VALVULAR HEART DISEASE

- Regardless of the causative disease, Valvular heart disease results in impairment of the value function due to either stenosis (narrowing)

or insufficiency (regurgitation= incompetence)

- **Stenosis** *: failure of a valve to open completely, obstructing* ***forward*** *flow.*

- **Insufficiency** *: failure of a valve to close completely→ regurgitation (backflow) of blood.*

Clinical signs of valve disease:

1 abnormal heart sounds (***murmurs***

-Heard through the stethoscope-)

2 palpated heart sound (***thrills***)

3 signs according to the involved valve

Valve diseases

- Valvular abnormalities can be congenital or acquired.
- The most common ***congenital*** valvular lesion is ***bicuspid aortic valve***
- The **mitral valve** is the most common target of ***acquired*** valve diseases *(because the mitral valve is in contact with 2 blood flows)*

the aortic valve is the second most common target of ***acquired*** valve diseases

- **Bicuspid Aortic Valve**:

- only two functional cusps instead of the normal three
- 1% to 2% of all live births
- Might be an isolated abnormality or associated with multiple genetic mutations
- Asymptomatic in early life;
- After the age of 40, these patients are more prone to early and progressive degenerative calcification *(which ends in valvular **stenosis**)*

From Wikipedia:
a disease (usually congenital in nature) of the aortic valve, in which two of the aortic valvular leaflets **fuse** during development resulting in a valve that is **bicuspid**.

Acquired Valve Diseases

- **most important causes = post-inflammatory scarring due to (rheumatic fever) → 2/3 of all Acquired Valve Diseases.**

- **most common target is mitral valve**

Degenerative Valve Disease

- Degenerative changes include

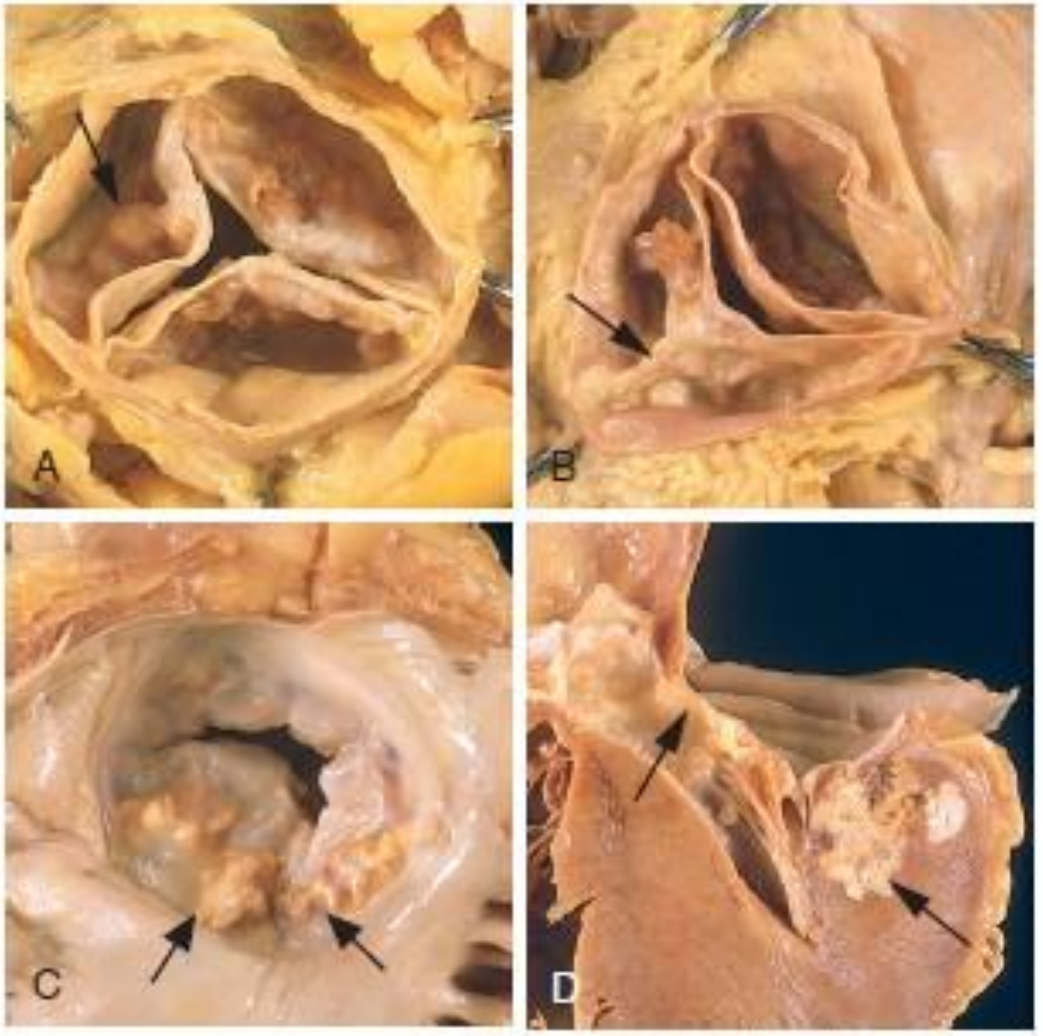
1 Calcifications (most common)

