Endocarditis

BY

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Endocarditis

- **Endocarditis is an inflammation of the endocardium**, the membrane lining the chambers of the heart and covering the cusps of the heart valves.
- **Infective endocarditis (IE) refers to infection of the heart valves by microorganisms, primarily bacteria.**
- Endocarditis is often referred to as either **acute** or **subacute** depending on the clinical presentation.
- A-**Acute bacterial endocarditis** is a fulminating infection associated with high fevers, systemic toxicity, and **death within days to weeks if untreated**.
- B-**Subacute infectious endocarditis** is a **more indolent infection**, usually occurring in a setting of prior valvular heart disease

Etiology

- Most patients with IE **have risk factors**, such as preexisting cardiac valve abnormalities. Many types of structural heart disease resulting in **turbulence of blood flow** will increase the risk for IE.
- Some of the most important risk factors include the following:
- **Highest risk:** presence of a prosthetic valve or previous IE.
- **Congenital heart disease (CHD).**
- chronic intravenous (IV) access.
- diabetes mellitus.
- acquired valvular dysfunction (eg, rheumatic heart disease).
- cardiac implantable device, chronic heart failure, mitral valve prolapse with regurgitation, IV drug abuse (IVDA).
- HIV infection.
- and poor dentition and/or oral hygiene.

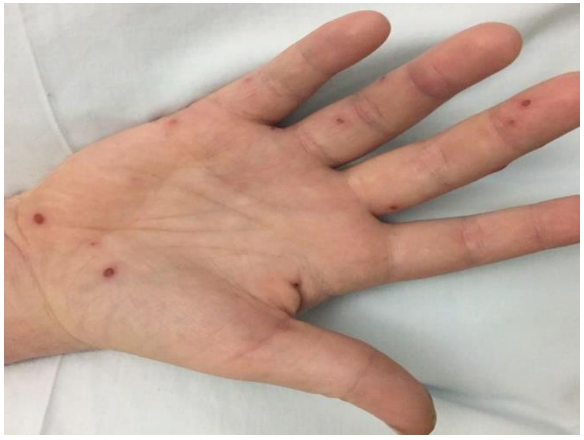
- 3-**Three groups of organisms cause most cases of IE**: **staphylococci**, **streptococci**, and **enterococci**. **Staphylococci** (S. aureus and coagulase-negative staphylococci) are the most common cause of prosthetic valve endocarditis (**PVE**) within the first year after valve surgery, and S. aureus is common in those with a history of **IVDA**

Clinical presentation

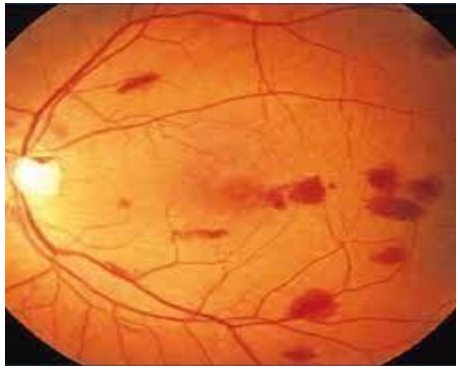
- The clinical presentation of patients with IE is **highly variable and nonspecific**. **Fever** is the most common finding (more than 90% of patients).
- The **mitral and aortic valves are most often affected**.
- IE usually begins **insidiously and worsens gradually**. Patients may present with **nonspecific findings** such as fever, chills, weakness, dyspnea, cough, night sweats, weight loss, or malaise.
- Important clinical signs, especially prevalent in **subacute illness**, may include the following **peripheral manifestations** (“stigmata”) of endocarditis:
- **Osler nodes**, **Janeway** lesions, **splinter hemorrhages**, **petechiae**, **clubbing** of the fingers, **Roth** spots, and **emboli**.

Osler nodes, **Janeway** lesions, **splinter hemorrhages**, **petechiae**





- ROTH SPOTS

- The patient may also have **a heart murmur** (sometimes new or changing), congestive heart failure, cardiac conduction abnormalities, cerebral manifestations, embolic phenomenon, and splenomegaly.
- **Without appropriate antimicrobial** therapy and **surgery**, **IE is usually fatal**. With proper management, recovery can be expected in most patients.
- **Factors associated with increased mortality include:** congestive heart failure, culture-negative endocarditis, endocarditis caused by resistant organisms such as fungi and gram-negative bacteria, left-sided endocarditis caused by Staphylococcus aureus, PVE.
- **Ninety to 95% of patients with IE have a positive blood culture.** The hallmark laboratory finding is continuous bacteremia.

