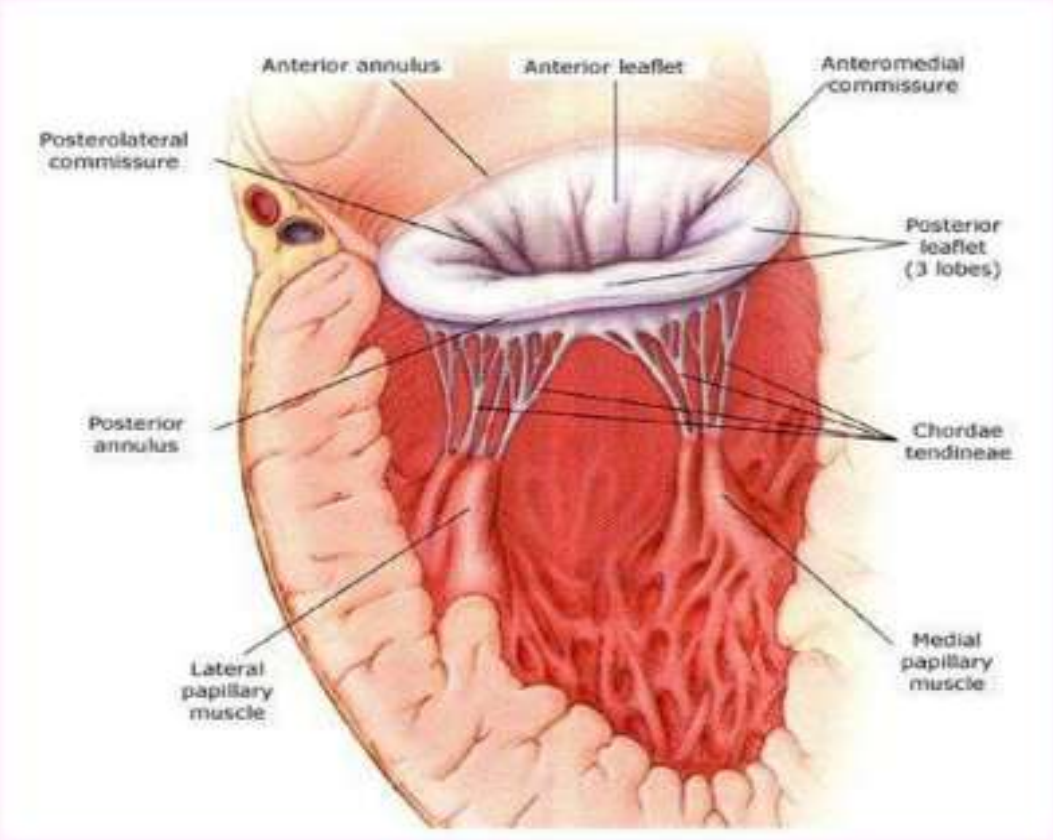
(MR, Insufficiency, Regurgitation, Incompetence)

The mitral valve consists of:

- an annulus
- 2 leaflets

(anterior & posterior)

- chordae tendinea
- 2 papillary muscles

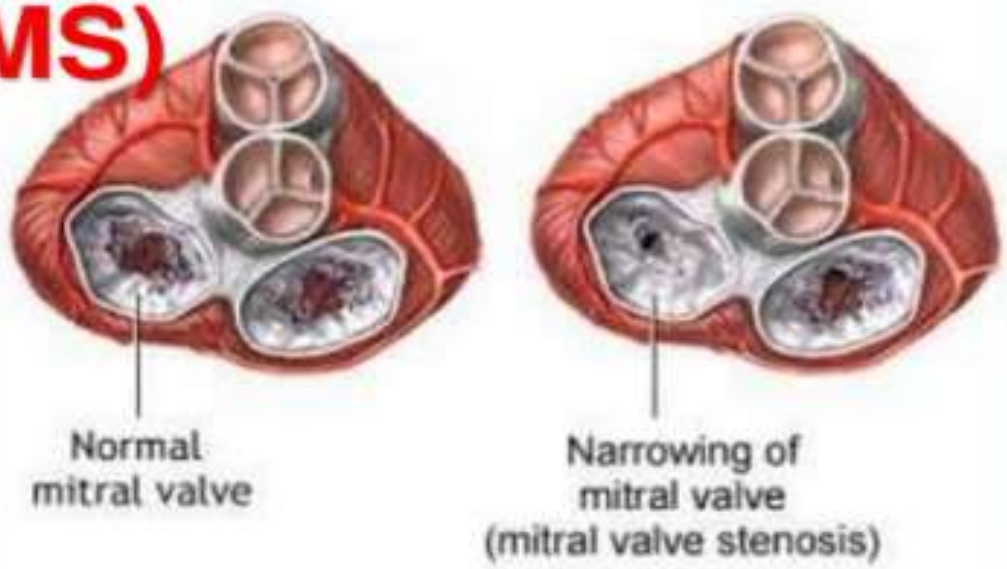


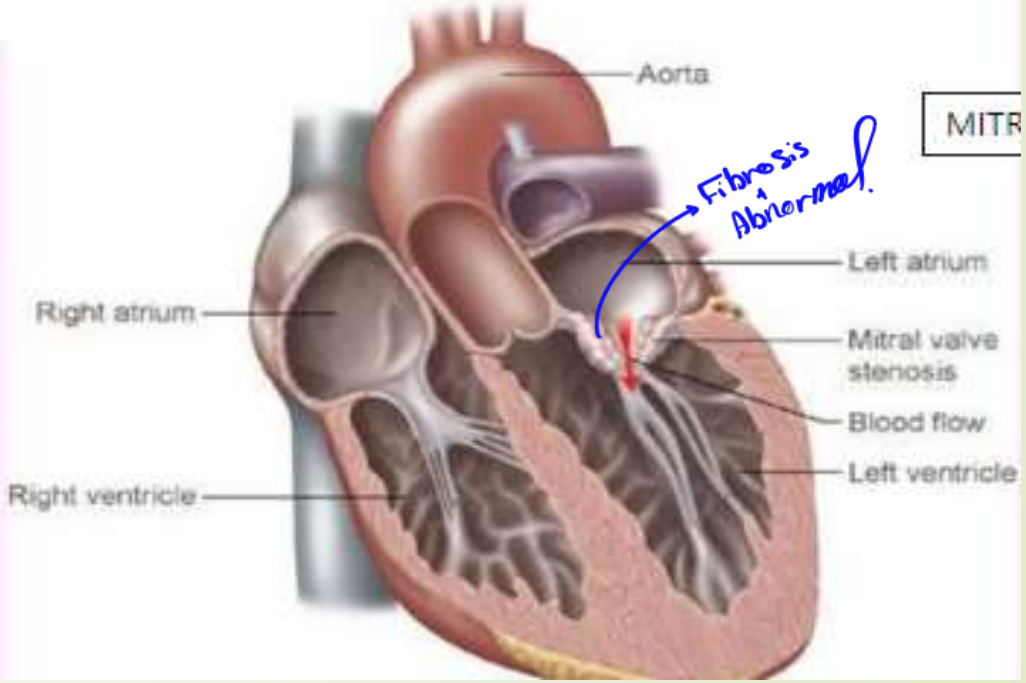
→ اللي قبل ال تشنز → Pulmonary problems ex→ Pulmonary Hypertension.