2 Alterations in the ECM (myxoid changes)

- **Calcific aortic degeneration** is the most common cause of aortic stenosis.
- typically during 70s and 80s;
- If bicuspid aortic valves are present → 40 to 50 yr

Degenerative Valve Disease

Arrows represent areas of white colored calcifications



Rheumatic Valvular Disease

- acute, **immune** mediated, inflammatory disease (*not* infection of the valves).

So we won't find any microorganisms on the valve

- pathogenesis: **hypersensitivity reaction→ antibodies** against streptococcal molecules that cross-react with host antigens 2-3 weeks after **group A β-hemolytic streptococcal** infections (pharyngitis, rarely skin).
- **There are 2 phases of the disease :**

1-acute phase →valve inflammation

2-chronic phase → scarring

In these patients, Streptococcal antigens *(not the whole organism*)can be found in the blood indicating a previous infection

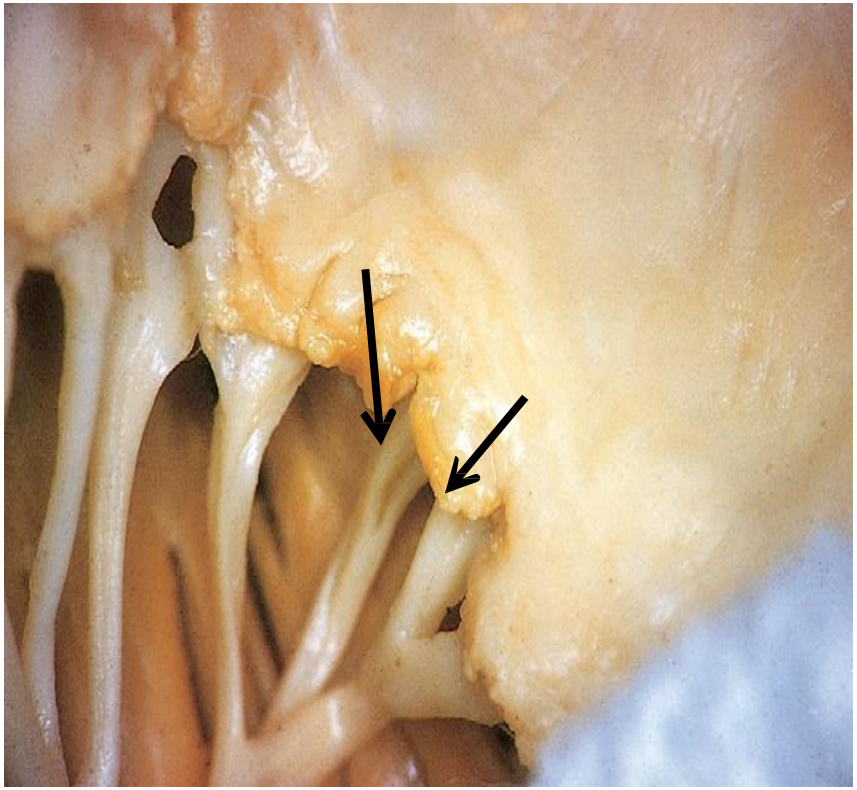
Morphology- **Acute phase** of Rheumatic Fever

