results in stenosis or insufficiency (regurgitation or incompetence), or both.

- **Stenosis**: failure of a valve to open completely, obstructing forward flow.
  - almost always due to a primary cuspal abnormality and is virtually always a chronic process (e.g., calcification or valve scarring).
Insufficiency: failure of a valve to close completely → regurgitation (backflow) of blood.

It can result from either:

- intrinsic disease of valve cusps (e.g., endocarditis)
- disruption of supporting structures (e.g., the aorta, mitral annulus, tendinous cords, papillary muscles, or ventricular free wall) without primary cuspal injury.

- It can be either: Abrupt → e.g. due to chordal rupture
- Insidious → e.g. due to leaflet scarring and retraction
The mitral valve is the most common target of acquired valve diseases.

Clinical signs of valve disease:
- abnormal heart sounds called *murmurs*
- palpated heart sound (*thrills*) ➔ severe lesions
- clinical signs according to the involved valve
Valvular abnormalities can be congenital or acquired.

- The most common **congenital** valvular lesion is **bicuspid aortic valve**
  - only two functional cusps instead of the normal three
  - 1% to 2% of all live births
  - associated with a number of genetic mutations
  - Asymptomatic in early life; however, the valve is more prone to early and progressive degenerative calcification

- The most important causes of acquired valvular diseases are postinflammatory scarring of the mitral valves and aortic valve due to **rheumatic fever** → 2/3 of all valve disease.
Rheumatic Valvular Disease

- is an acute, immunologically mediated, multisystem inflammatory disease that occurs after group A β-hemolytic streptococcal infections (usually pharyngitis, rarely skin infection).
- Rheumatic heart disease is the cardiac manifestation of rheumatic fever.
- *valvular inflammation and scarring* produces the most important clinical features
- PATHOGENESIS: a hypersensitivity reaction due to antibodies directed against group A streptococcal molecules that also are cross-reactive with host antigens
MORPHOLOGY- acute rheumatic fever

- characterized by discrete inflammatory foci within a variety of tissues.

Myocardial inflammatory lesions = Aschoff bodies are *pathognomonic* for rheumatic fever (( collections of lymphocytes (T cells), plasma cells, and activated macrophages called *Anitschkow cells* with rare zones of fibrinoid necrosis))

*Anitschkow cells*: macrophages with abundant cytoplasm and central nuclei with chromatin condensed to form a slender, wavy ribbon (so-called caterpillar cells).
MORPHOLOGY- acute rheumatic fever

- acute rheumatic fever $\rightarrow$ Aschoff bodies found in any of the three layers of the heart-pericardium, myocardium, or endocardium (including valves), or allover pancarditis.

- Valve involvement $\rightarrow$ fibrin deposition along the lines of closure $\rightarrow$ regurgitation
**Chronic rheumatic heart disease**

- characterized by organization of inflammation and scarring.
- Aschoff bodies are **rarely** seen in chronic RHD since they are replaced by fibrous scar

- mitral valves is most commonly affected → fishmouth" or "buttonhole" stenoses

- Microscopic: neovascularization and diffuse fibrosis that obliterates the normal leaflet architecture
The most important functional consequence of chronic RHD is **valvular stenosis** (most common) and **regurgitation** (less common)
- **mitral** valve alone: 70% of cases (most common)
- combined mitral and aortic disease: 25%
- tricuspid valve: less frequent, less severe
- **pulmonic** valve: almost always escapes injury.