MITRAL STENOSIS (MS)

Pathophysiology

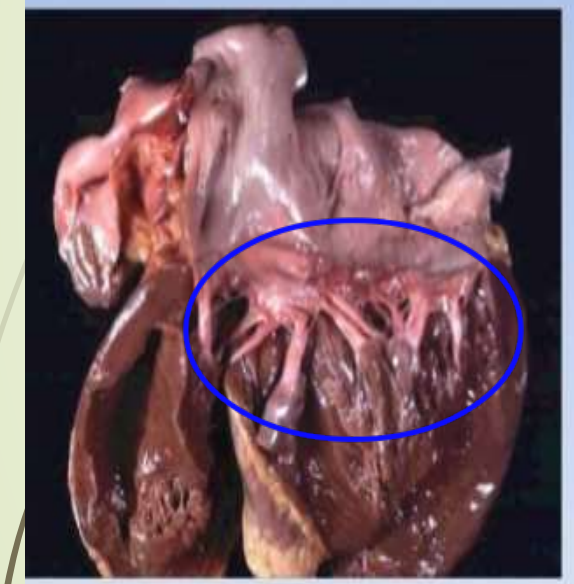
- Thickening of valve leaflets
- Fusion of commissures
- Shortening & thickening of chordae tendineae.
- Funnel shaped valve apparatus → marked obstruction to blood flow from LA to LV
- LA enlargement **(Not LV)**, pulmonary venous congestion, PH, RV & RA dilation
- Right side HF





Fibrosis → Abnormal!

Mitral → Aortic → Pulmonary
Most common
very rare.



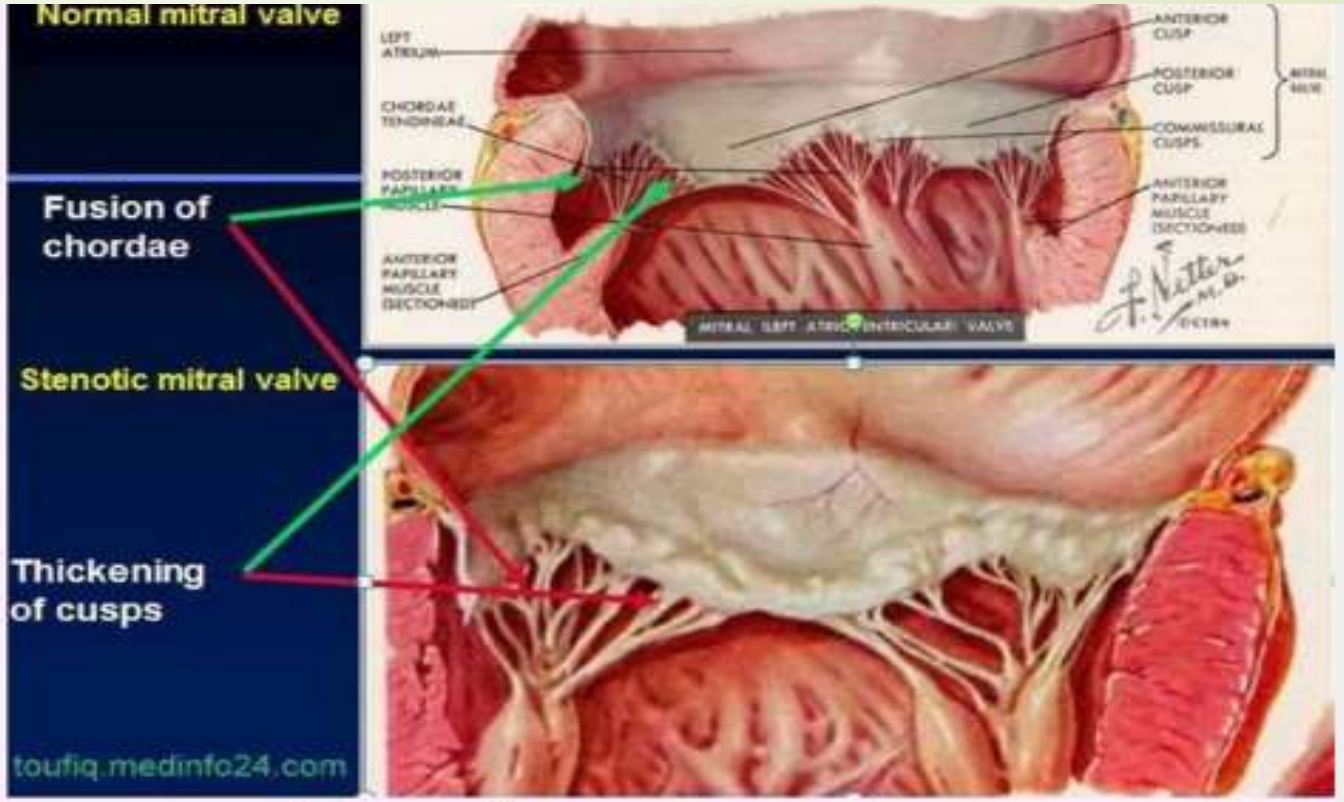
Rheumatic heart disease.

Abnormal mitral valve. Thick, fused chordae

Another view of thick and fused mitral valves in Rheumatic heart disease

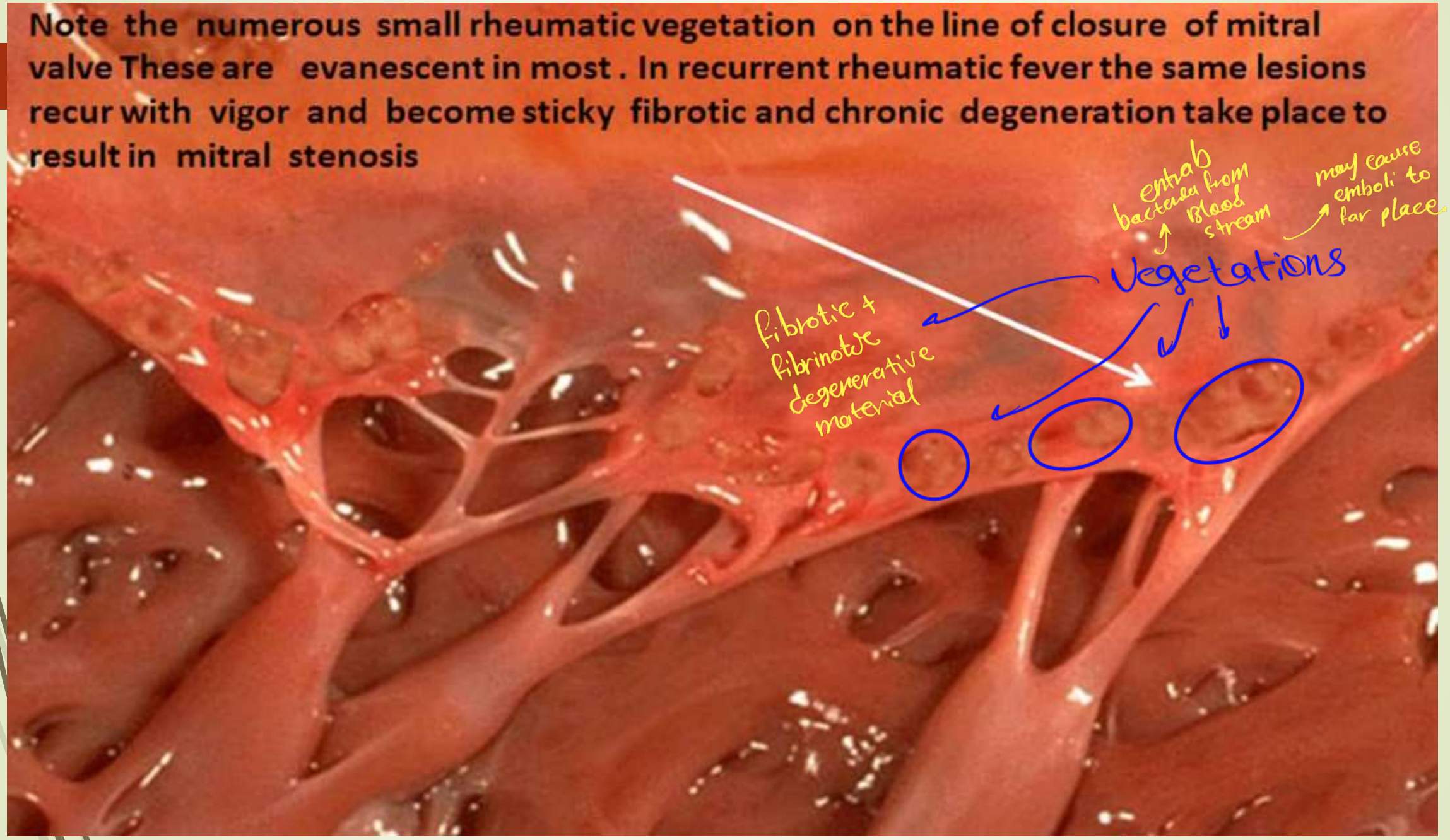
Pathophysiology

Healing of ARF results in



- Fibrosis & contracture of leaflets
- Shortening & thickening of chordea tendinea.
- Leaflets cannot coapt and separated
- LA and LV volume overload and enlargement.
- Pulmonary venous congestion, PH, RVH