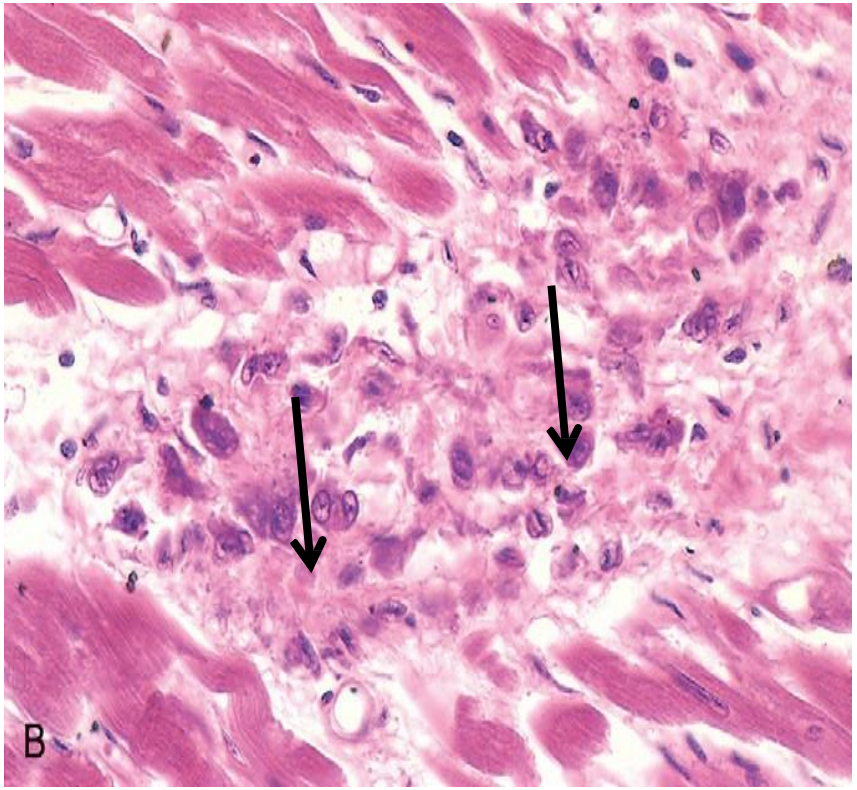
- (**Aschoff bodies)** are inflammatory lesions *Pathognomonic*(diagnostic/ characteristic) for rheumatic fever

- Aschoff bodies May be found in any of the three layers of the **heart- pericardium**, **myocardium**, or **endocardium** (including **valves**), or allover **pancarditis**.

- Inflammation + fibrin deposition along the lines of closure → valve regurgitation*(in the **acute phase**)*

Acute rheumatic heart disease





Aschoff bodies =

collections of lymphocytes(Tcells), plasma cells, and <u>macrophages called Anitschkow cells</u> (or caterpillar cells**) (arrows)**

Acute rheumatic fever- clinical picture

- most often in children 80%
- symptoms 2- 3 weeks after streptococcal infection:
- fever; polyarthritis, carditis
- Streptococci cultures are negative (no microorganisms in lesions)
- serum streptococcal antigens (e.g., **streptolysin O** or **DNAase**) are elevated.

Chronic phase of rheumatic heart disease

- This phase is characterized by tissue repair following the inflammation (organization of inflammation and **scarring)**.

