

Infective Endocarditis

Definition

- **Infectious Endocarditis (IE)**: an infection of the heart's endocardial surface
- Classified into **four** groups:
 - Native Valve IE
 - Prosthetic Valve IE
 - Intravenous drug abuse (IVDA) IE
 - Nosocomial IE

Further Classification

■ Acute

- Affects normal heart valves
- Rapidly destructive
- Metastatic foci
- Commonly Staph.
- If not treated, usually fatal within 6 weeks

■ Subacute

- Often affects damaged heart valves
- Indolent nature
- If not treated, usually fatal by one year

Pathophysiology

1. **Turbulent blood flow** disrupts the endocardium making it “sticky”
2. **Bacteremia** delivers the organisms to the endocardial surface
3. **Adherence** of the organisms to the endocardial surface
4. **Eventual invasion** of the valvular leaflets

Epidemiology

- Incidence difficult to ascertain and varies according to location
- Much more common in males than in females
- May occur in persons of any age and increasingly common in elderly
- Mortality ranges from 20-30%

Risk Factors

- Intravenous drug abuse
- Artificial heart valves and pacemakers
- Acquired heart defects
 - Calcific aortic stenosis
 - Mitral valve prolapse with regurgitation
- Congenital heart defects
- Intravascular catheters

Infecting Organisms

- Common bacteria
 - S. aureus
 - Streptococci
 - Enterococci
- Not so common bacteria
 - Fungi
 - Pseudomonas
 - HACEK

Symptoms

■ Acute

- High grade fever and chills
- SOB
- Arthralgias/ myalgias
- Abdominal pain
- Pleuritic chest pain
- Back pain

■ Subacute

- Low grade fever
- Anorexia
- Weight loss
- Fatigue
- Arthralgias/ myalgias
- Abdominal pain
- N/V

The onset of symptoms is usually ~2 weeks or less from the initiating bacteremia

Signs

- Fever
- Heart murmur
- Nonspecific signs – petechiae, subungal or “splinter” hemorrhages, clubbing, splenomegaly, neurologic changes
- More specific signs - Osler’s Nodes, Janeway lesions, and Roth Spots

Petechiae

1. Nonspecific
2. Often located on extremities or mucous membranes



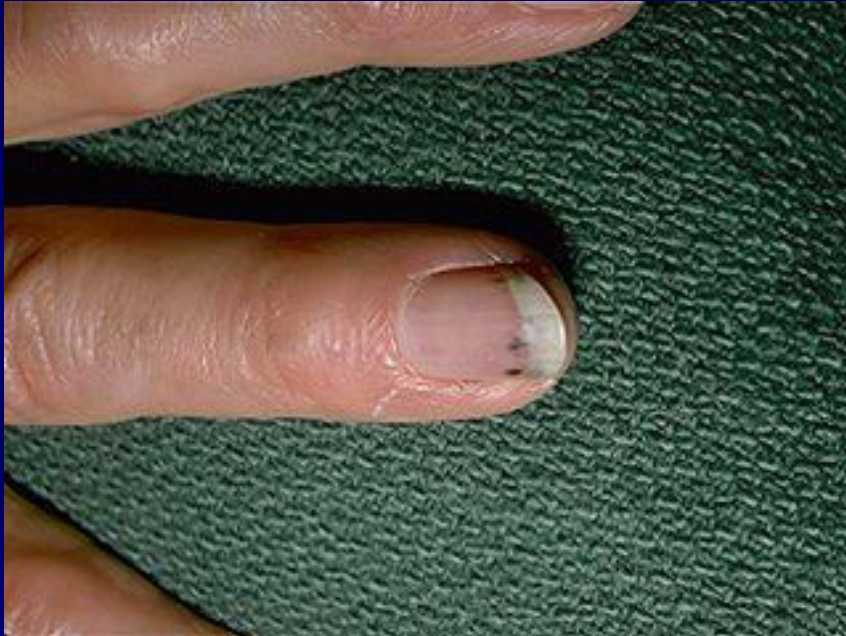
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Photo credit, Josh Fierer, M.D.
[medicine.ucsd.edu/clinicalimg/
Eye-Petechiae.html](http://medicine.ucsd.edu/clinicalimg/Eye-Petechiae.html)