Note the numerous small rheumatic vegetation on the line of closure of mitral valve These are evanescent in most . In recurrent rheumatic fever the same lesions recur with vigor and become sticky fibrotic and chronic degeneration take place to result in mitral stenosis

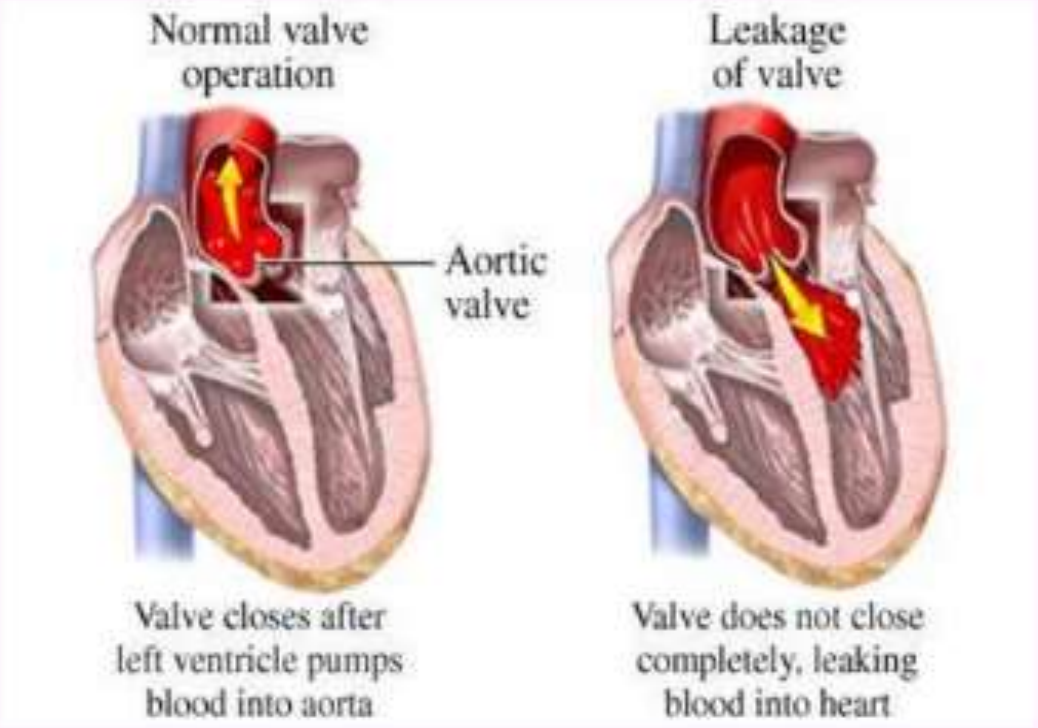


AORTIC REGURGE

(AR, Insufficiency, Regurgitation, Incompetence)

- Rheumatic AR is the result of fibrosis and contracture of the aortic valve structure

- Hemodynamically
  AR → LV volume overload

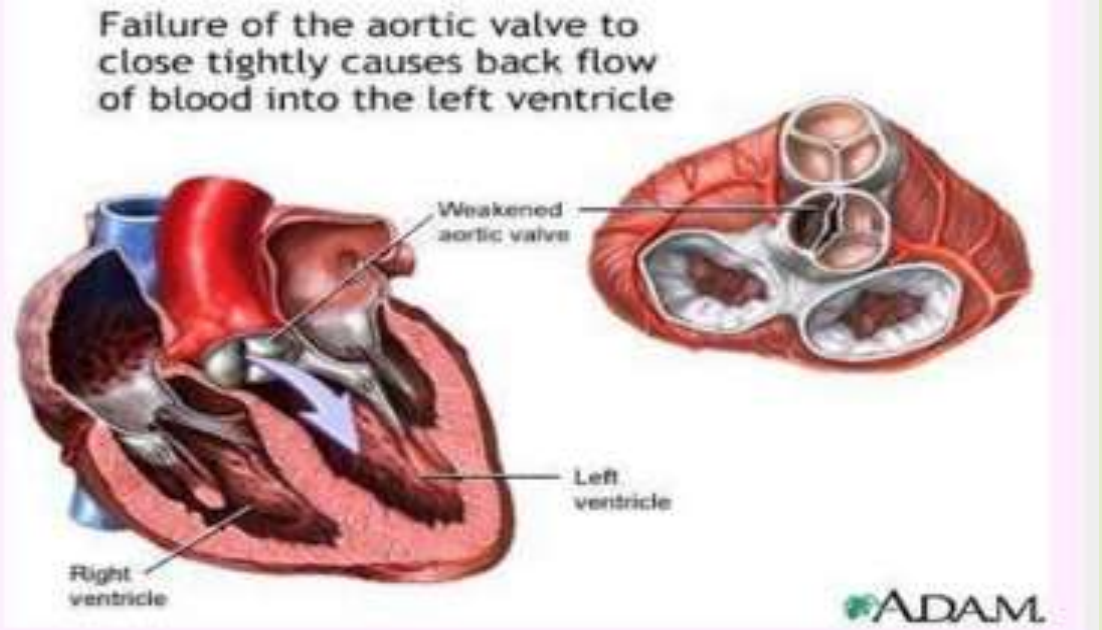


- Rheumatic AR is almost always associated with mitral valve disease.

Clinical manifestations:

Symptoms

Depend on the severity.



Clinical manifes

<u>In moderate and severe cases:</u>

- Effort intolerance, palpitation, dyspnea, orthopnea & paroxysmal nocturnal dyspnea, excessive sweating.

- Manifestations of pulmonary congestion and edema.

❖ Minor criteria includes:

Clinical finding:

1. fever (38.2°C to 38.9°C)
2. Arthralgia(joint pain without swelling)
3. Previous rheumatic fever

Laboratory finding:

1. Elevated erythrocyte sedimentation rate (ESR)
2. Elevated C-reactive protein (CRP)
3. ECG: prolonged P-R interval.

Evidence of recent group A streptococcal disease

- **Supporting evidence for antecedent Group A streptococcal infection:**

1. Scarlet fever
2. Positive throat culture(in 25% of patients)
3. Rapid streptococcal antigen test
4. Elevated or rising streptococcal antibody titer – ASO [anti-streptolysin] or Anti DNAseB, AH [anti-hyaluronic acid]

Treatment

1. Bed rest 2-6 weeks (till inflammation subsided)
2. Supportive therapy- treatment of heart failure
3. Eradication of Organism Anti-streptococcal therapy- Benzathine penicillin(long acting) 1.2 million units once (IM injection) or oral penicillin 10 days, if allergic to penicillin erythromycin 10 days (antibiotic is given even if throat culture is negative)
4. Anti-inflammatory agents-

- For Polyarthritis & mild carditis; anti-inflammatory therapy with salicylates; Aspirin 100 mg/kg per day for arthritis and in the absence of carditis- for 4-6 weeks to be tapered off
- For severe carditis with cardiomegaly: use steroid; Corticosteroids 1-2 mg/kg per day – for 4-6 weeks to be tapered off.

Prevention

- Antibiotic for long time
- presence of cardiac events? Antibiotic For LIFE!