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.
Acute rheumatic fever- clinical picture

- occurs most often in children 80%
- (20% → adults; arthritis is the predominant feature)
- principal clinical manifestation is carditis.
- symptoms begin 2-3 weeks after streptococcal infection: fever; migratory polyarthritis (one large joint after another followed by spontaneous resolution with no residual disability).
- cultures are (-) for streptococci at the time of symptom onset
- serum titers to streptococcal antigens (e.g., streptolysin O or DNAase) are elevated.
- clinical signs of carditis → pericardial friction rubs; arrhythmias; myocarditis; cardiac dilation; functional mitral insufficiency and CHF.
- less than 1% of patients die of acute rheumatic fever.
The diagnosis of acute rheumatic fever

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

**Jones criteria:**

1. Carditis
2. Migratory polyarthritis of large joints
3. Subcutaneous nodules
4. Erythema marginatum skin rashes
5. Sydenham chorea, a neurologic disorder characterized by involuntary purposeless, rapid movements.

Minor criteria such as fever, arthralgias, ECG changes, or elevated acute phase reactants also can help support the diagnosis.
chronic rheumatic carditis- long-term prognosis

- manifest itself clinically **years or decades** after initial episode of rheumatic fever.
- signs and symptoms depend on which cardiac valve(s) are involved: - cardiac murmurs - cardiac hypertrophy - CHF - arrhythmias (esp. A. fib.) - thromboembolism (mural thrombi).
- scarred and deformed valves are more susceptible to infective endocarditis (IE).
- prognosis is highly variable.
- Management: Surgical repair or replacement of diseased valves.
Infective endocarditis (IE)

- Microbial invasion of heart valves or endocardium, with destruction of underlying cardiac tissues → cause bulky, friable vegetations (necrotic debris+ thrombus+ organisms).
- Common sites of infection: valves, endocardium, aorta, aneurysms; prosthetic devices.
- The vast majority of cases → caused by bacteria.
- Other cases: fungi, rickettsiae (agents of Q fever), and chlamydial species.
- Classified into acute and subacute, based on pace and severity of clinical course.
- How? 1- the virulence of the responsible microbe
  2- whether underlying cardiac disease is present.
Acute versus subacute

- **Acute endocarditis**
  - a highly **virulent** organism (\(S. \text{ aureus}\) is most common)
  - attack a previously **normal** valve
  - substantial **morbidity** and **mortality** even with appropriate antibiotic therapy and/or surgery.

- **Subacute endocarditis**
  - organisms of **low** virulence (60% ➔ *Streptococcus viridans*)
  - a previously **abnormal** valve (e.g. scarred or deformed)
  - **Insidious** disease; follows a protracted course of weeks to months; most patients **recover** after appropriate antibiotic therapy
MORPHOLOGY

- both acute and subacute disease → friable, bulky, and potentially destructive vegetations (fibrin, inflammatory cells, and microorganisms) on heart valves
- aortic and mitral valves are the most common sites
- tricuspid valve is a frequent target in I.V. drug abuse.
- Complications:
  1. emboli (friable nature of the vegetations).
  2. abscesses at the sites where emboli lodge
  3. septic infarcts
  4. mycotic aneurysms.
Clinical Features

- **Acute** → a stormy onset including rapidly developing fever, chills, weakness, and lassitude; murmurs
- Fever is the most consistent sign of infective endocarditis (almost 100%)
- **Subacute**: nonspecific fatigue, weight loss, and a flulike syndrome; splenomegaly; murmurs

- *microemboli* in different target tissues:
  - Petechia (skin)
  - nail bed (*splinter* hemorrhages)
  - retinal hemorrhages (*Roth spots*)
  - painless palm or sole erythematous lesions (*Janeway lesions*)
  - painful fingertip nodules (*Osler nodes*)

- **Diagnosis = (positive blood cultures + echocardiographic (echo) findings)**
Prognosis

- depends on the infecting organism and on whether or not complications develop.
- untreated, infective endocarditis generally is fatal.
- Treatment: appropriate long-term (6 weeks or more) antibiotic therapy and/or valve replacement
- Mortality:
  - low-virulence organisms → cure rate is 98%
  - enterococci and *Staph. aureus* → cure rate 60% to 90%
  - aerobic gram-negative bacilli or fungi → mortality 50%.
- IE of prosthetic valves → cure rate is worse than genuine valves