- The patient's **white blood cell count may be normal or only slightly elevated**. **Anemia**, **leukocytosis**, and **thrombocytopenia** may be present.
- The erythrocyte sedimentation rate (**ESR**) and C-reactive protein (**CRP**) may be **elevated** in approximately 60% of patients.
- Urinalysis may reveal **proteinuria** and microscopic **hematuria**.
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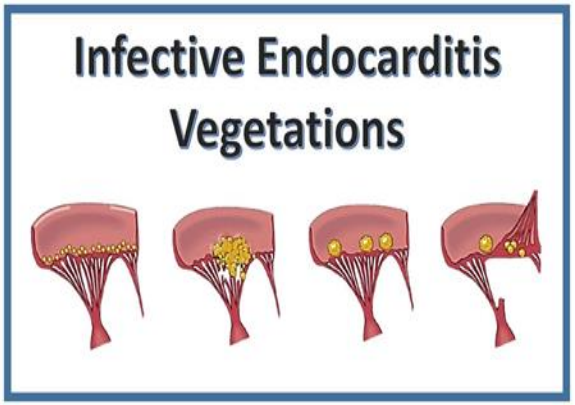
- **Trans esophageal echocardiography** is important in identifying and localizing **valvular lesions** in patients suspected of having IE. It is more sensitive for detecting vegetations (90%–100%), compared with transthoracic echocardiography (40%–65%).
- Endocarditis is characterized



by lesions, known as

vegetations, which is

a mass of platelets, fibrin, microcolonies of microorganisms, and scant inflammatory cells. In the subacute form of infective endocarditis, the vegetation may also include a center of granulomatous tissue, which may fibrose or calcify

Treatment

- **Goals of Treatment**: relieve the signs and symptoms of disease. Decrease morbidity and mortality associated with infection. Eradicate the causative organism with minimal drug exposure. Provide cost-effective antimicrobial therapy. **Prevent** IE in high-risk patients with appropriate prophylactic antimicrobials.
- The most important approach to treatment of IE is **isolation of the infecting pathogen** and **determination of antimicrobial susceptibilities**, followed **by high-dose, bactericidal antibiotics for an extended period.**
- **Treatment usually is started in the hospital**, but in select patients, it may be completed in the outpatient setting as long as **defervescence has occurred** and follow-up blood cultures show no growth.

- **Large doses of parenteral antimicrobials** are currently recommended to achieve bactericidal concentrations within **vegetations**.
- **An extended duration of therapy is required**, even for susceptible pathogens, because microorganisms are enclosed within valvular vegetations and fibrin deposits.
- Outpatient antimicrobial therapy should be considered early in the treatment of IE, after the patient is **stable clinically and responds favorably to initial antibiotics**.
- **β-Lactam antibiotics**, such as **penicillin G** (or **ceftriaxone**), **nafcillin** (or oxacillin), and **ampicillin**, remain the drugs of choice for **streptococcal**, **staphylococcal**, and **enterococcal** endocarditis, respectively.

Nonpharmacologic Therapy

- **Surgical intervention to remove the infectious foci and repair valves and/or valvular structures** is an important adjunct in the management of both NVE and PVE.
- In most cases, **valvectomy** and **valve replacement** are performed to remove infected tissues and restore hemodynamic function.

Streptococcal Endocarditis

- Streptococci are a common cause of IE, with most isolates being **viridans** group streptococci.
- Most **viridans group** streptococci are **highly sensitive to penicillin G**.
- Recommended therapy in the uncomplicated case caused by fully susceptible strains in **native** valves **is 4 weeks of either high-dose penicillin G or ceftriaxone, or 2 weeks of combined penicillin G or ceftriaxone therapy plus gentamicin**. Shorter-course antimicrobial regimens are advocated when possible.

- When a patient has a history of an **immediate-type hypersensitivity to penicillin**, **vancomycin** should be chosen for IE caused by viridans group streptococci. When vancomycin is used, **the addition of gentamicin is not recommended**.
- For patients with **complicated infection** (e.g., extracardiac foci) or when the organism is **relatively resistant**, **combination therapy with an aminoglycoside and penicillin** (higher dose) **or ceftriaxone** for the first 2 weeks is recommended followed by penicillin or ceftriaxone alone for an additional 2 weeks.
- In patients with **endocarditis of prosthetic valves or other prosthetic material** caused by viridans streptococci and Streptococcus bovis, treatment courses are **extended to 6 weeks.**

Staphylococcal Endocarditis

- **Endocarditis is most commonly caused by staphylococci**, in particular **S. aureus**, **mainly because of** increased IVDA, more frequent use of peripheral and central venous catheters, and increased frequency of valve replacement surgery.
- Coagulase-negative staphylococci (**usually S. epidermidis**) are prominent causes of **PVE**.
- The recommended therapy for patients with **left-sided IE caused by methicillin-susceptible S. aureus** (**MSSA**) is **6 weeks of nafcillin or oxacillin**.
- If a patient has a mild, delayed allergy to penicillin, first-**generation cephalosporins** (such as cefazolin) are **effective alternatives** but should be **avoided in patients with an immediate-type hypersensitivity reaction.**