- **Secondary prevention – prevention of recurrent attacks**

1. Benzathine penicillin G 1.2 million units IM every 4 weeks
2. Or Penicillin V 250 mg twice daily orally
3. If allergic to both – Erythromycin 250 mg twice daily orally

- **Duration of secondary rheumatic fever prophylaxis**

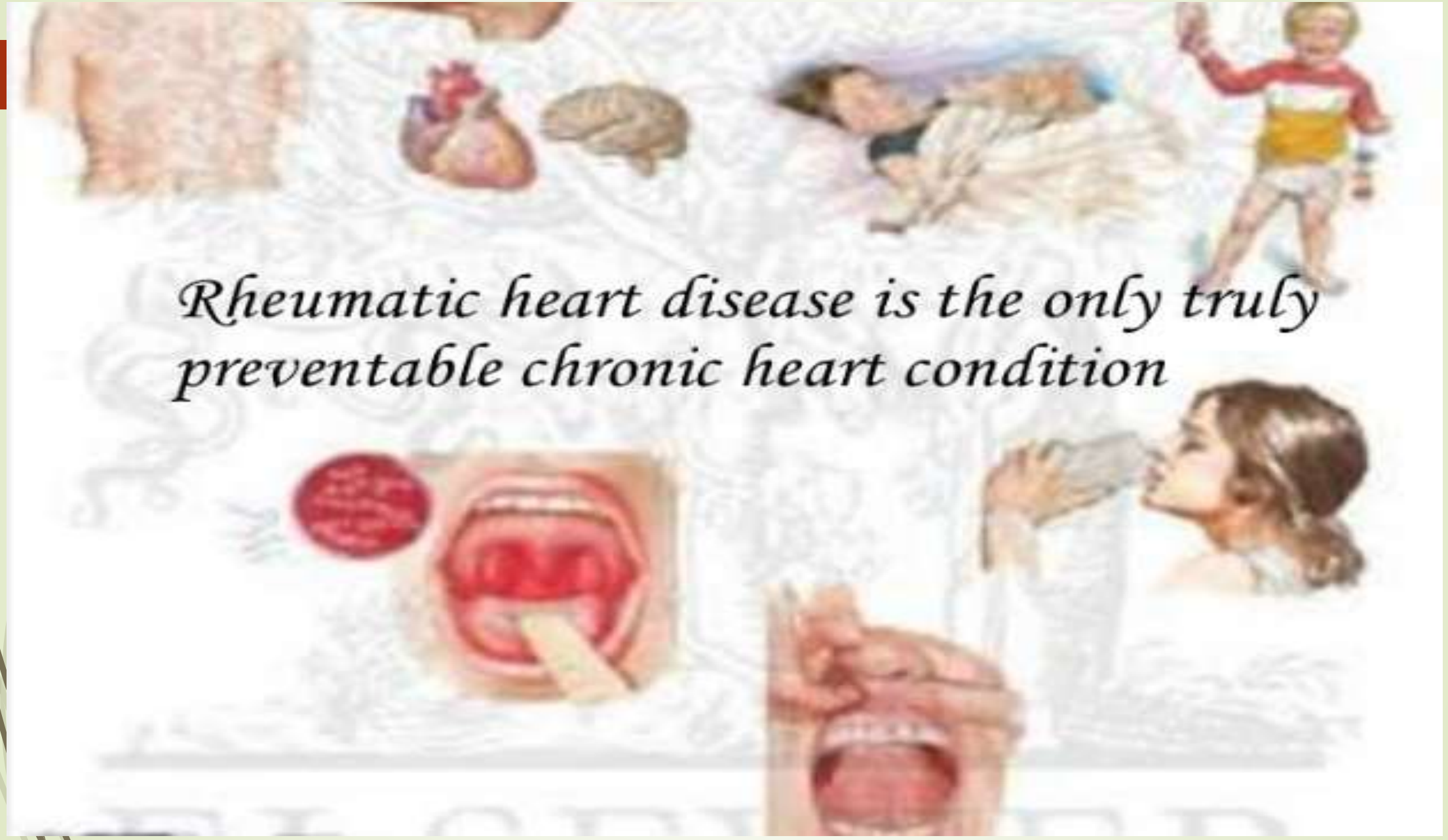
1. Rheumatic fever + carditis life long.
2. Rheumatic fever without carditis- 5 years or until 21 years whichever is longer.

❖ *Continuous prophylaxis is important since patient may have asymptomatic GAS infection.*

Prognosis

R.F. may cause permanent damage to the heart but not to the joint (only arthritis) thus its said "R.F. leaks the joints but bites the heart"

- The prognosis of acute rheumatic fever depends on the degree of permanent cardiac damage.
- Cardiac involvement may resolve completely, especially if it is the first episode and the prophylactic regimen is followed.
- The severity of cardiac involvement worsens with each recurrence of rheumatic fever.


Rheumatic heart disease is the only truly preventable chronic heart condition

ENDOCARDITIS

- **Infective endocarditis (IE)** is an inflammation of the endothelial lining of the heart muscle, valves and great vessels.

- The valves have a particularly high propensity for infection due to the lack of blood supply and limited access to immune cells.

Epidemiology

- IE is relatively rare in children.
- The highest rates are observed among patients with **prosthetic valves**, **intra-cardiac devices**, **unrepaired cyanotic congenital heart diseases, or a history of infective endocarditis.**
- About **50%** of cases of infective endocarditis develop in patients with no known history of valve disease.
- **Other** **risk factors** include chronic rheumatic heart disease, age-related degenerative valvular lesions, hemodialysis, and coexisting conditions such as diabetes, human immunodeficiency viral infection, and intravenous drug use.