- most important consequence of chronic phase is **valvular stenosis**
- **mitral** valve is most commonly affected, followed by aortic, tricuspid; **pulmonic** valve almost always **escapes** injury*(because its not affected by the turbulence blood flow and the pressure is low on its sides)*.

- Complications of mitral stenosis:

- dilated left atrium - atrial fibrillation
- mural thrombi.

- Complications of aortic valve disease:

- left-sided heart failure
- right ventricular hypertrophy and failure.

The diagnosis of acute rheumatic fever

- = (serologic evidence of previous streptococcal infection*(streptococcal antigens)* + two or more of the so-called *Jones criteria).*
- ***Jones criteria:***

The criteria is made by the presence of the disease in its **target** tissues that can cross-react with the antibodies.

(1) Carditis

(2) migratory polyarthritis(in the joints)

(3) subcutaneous nodules

(4) erythema marginatum skin rashes

(5) Sydenham chorea (in the CNS, and is an involuntary movements in the skeletal muscles)

chronic rheumatic carditis- long-term prognosis

- **years or decades** after initial episode of RF.
- depend on cardiac valve(s) involved:

  - murmurs - hypertrophy -CHF - arrhythmias (esp. A. fib.) - mural thrombi.

- **Management**: Surgical repair or replacement of diseased valves

Infective endocarditis (IE)

- **Microbial** invasion and destruction of heart valves
- Causes friable ***vegetations*** (necrotic debris+ thrombus+ organisms).
- majority of cases→ bacteria.

Infective endocarditis (IE)

classified into ***acute*** and ***subacute***, based on pace and severity of clinical course, the distinctions are attributable to:

1 the virulence of responsible microbe

2 whether underlying cardiac disease is present *(before the disease occurred)*.

- How?
- If: high virulance + "previously" normal valve= acute
- If: low virulence + "previously" abnormal valve= subacute

Acute versus subacute

- ***Acute endocarditis***
- a highly **virulent** organism (***S. aureus -most common***) attack a previously **normal** valve, the onset of symptoms and the progression are very rapid.
- high **morbidity** and **mortality** even with therapy

- ***Subacute endocarditis :*** organisms of **low** virulence (***Strept.viridans- most com****.) on* a previously **abnormal** valve (e.g. scarred or deformed), the onset of symptoms is **Insidious** and the progression is slow
- **Insidious** disease; most patients **recover** after appropriate antibiotic therapy

-Strept. Viridans is a part of the normal flora ,a common mechanism of its entry is dental producers

MORPHOLOGY

•**Friable***(easily fragmented)***, bulky/large vegetations** on heart valves

- aortic and mitral valves most common
- tricuspid is a frequent target in I.V. drug abusers*(because it's the first valve the venous blood encounters)*.

•Complications:

