Infective Endocarditis

What is it?

Infective endocarditis (IE) is a microbial infection of the heart valves or the mural endocardium that leads to the formation of vegetations composed of thrombotic debris and organisms, often associated with destruction of the underlying cardiac tissues.The aorta, aneurysms, other blood vessels, and prosthetic devices can also become infected.

How is it classified?

Traditionally, IE has been classified on clinical grounds into acute and subacute forms.

1.) Acute infective endocarditis is typically caused by infection of a previously normal heart valve by a highly virulent organism (e.g., Staphylococcus aureus) that rapidly produces necrotizing and destructive lesions. These infections may be difficult to cure with antibiotics alone, and usually require surgery.

2.) Subacute IE is characterized by organisms with lower virulence (e.g., viridans streptococci) that cause insidious infections of deformed valves with overall less destruction. In such cases the disease may pursue a protracted course of weeks to months, and cures can be achieved with antibiotics.

How does it happen?

Pathogenesis

Apart from highly virulent organisms which can infect previously normal valves, a variety of cardiac and vascular abnormalities increase the risk of developing IE. Namely,

1.) **Preexisting cardiac disease** :- Rheumatic heart disease with valvular scarring mitral valve prolapse, degenerative calcific valvular stenosis, bicuspid aortic valve, artificial (prosthetic) valves, and unrepaired and repaired congenital defects.

2.) **Microbiological** :- The causal organisms differ among the major high-risk groups. Majority of cases are caused by Streptococcus viridans, a normal component of the oral cavity flora. In contrast, more virulent S.aureus organisms can infect either healthy or deformed valves and are responsible for 20% to 30% of cases overall;

Other causes : enterococci and the HACEK group (Haemophilus, Actinobacillus, Cardiobacterium, Eikenella, and Kingella),

In 10% of cases of endocarditis, no organism can be isolated from the blood (“culture negative” endocarditis); reasons include prior antibiotic therapy, difficulties in isolating the offending agent, or extreme depth of embedded organisms (hence unreleased into the blood)

Mechanism

Endothelial injury allows direct infection by pathogens or the development of an uninfected platelet fibrin thrombus that may become infected during transient bacteremia.

After entering the bloodstream, organisms adhere to the endothelium or sites of NBTE via surface adhesin molecules. The clinical manifestations of endocarditis arise from cytokine production, damage to intracardiac structures, embolization of vegetation fragments, hematogenous infection of sites during bacteremia, and tissue injury due to the deposition of immune complexes.

How do you recognize IE?

Clinical Features.

Acute endocarditis has a stormy onset with rapidly developing fever, chills, weakness, and lassitude. Fever is the most consistent sign of IE, but it can be slight or absent, particularly in older adults.

Other manifestations may be nonspecific fatigue, loss of weight, and a flulike syndrome.

Murmurs are present in 90% of patients with left-sided IE, either from a new valvular defect or from a preexisting abnormality. The modified Duke criteria (see the Table provided) facilitate evaluation of individuals with suspected IE.

Modified Duke's Diagnostic Criteria for Infective Endocarditis

Pathologic Criteria
Microorganisms - demonstrated by culture or histologic examination, in a vegetation, embolus from a vegetation, or intra-cardiac abscess
Histologic confirmation of active endocarditis in vegetation or intra-cardiac abscess
Clinical Criteria
Major
Blood culture(s) positive for a characteristic organism or persistently positive for an unusual organism
Echocardiographic identification of a valve-related or implant-related mass oral abscess, or partial separation of artificial valve, new valvular regurgitation
Minor
Predisposing heart lesion or intravenous drug use
Fever
Vascular lesions, including arterial petechiae, subungual/splinter hemorrhages, emboli, septic infarcts, mycotic aneurysm, intracranial hemorrhage, Janeway lesions
Immunological phenomena, including glomerulonephritis, Osler nodes, Roth spots, Rheumatoid factor
Microbiologic evidence, including a single culture positive for an unusual organism
Echocardiographic findings consistent with but not diagnostic of endocarditis, including worsening or changing of a preexistent murmur
N.B. **Diagnosis by these guidelines, often called the Duke Criteria, requires either pathologic or clinical criteria; if clinical criteria are used, 2 major, 1 major + 3 minor, or 5 minor criteria are required for diagnosis*

TREATMENT

1.) ANTIMICROBIAL THERAPY

Antimicrobial therapy must be bactericidal and prolonged.

Blood cultures should be repeated until sterile, and results should be rechecked if there is recurrence in fever and at 4–6 weeks after therapy to document cure.

Drug Regimen for Anti-Microbial Therapy

Organism	Drug (Dose, Duration)
Streptococci (Penicillin susceptible streptococci)	Penicillin G (2–3 mU IV q4h for 4 weeks) Ceftriaxone (2 g/d IV as a single dose for 4 weeks). Vancomycin(15 mg/kg IV q12h for 4 weeks)
Penicillin resistant streptococci	Penicillin G (4 mU IV q4h) or ceftriaxone (2 g IV qd) for 4 weeks plus Gentamicin(3 mg/kg qd IV or IM, as a single dose)
Enterococci	Penicillin G (4–5 mU IV q4h) plus Gentamicin (1 mg/kg IV q8h), both for 4–6 weeks. Ampicillin, Vancomycin
Staphylococci	• Nafcillin or oxacillin (2 g IV q4h for 4–6 weeks) • Cefazolin (2 g IV q8h for 4–6 weeks • Vancomycin(15 mg/kg IV q12h for 4–6 weeks)
HACEK organisms	• Ceftriaxone (2 g/d IV as a Single dose for 4 weeks) • Ampicillin/Sulbactam (3 g IV q6h for 4 weeks)

2.) SURGICAL TREATMENT

Surgery should be considered early in the course of illness provided the indications mentioned in the table are present.

Moderate or severe refractory CHF is the major indication for surgical treatment of endocarditis.

• Patients who develop acute aortic regurgitation with preclosure of the mitral valve, a sinus of Valsalva abscess rupture into the right heart, or rupture into the pericardial sac require emergent (same-day) surgery.

• The duration of antibiotic therapy after cardiac surgery depends on the indication for surgery.

– For cases of uncomplicated NVE caused by susceptible organisms with negative valve cultures at surgery, the duration of pre- and postoperative treatment should equal the total duration of recommended therapy, with 2 weeks of treatment given postoperatively.

INDICATIONS FOR CARDIAC SURGICAL INTERVENTION IN PATIENTS WITH ENDOCARDITIS

Surgery required for optimal outcome
Moderate to severe CHF due to valve dysfunction
Partially dehisced unstable prosthetic valve
Persistent bacteremia despite optimal antimicrobial therapy
Lack of effective microbicidal therapy (e.g., fungal or Brucella endocarditis)
Staphylococcus aureus PVE with an intra-cardiac complication
Relapse of PVE after optimal antimicrobial therapy
Surgery to be strongly considered for improved outcome
Peri-valvular extension of infection
Poorly responsive S. aureus endocarditis involving the aortic or mitral valve
Large (>10-mm diameter) hypermobile vegetations with increased risk of embolism
Persistent unexplained fever (≥10 days) in culture-negative NVE
Poorly responsive or relapsed endocarditis due to highly antibiotic-resistant enterococci or gram-negative bacilli