Splinter Hemorrhages



1. Nonspecific
2. Nonblanching
3. Linear reddish-brown lesions found under the nail bed
4. Usually do NOT extend the entire length of the nail

Osler's Nodes

American College of Rheumatology

web.rheum.bham.ac.uk/.../default/pages/3b5.htm



www.meddean.luc.edu/.../Hand10/Hand10dx.html



1. More specific
2. Painful and erythematous nodules
3. Located on pulp of fingers and toes
4. More common in subacute IE

Janeway Lesions



1. More specific
2. Erythematous, blanching macules
3. Nonpainful
4. Located on palms and soles

The Essential Blood Test

■ Blood Cultures

- Minimum of three blood cultures¹
- Three separate venipuncture sites
- Obtain 10-20mL in adults and 0.5-5mL in children²

■ Positive Result

- Typical organisms present in at least 2 separate samples
- Persistently positive blood culture (atypical organisms)
 - Two positive blood cultures obtained at least 12 hours apart
 - Three or a more positive blood cultures in which the first and last samples were collected at least one hour apart

Additional Labs

- CBC
- ESR and CRP
- Complement levels (C3, C4, CH50)
- RF
- Urinalysis
- Baseline chemistries and coags

Imaging

■ Chest x-ray

- Look for multiple focal infiltrates and calcification of heart valves

■ EKG

- Rarely diagnostic
- Look for evidence of ischemia, conduction delay, and arrhythmias

■ Echocardiography

Indications for Echocardiography

- **Transthoracic echocardiography (TTE)**
 - First line if suspected IE
 - Native valves
- **Transesophageal echocardiography (TEE)**
 - Prosthetic valves
 - Intracardiac complications
 - Inadequate TTE
 - Fungal or *S. aureus* or bacteremia

Modified Duke Criteria

■ Definite IE

- Microorganism (via culture or histology) in a valvular vegetation, embolized vegetation, or intracardiac abscess
- Histologic evidence of vegetation or intracardiac abscess

■ Possible IE

- 2 major
- 1 major and 3 minor
- 5 minor

■ Rejected IE

- Resolution of illness with four days or less of antibiotics

Treatment

- Parenteral antibiotics
 - High serum concentrations to penetrate vegetations
 - Prolonged treatment to kill dormant bacteria clustered in vegetations
- Surgery
 - Intracardiac complications
- Surveillance blood cultures

Complications

- Four etiologies
 - Embolic
 - Local spread of infection
 - Metastatic spread of infection
 - Formation of immune complexes – glomerulonephritis and arthritis

Embolic Complications

- Occur in up to 40% of patients with IE
- Predictors of embolization
 - Size of vegetation
 - Left-sided vegetations
 - Fungal pathogens, *S. aureus*, and *Strep. Bovis*
- Incidence decreases significantly after initiation of effective antibiotics