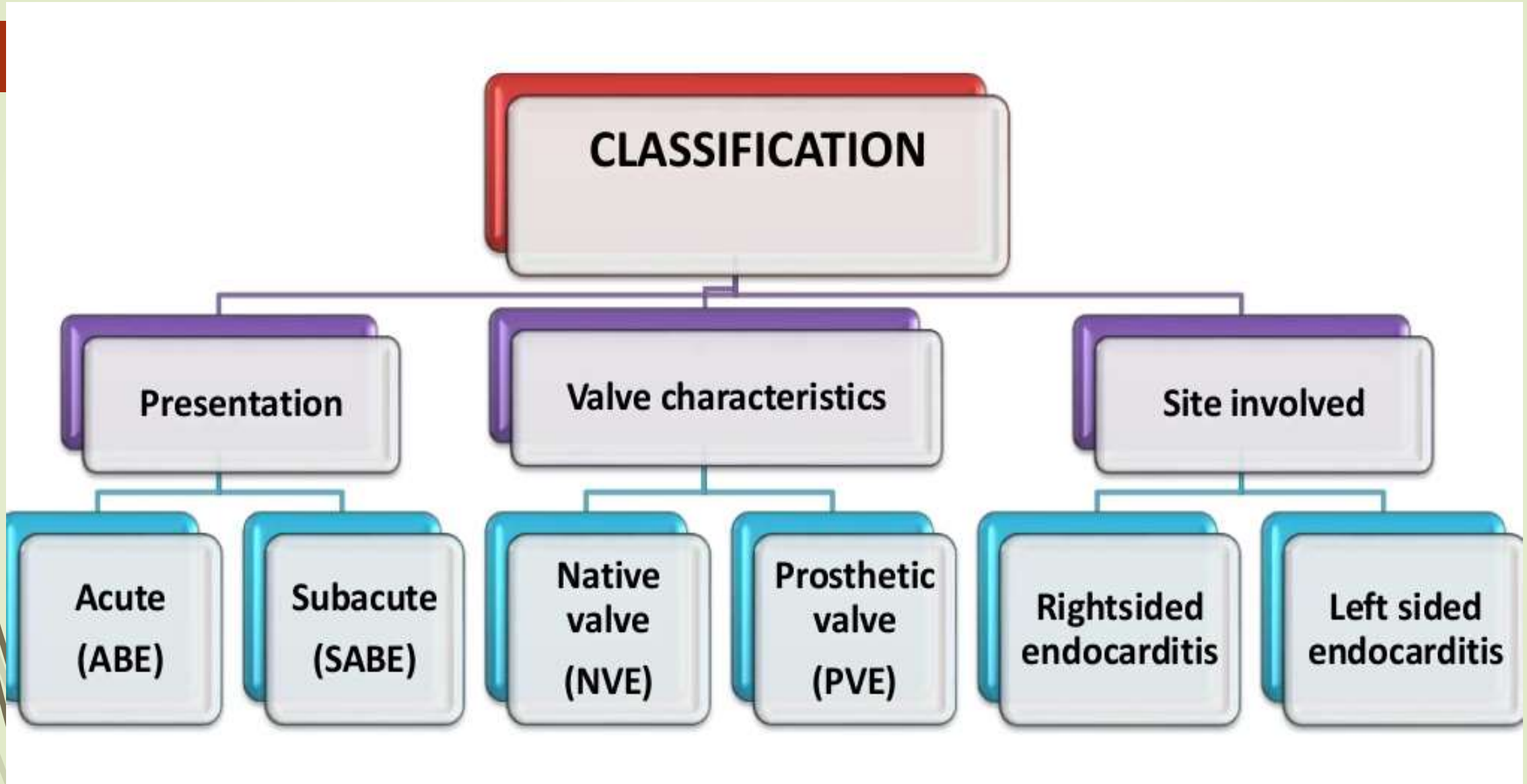
Predisposing factors

CARDIAC AND VASCULAR ABNORMALITIES

- RHD
- Myxomatous mitral valve
- Degenerative calcific valvular stenosis
- Bicuspid aortic valves
- Prosthetic valves

HOST FACTORS

- Neutropenia
- Immunodeficiency
- Malignancy
- Therapeutic immunosuppression
- Diabetes mellitus
- Alcohol
- IV drug abuse


CLASSIFICATION
Presentation
Valve characteristics
Site involved
Acute (ABE)
Subacute (SABE)
Native valve (NVE)
Prosthetic valve (PVE)
Rightsided endocarditis
Left sided endocarditis

Very Severe

Distinction between Acute and Subacute Bacterial Endocarditis

Feature	Acute	Subacute
Underlying Heart Disease	Heart may be normal	RHD,CHD, etc.
Presentation	Toxic presentation Progressive valve destruction & metastatic infection developing in days to weeks	Mild toxicity Presentation over weeks to months
Organism	S. aureus, Pneumococcus S. pyogenes, Enterococcus	viridans Streptococci, Entercoccus

Pathogenesis

⇒ bacteria would cause the defects.

RF ⇒ vegetations are small and numerous

Inf. Endo ⇒ Large

- Vegetations develop at the site of endothelial damage, which is usually located at the lower pressure side of the lesion.

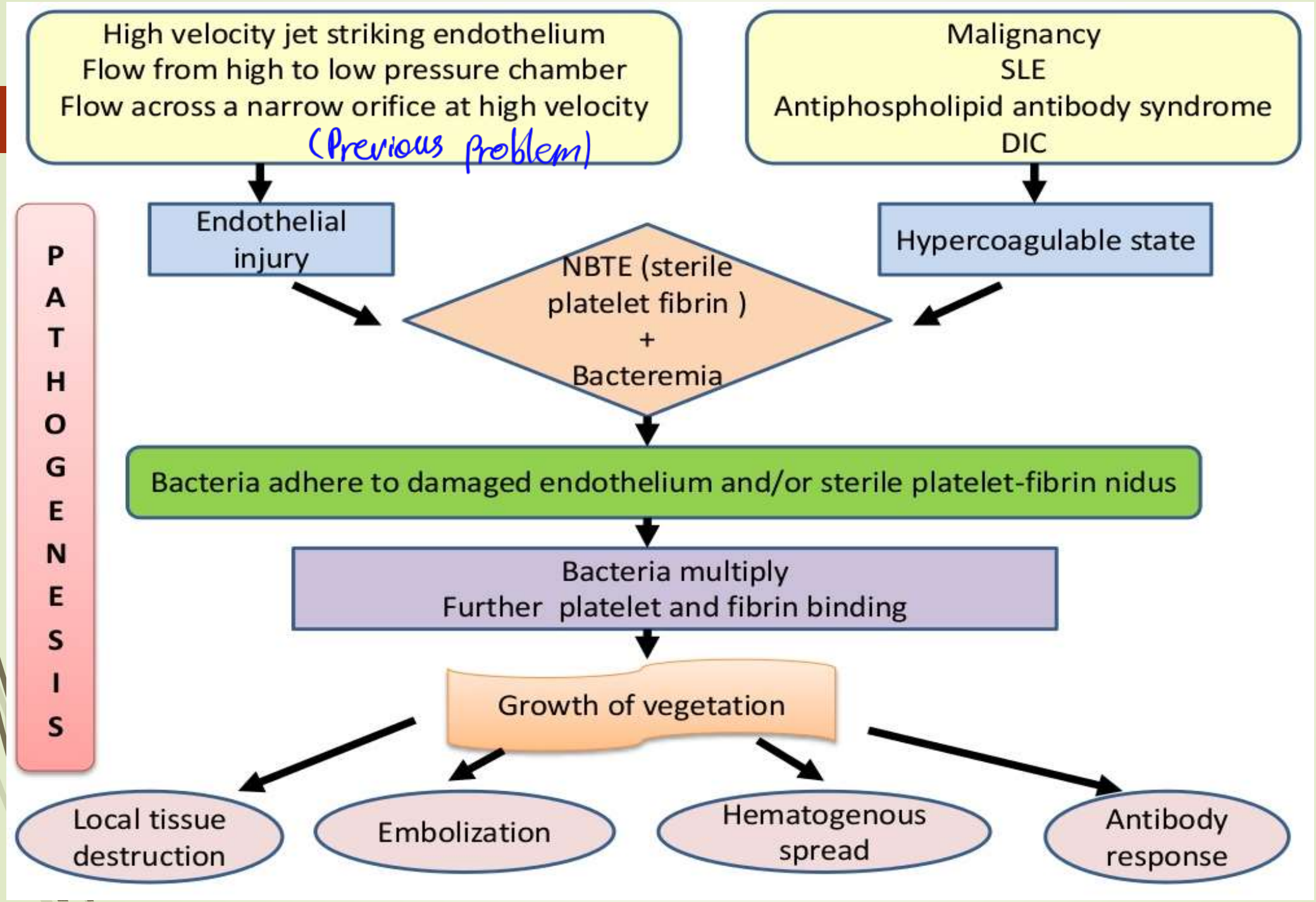
- After bacteria adhere to the damaged endothelium, platelets and fibrin are deposited over the organisms, leading to the formation of a vegetation. The organisms trapped within the vegetation are protected from phagocytic cells and other host defense mechanisms.

- Marantic endocarditis - uninfected vegetations seen in patients with malignancy and chronic diseases