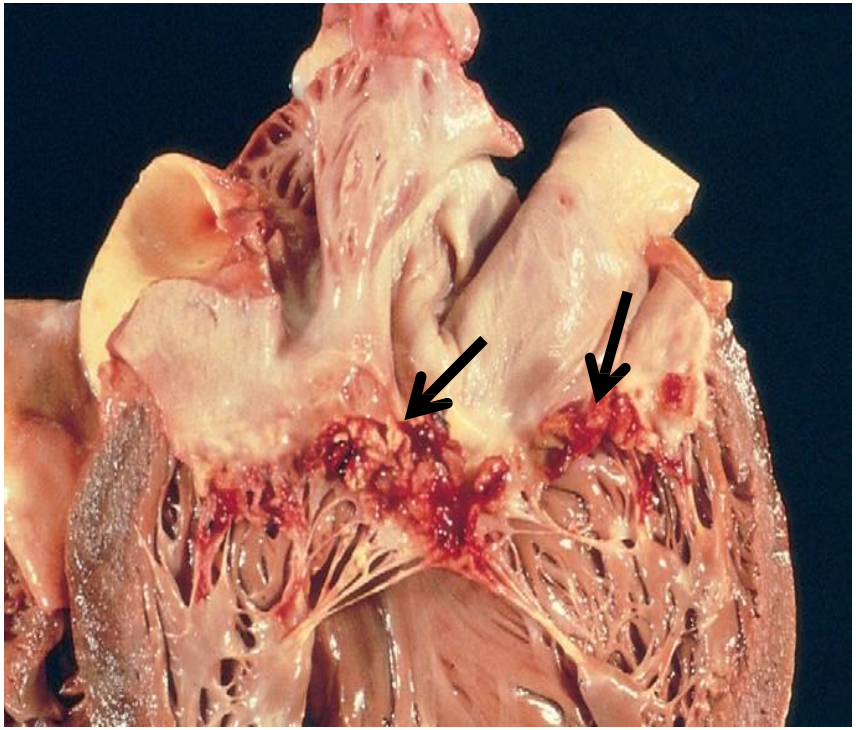
1- **emboli**

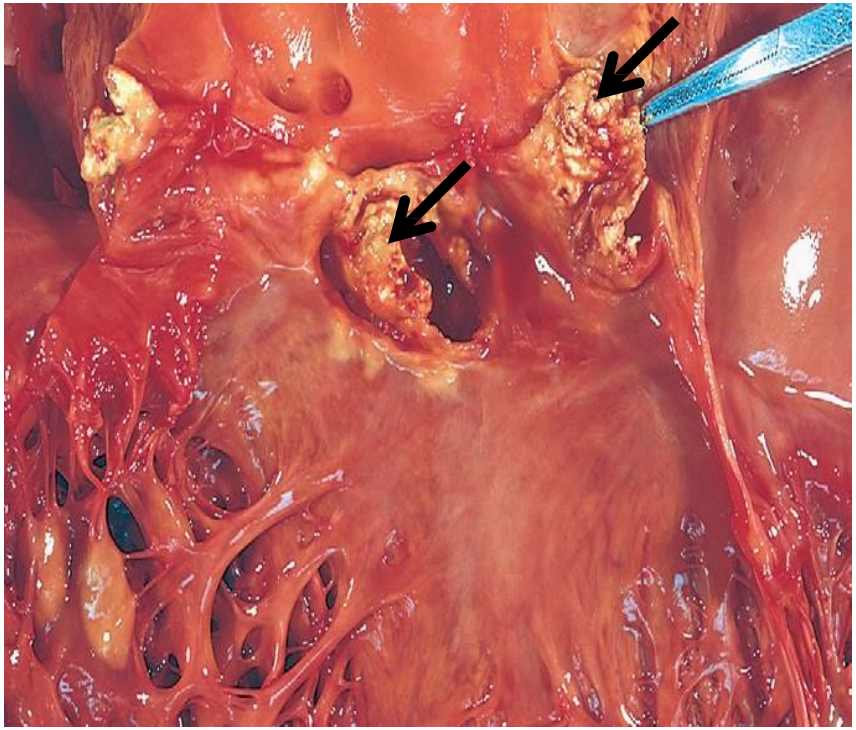
2 **abscesses**

3 **septic infarcts**

4 **mycotic aneurysms.**

Infective endocarditis (IE)





friable, bulky vegetations (arrows) (also contain thrombus)

Clinical Features -**Acute** IE

- fever (100%), chills, weakness, and murmurs
- **microemboli** in different target tissues …

Clinical Features-subacute IE

- nonspecific fatigue, weight loss, and murmurs

- **Diagnosis = (positive <u>blood cultures</u>** *(also we can know the causative microorganism)* **+ <u>echocardiographic</u> (echo) findings)**

Prognosis

- If untreated, generally fatal.
- **Treatment**:

1 appropriate long-term (6 weeks or more) IV antibiotic therapy *(the specific antibiotic given depends on the microorganism in the tissue)*

2 valve replacement *(the damage is permanent)*

- **Depends on type of organism and treatment**