Embolic Complications

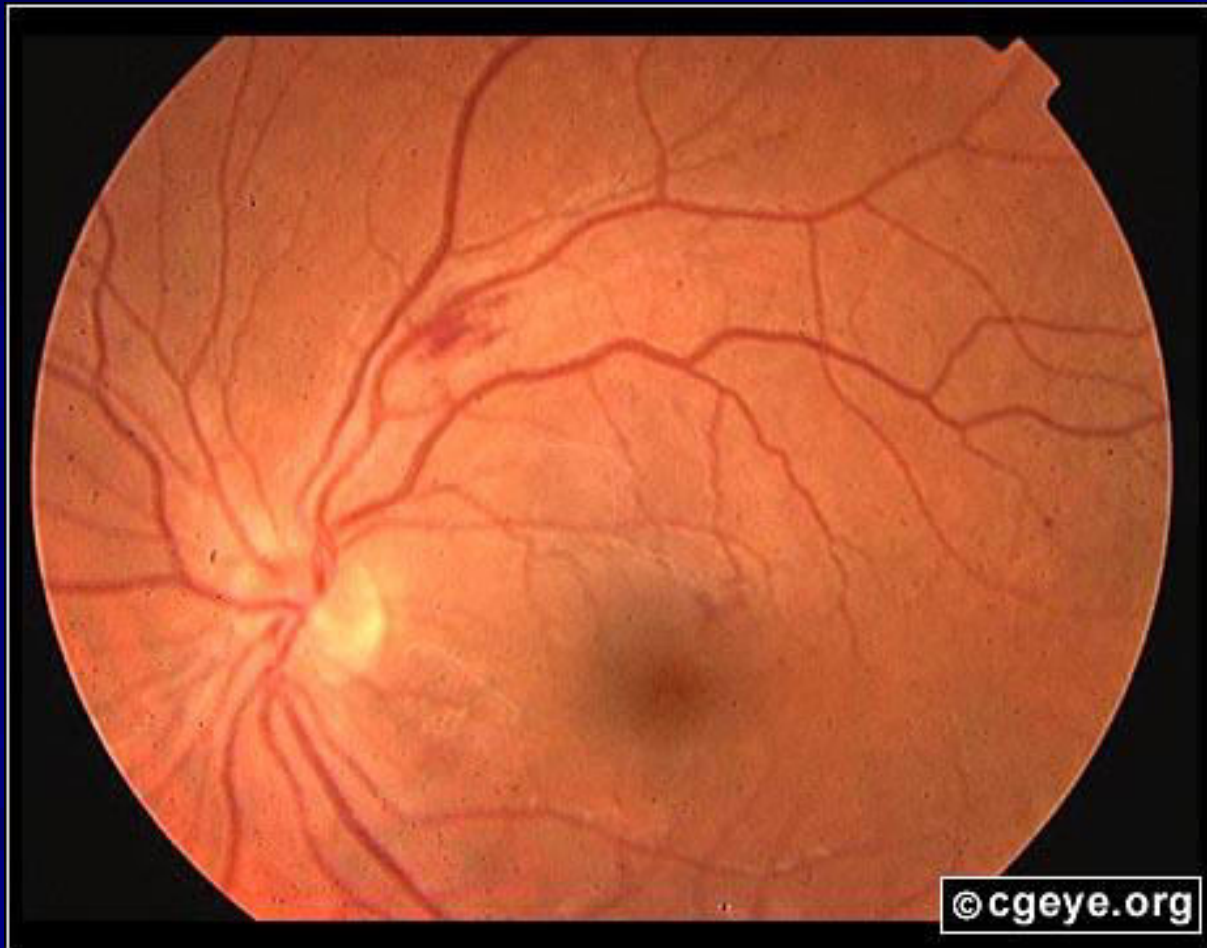
- Stroke
- Myocardial Infarction
 - Fragments of valvular vegetation or vegetation-induced stenosis of coronary ostia
- Ischemic limbs
- Hypoxia from pulmonary emboli
- Abdominal pain (splenic or renal infarction)