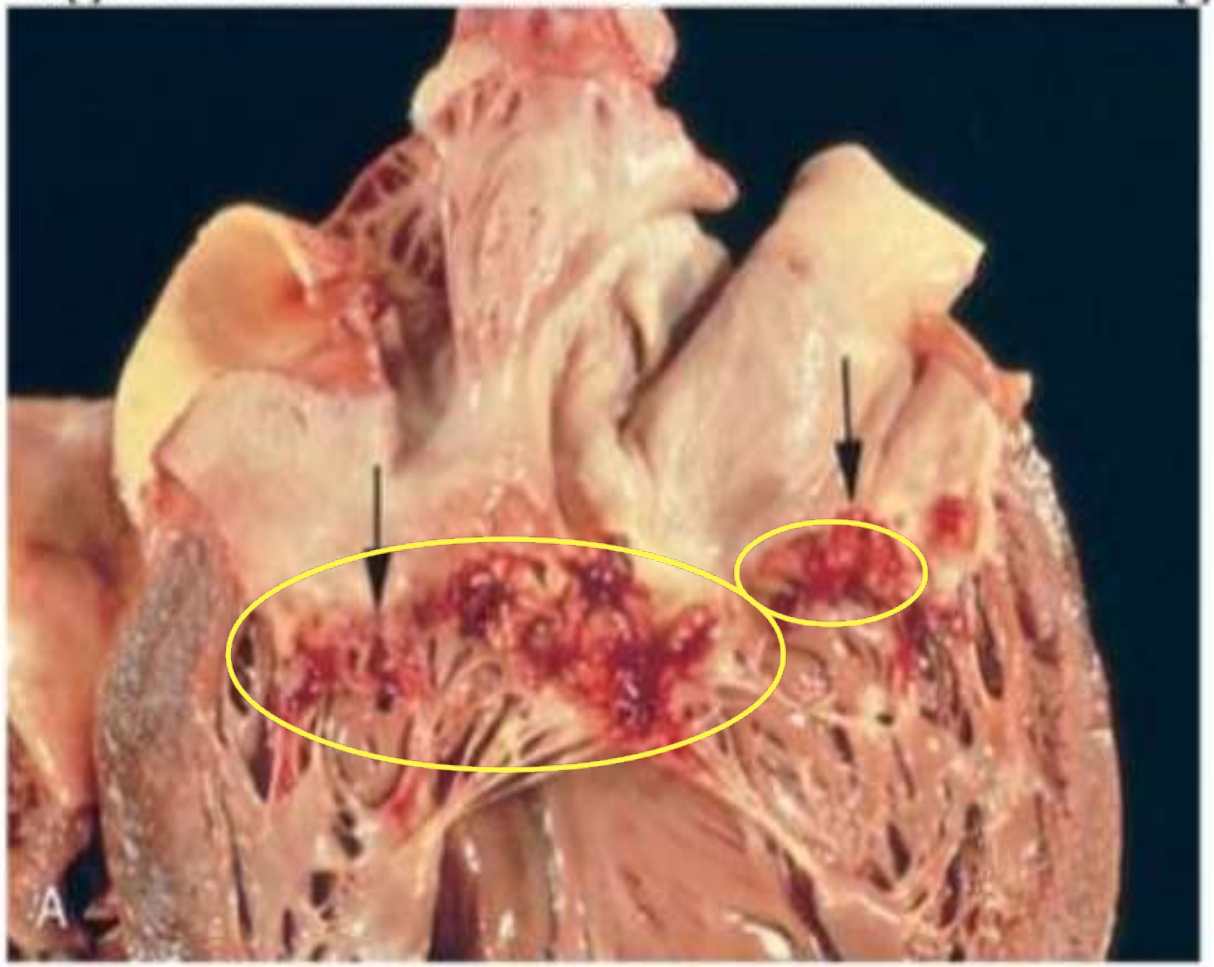
- Libman sacks endocarditis – bland vegetations in SLE