- In a patient with a positive penicillin skin test or a history of immediate hypersensitivity to penicillin, **vancomycin is an option**. Vancomycin, however, kills S. aureus slowly and is generally regarded as inferior to penicillinase-resistant penicillins for MSSA.
- Penicillin-allergic patients who fail on vancomycin therapy should be considered for **penicillin desensitization. Daptomycin is a recommended alternative**.
- **Vancomycin is the drug of choice for methicillin-resistant staphylococci** because most **methicillin-resistant S. aureus (MRSA**) and most coagulase-negative staphylococci are susceptible. Reports of S. aureus strains resistant to vancomycin are increasing**. Daptomycin is now a recommended alternative.**

Treatment of Staphylococcus Endocarditis in IV Drug Abusers

- **IE in IV drug abusers is most frequently** (60%–70%) **caused by S. aureus**, although other organisms may be more common in certain geographic locations.
- A 2**-week course of nafcillin, oxacillin, or daptomycin** without an aminoglycoside is recommended. **If vancomycin is selected, the standard 6-week regimen** should be used.

Treatment of Staphylococcal Prosthetic Valve Endocarditis

- **PVE** that occurs **within 2 months of cardiac surgery is usually caused by staphylococci implanted at the time of surgery.** Methicillin-resistant organisms are common. **Vancomycin** is the cornerstone of therapy.
- Because of the **high morbidity and mortality** associated with **PVE** and refractoriness to therapy, **combinations of antimicrobials are usually recommended**.
- For **methicillin-resistant staphylococci** (both MRSA and coagulase-negative staphylococci), **vancomycin is used with rifampin for 6 weeks or more.** An **aminoglycoside is added for the first 2 weeks** if the organism is susceptible.

- Due to the risk of developing on therapy resistance, **rifampin should not be started until blood cultures have cleared.**
- For **methicillin-susceptible staphylococci**, **a penicillinase-resistant penicillin** is used in place of vancomycin.
- If an organism is identified other than staphylococci, the treatment regimen should be guided by susceptibilities and should be at least **6 weeks in duration.**

Enterococcal Endocarditis

- 1-Enterococci are the third leading cause of endocarditis and are **noteworthy for the following reasons:**
- (1) No single antibiotic is bactericidal; (2)Minimum inhibitory concentrations (MICs) to penicillin are relatively high (3) They are intrinsically resistant to all cephalosporins and relatively resistant to aminoglycosides (4) Combinations of a cell wall–active agent, such as a penicillin or vancomycin, plus an aminoglycoside are necessary for killing; and (5) Resistance to all available drugs is increasing.
- Enterococcal endocarditis ordinarily **requires 4–6 weeks** of high-dose penicillin G or ampicillin, plus gentamicin for cure.

- **Ampicillin plus ceftriaxone** is as effective as ampicillin plus gentamicin and should be considered as a treatment option.
- **A 6-week course is recommended for patients with symptoms** lasting longer than 3 months and those with PVE.
- In addition to isolates with high-level aminoglycoside resistance, **β-lactamase–producing enterococci (especially Enterococcus faecium) are increasingly reported.** If these organisms are discovered, use of vancomycin or ampicillin–sulbactam in combination with gentamicin should be considered.

Prevention of endocarditis

- Antimicrobial prophylaxis is used to prevent **IE in patients believed to be at high risk**.
- The use of antimicrobials for this purpose requires consideration of the **types of patients who** are at **risk**; the procedures causing bacteremia; the organisms that are likely to cause endocarditis; and the pharmacokinetics, spectrum, cost, and ease of administration of available agents.
- The objective of prophylaxis is to **diminish the likelihood of IE in high-risk individuals** who are undergoing procedures that cause transient bacteremia.

- 4-IE prophylaxis should be recommended only for patients with underlying cardiac conditions **associated with the highest risk,** which includes
- presence of a prosthetic heart valve,
- prosthetic material used for cardiac valve repair,
- prior diagnosis of IE, cardiac transplantation with subsequent valvulopathy,
- CHD,
- **for dental procedures** involving manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa,
- invasive respiratory procedures involving an incision or biopsy,
- or invasive procedures involving infected skin, skin structures, or musculoskeletal tissues.

Prophylaxis of Infective Endocarditis

Highest Risk Cardiac Conditions	Presence of a prosthetic heart valve Prosthetic material used for cardiac valve repair Prior diagnosis of infective endocarditis Cardiac transplantation with subsequent valvulopathy Congenital heart disease (CHD)[a]	
Types of Procedures	Dental procedures that require perforation of the oral mucosa or manipulation of the periapical region of the teeth of gingival tissue Invasive respiratory procedures involving an incision or biopsy Invasive procedures involving infected skin, skin structures, or musculoskeletal tissue	
Antimicrobial Options	**Adult Doses[b]**	**Pediatric Doses[b] (mg/kg)**
Oral amoxicillin	2 g	50
IM or IV ampicillin[c]	2 g	50
IM or IV cefazolin or ceftriaxone[c,d,e]	1 g	50
Oral cephalexin[d,e,f]	2 g	50