Septic Pulmonary Emboli



<http://www.emedicine.com/emerg/topic164.htm>

Septic Retinal Embolus



Local Spread of Infection

■ Heart failure

- Extensive valvular damage

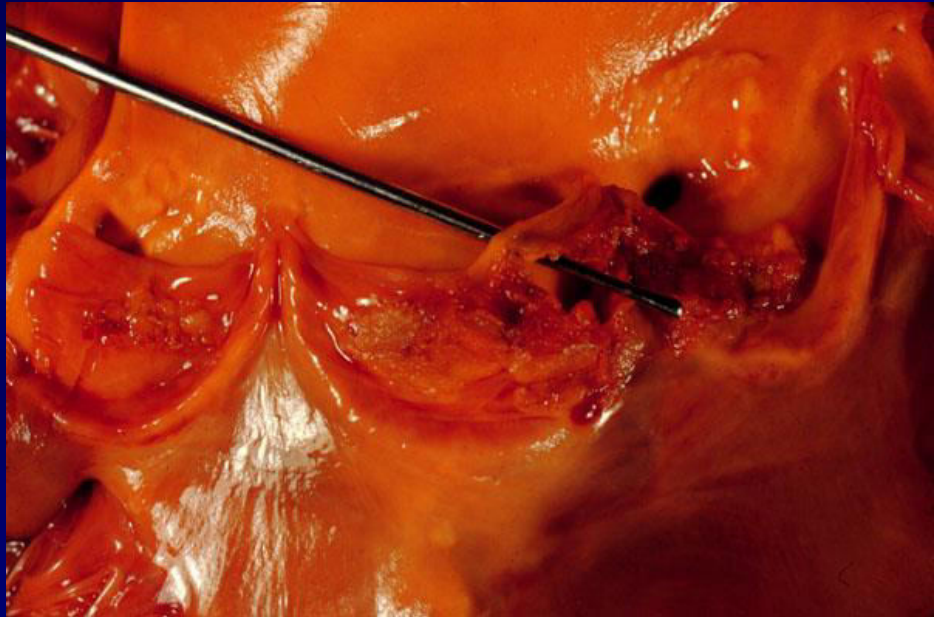
■ Paravalvular abscess (30-40%)

- Most common in aortic valve, IVDA, and *S. aureus*
- May extend into adjacent conduction tissue causing arrhythmias
- Higher rates of embolization and mortality

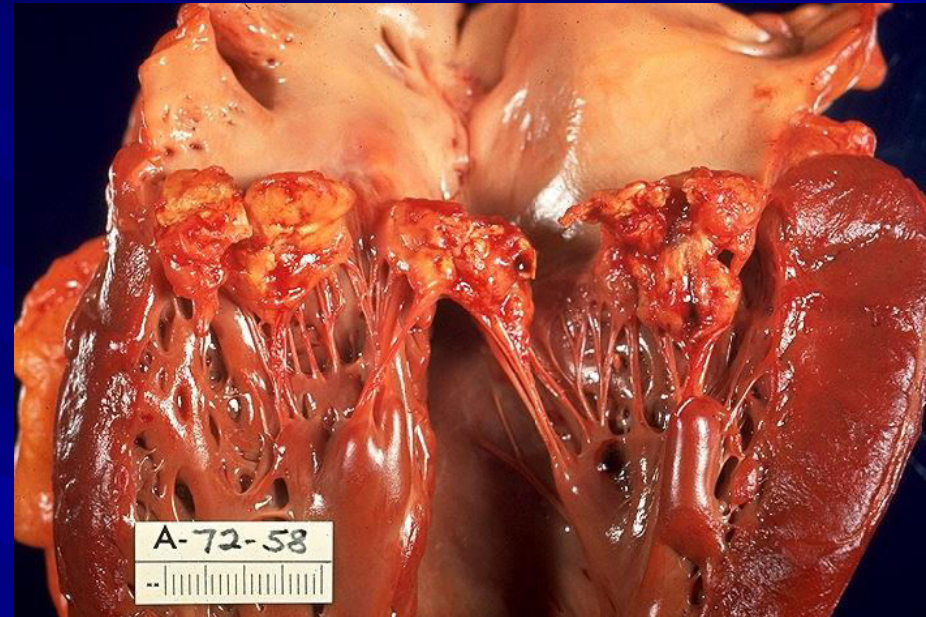
■ Pericarditis

■ Fistulous intracardiac connections

Local Spread of Infection



Acute *S. aureus* IE with perforation of the aortic valve and aortic valve vegetations.



Acute *S. aureus* IE with mitral valve ring abscess extending into myocardium.

Metastatic Spread of Infection

- Metastatic abscess
 - Kidneys, spleen, brain, soft tissues
- Meningitis and/or encephalitis
- Vertebral osteomyelitis
- Septic arthritis

Poor Prognostic Factors

- Female
- S. aureus
- Vegetation size
- Aortic valve
- Prosthetic valve
- Older age
- Diabetes mellitus
- Low serum albumen
- Apache II score
- Heart failure
- Paravalvular abscess
- Embolic events