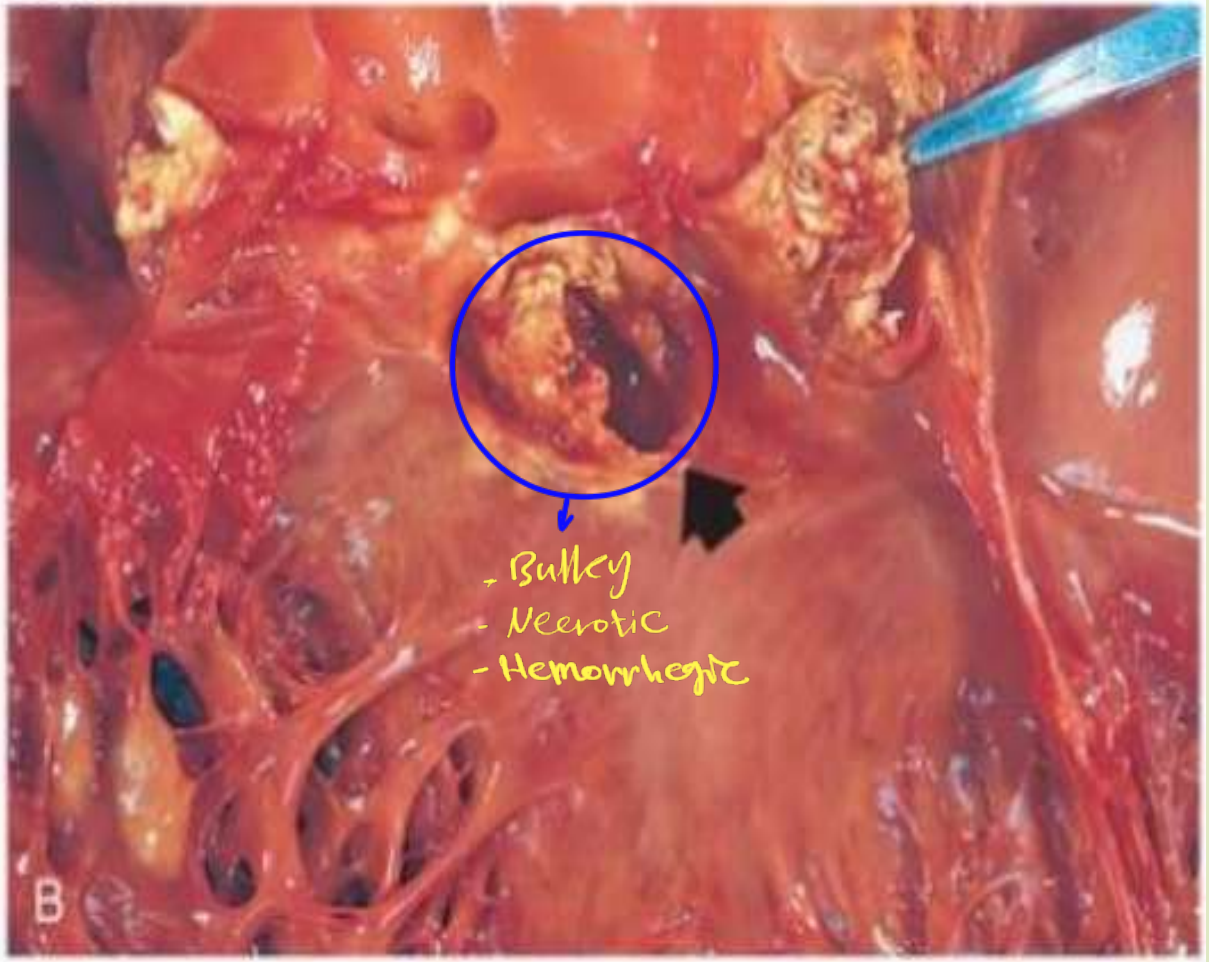
Both sides

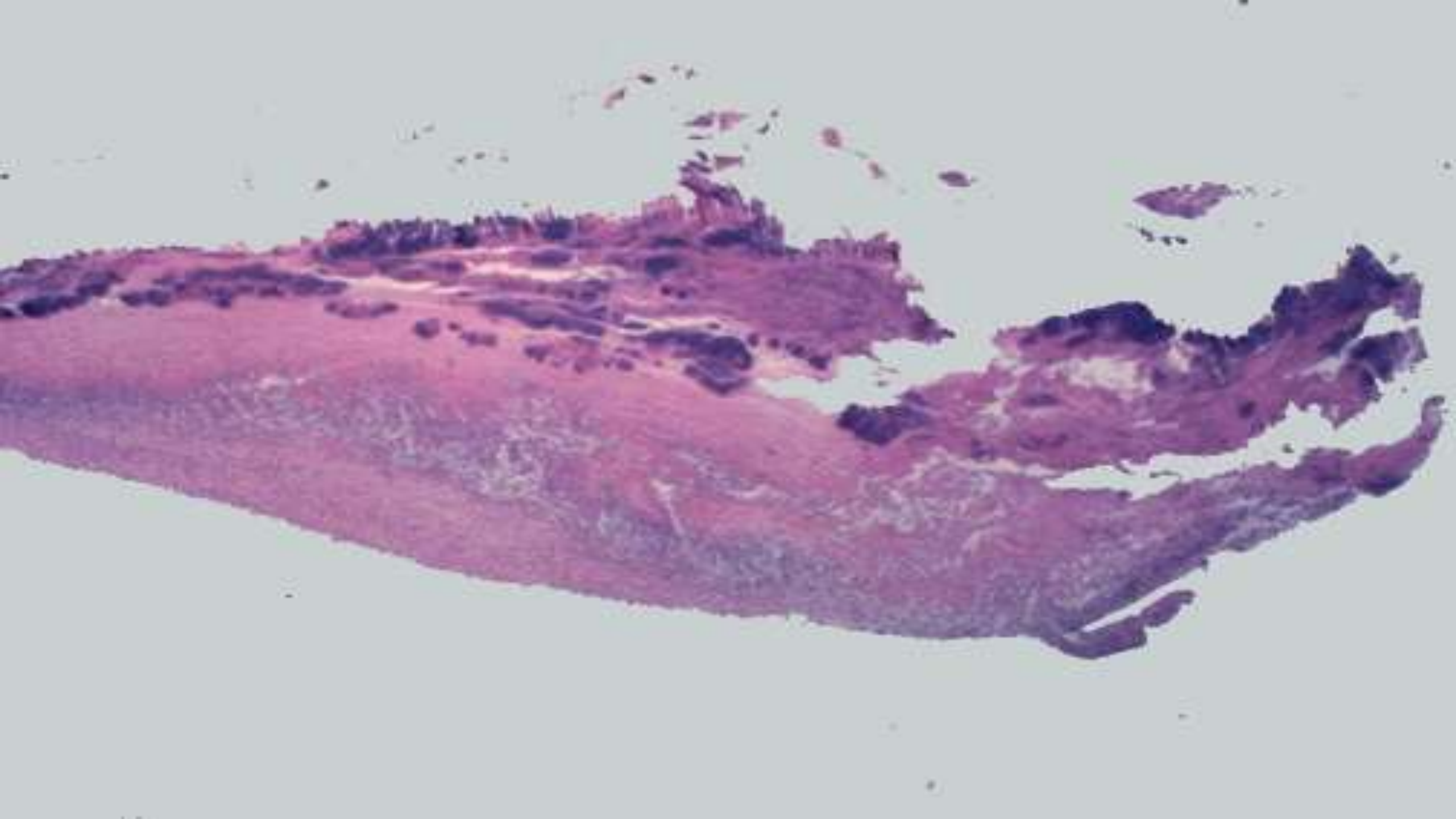
Very common in female


High velocity jet striking endothelium
Flow from high to low pressure chamber
Flow across a narrow orifice at high velocity
(Previous problem)
Malignancy
SLE
Antiphospholipid antibody syndrome
DIC
PATHOGENESIS
Endothelial injury
Hypercoagulable state
NBTE (sterile platelet fibrin) + Bacteremia
Bacteria adhere to damaged endothelium and/or sterile platelet-fibrin nidus
Bacteria multiply
Further platelet and fibrin binding
Growth of vegetation
Local tissue destruction
Embolization
Hematogenous spread
Antibody response

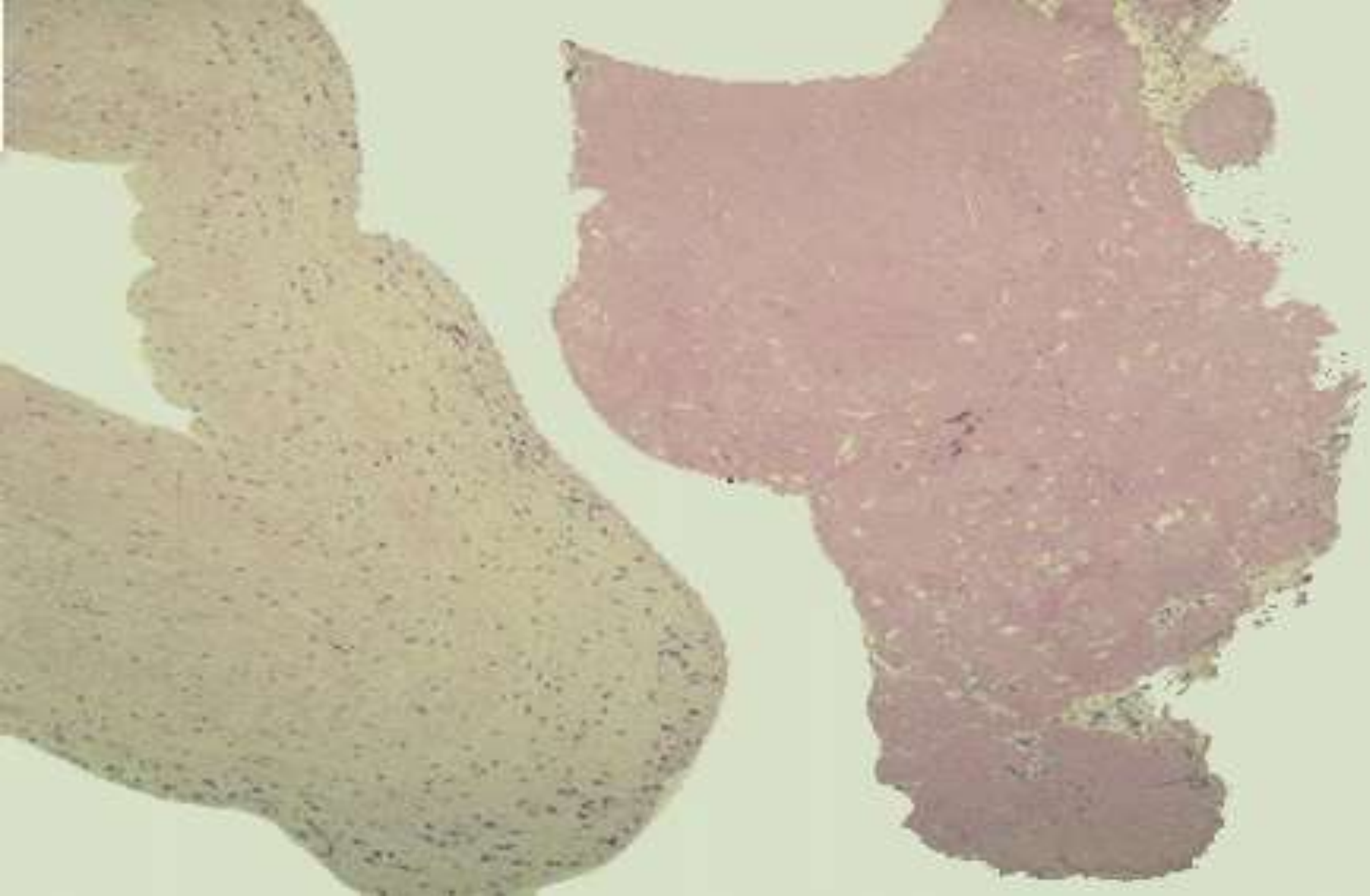
- Friable, bulky vegetation containing fibrin, inflammatory cells, and microbes
- Aortic and mitral valves involved most commonly.
- Right side valve involvement in iv drug users.








nIG
cm 1 2 3 4 5
- Just Fibrotic tissue



Microbiology

- **Viridians group streptococcus** and **S. aureus** are responsible for most cases of IE.
- Streptococcus pneumoniae, coagulase negative staphylococcus, gram negative bacilli and fungi may also cause IE.

- in **≈6%** of cases, blood cultures are negative for any organisms.

- The blood cultures may be **negative** in patients who have already received antibiotics or in patients who have IE caused by fastidious microorganisms such as brucella species, Coxiella burnetii, bacteria in the HACEK group (haemophilus species, actinomycetemcomitans, Cardiobacterium hominis, Eikenella corrodens and Kingella kingae), and Tropheryma whipplei. In these cases, serologic testing, blood polymerase chain reaction (PCR) assay and highly specialized microbiologic techniques may lead to the identification of the pathogen in up to 60% of cases.

Microbiology

- The type of pathogens depends on the following factors: 1) whether the valve is a native or a prosthetic valve, 2) patient age and 3) source of infection.
- Staphylococcal endocarditis is more common in patients with no underlying heart disease
- viridians group streptococcal infection is more common after dental procedures
- group D enterococci are seen more often after lower bowel or genitourinary manipulation.

Ex → Endoscopy or surgical procedure

CLINICAL MANIFESTATIONS

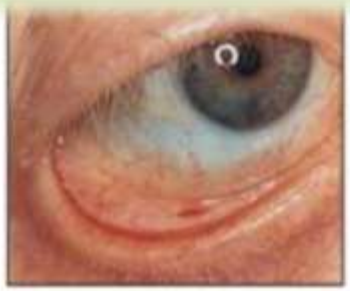
Cardiac

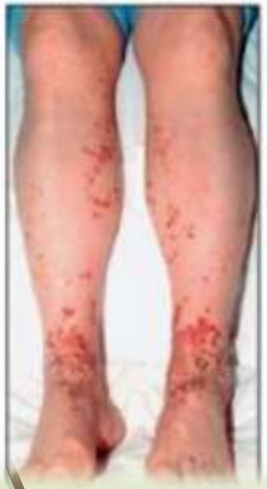
- Heart murmurs
- Congestive cardiac failure
- Perivalvular abscess
- Pericarditis
- Heart block
- Intracardiac fistulae
- Myocardial infarction

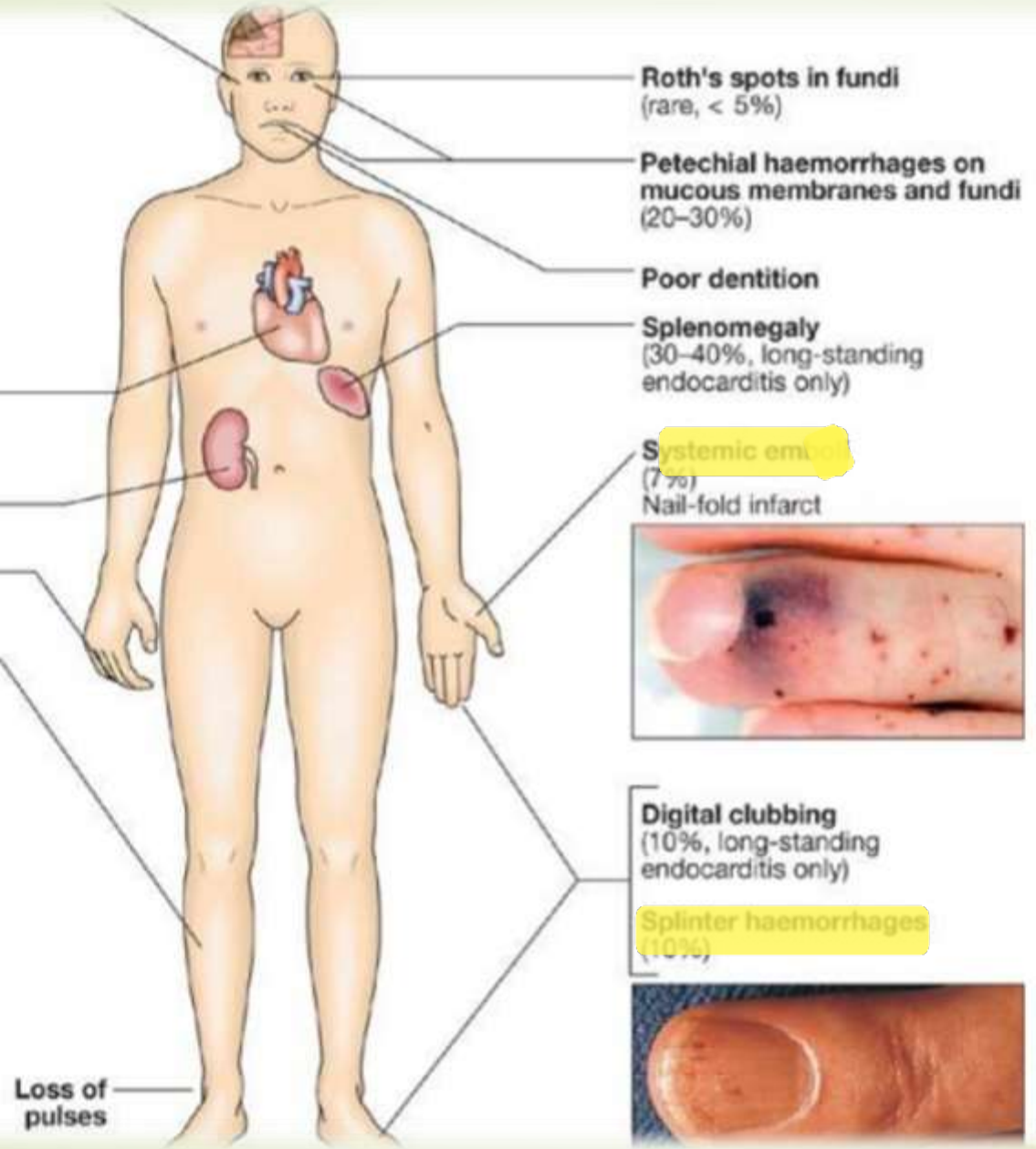
Noncardiac

- Septic embolization
  - CNS
  - Skin
  - Spleen
  - Kidneys
  - Skeletal system
- Immunological phenomenon
  - Glomerulonephritis
  - Roth's spots
  - Osler's nodes

Sub-acute Endocarditis







- Persistent fever
- Constitutional symptoms
- New signs of valve dysfunction
- Heart failure

- Embolic Stroke
- Peripheral arterial embolism

- Other features

Major Criteria

Positive blood culture

- Typical organism from two cultures
- Persistent positive blood cultures taken > 12 hours apart
- Three or more positive cultures taken over more than 1 hour.

Endocardial involvement

- Positive echocardiographic findings of vegetations
- New valvular regurgitation

Minor Criteria

- Predisposition: Predisposing valvular or cardiac abnormality
- Intravenous drug misuse
- Pyrexia ≥38°C (≥100.4°F)
- Embolic phenomenon
- Vasculitic/ immunologic phenomenon
- Blood cultures suggestive: -organism grown but not achieving major criteria
- Suggestive echocardiographic findings

Modified Duke's criteria

Definite IE

Pathological criteria

- Microorganisms demonstrated by culture or on histological examination of a vegetation, a vegetation that has embolized, or an intracardiac abscess specimen; or
- Pathological lesions; vegetation or intracardiac abscess confirmed by histological examination showing active endocarditis

Clinical criteria

- 2 major criteria; or
- 1 major criterion and 3 minor criteria; or
- 5 minor criteria

Possible IE

- 1 major criterion and 1 minor criterion; or
- 3 minor criteria

Rejected IE

- Firm alternate diagnosis; or
- Resolution of symptoms suggesting IE with antibiotic therapy for ≤4 days; or
- No pathological evidence of IE at surgery or autopsy, with antibiotic therapy for ≤4 days; or
- Does not meet criteria for possible IE, as above

Treatment

- Antibiotic therapy should be instituted immediately once a definitive diagnosis is made.
- Empirical therapy before the identifiable agent is recovered may be initiated with vancomycin plus gentamicin.
- A total of 4-6 weeks of treatment is usually recommended.
- Depending on the clinical and laboratory responses, antibiotic therapy may require modification and, in some instances, more prolonged treatment is required.
- Surgical intervention for infective endocarditis is indicated for severe aortic or mitral valve involvement with intractable heart failure.

- Other surgical indications include failure to sterilize the blood despite adequate antibiotic levels, myocardial abscess

Antimicrobial prophylaxis

- Antimicrobial prophylaxis is indicated in patients undergoing dental procedures who have:

1. A prosthetic heart valve
2. A history of IE
3. A heart transplant with abnormal heart valve function
4. Congenital heart disease.

- Antibiotics are **NOT** recommended for patients who have procedures involving the reproductive, urinary or gastrointestinal tract.