Infective Endocarditis

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Infective endocarditis-1

- Fever of unknown origin is caused by a wide variety of bacteria rarely a fungus or virus.
- Infective Endocarditis. Commonly associated with FUO. Inflammation of the endocardium, inner of the heart muscle & the epithelial lining of heart valves.
- Any organism attaches to a valve surface and forms a vegetation and the host immune response will be inhibited.
- Any damage in heart valves induce formation of endocarditic vegetation. A Biofilm. Accumulation Bacteria, platelets, fibrin and few leucocytes.
- Generally, Host defensive immune mechanisms including WBCs can’t directly reach the valves via the bloodstream and prevent development endocarditis
The lack of blood supply to the valves also has implications on treatment, since antimicrobial drugs have difficulty reaching the infected valve.

The incidence of infective *endocarditis* in a general healthy population has been estimated between 3-9 cases per 100,000 patient/year in western countries.

*Endocarditis* is twice as common among men, than women. It can strike at any age, most cases occur with people over the age of 50.

It is higher in patients with underlying congenital & valvular heart disease, intravenous drug abuse, invasive surgery & oral dental procedures.
Historically, Rheumatic Disease caused by Group A Streptococci was considered a frequent pre-disposing factor for endocarditis.

Prosthetic valvular heart disease accounts for about 1/3 of all cases of endocarditis. Occurs in 1% to 3% of patients after valvular heart surgery.

All invasive procedures may cause blood stream infections and result in acute or subacute endocarditis.
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- **Acute endocarditis** followed bacteremia..mostly Staphylococci (**S. aureus**) & streptococci (85%) Bacteria cells settle on normal or deformed heart valves.. multiply, interact & cause rapid destruction ..Fatal cardiac failure.. **days-weeks**.

- **Subacute endocarditis** .. often developed by presence abnormal valves.. congenital deformities & rheumatic lesions.. slowly .. caused by few Gram-positive cocci.. mostly Strept. Viridans group less Enterococcus spp. causing first subacute bacteremia..Low fever & other symptoms.
Predisposing Factors for Endocarditis

- Congenital heart disorders, Prosthetic heart valves
- Pacemaker, following pneumonia and meningitis
- Periodontal procedures/disease, Damaged gingival tissue due to plaque accumulation on teeth
- Dental extractions, Dental implants
- Hemodialysis Tonsillectomy, Esophageal dilation
- Skin infections, Intravenous drug users
- Cystoscopy, Colonoscopy, Urethral dilation,
- All these procedures associated with mucosal commensal flora. May cause endogenous infections.
- Antibiotic Prophylaxis is recommended.
Microbial Causes-1

- **Gram-positive cocci** facultative anaerobes, diplococci chains/clusters or pairs cocci. **Catalase+ve** /Staphylococci group. **catalase-ve**/ Streptococci & Enterococci groups.

- **Streptococci** subdivided into groups according their hemolytic reaction on blood agar in vitro & by serotypes according to surface cell wall specific carbohydrate antigens.

Microbial Causes-2

- **Viridans streptococci Group**.. Deposit dextran, adhesins, Fibronectin-binding protein..attract platelets..development **Plaque**.. **Gingivitis**

- Responsible for the largest percentage of Endocarditis cases (30-40%).. Certain species Viridans streptococci, like *St. mutans, St. mitis* accounted for many cases, and tend to be less susceptible to penicillins.

- **Group A Streptococci** (*S. pyogenes*).. Repeat Sore throat infection.. Less skin infection.. Develop Pos-streptococcal Diseases ..Rheumatic heart disease.. Children..observed later in jung adults.
Streptococci - Staphylococci
Viridans streptococci & S.aureus
Microbial Causes-3

- **Group A Streptococci.** Virulence substance M-protein (80 types) part Cell wall antigens is strongly anti-phagocytic. cross-react with the cardiac muscle tissues. causing damage responsible for rheumatic myocarditis. M-protein Type Specific Antibodies is protecting host to some extent.

- **Enterococcus species** (*E. fecalis, E. faecium*) are responsible for up to 5-10% of cases; some strains may be resistant to *penicillin*, *vancomycin*.

- The treatment of choice for infections caused by **Viridans streptococci** is still *penicillin* or *vancomycin* / *teicoplanin* in case of resistance.
Microbial Causes-5

- **S. aureus** is a common cause of **acute endocarditis**, may result in a severe sepsis syndrome with a fatal outcome.

- **Metastasis staphylococci foci** spread to the brain, lungs, liver, and kidneys. These complications result in a very high mortality rate.

- Most endocarditis cases occurred within 2-month-1 year following **surgery, skin injury/ invasive dental procedures and others.**

- Infections from **vascular catheters & surgical wounds** are more frequent sources of infection.
# Infective agents of Native Valve Endocarditis

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Cases %</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Streptococcus viridans</em></td>
<td>30-40</td>
</tr>
<tr>
<td><em>Enterococcus species</em></td>
<td>5-10</td>
</tr>
<tr>
<td>Other streptococci</td>
<td>10-25</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em> / Coagulase-negative staphylococci</td>
<td>10-40 / 1-3</td>
</tr>
<tr>
<td>Gram-negative bacilli</td>
<td>2-13</td>
</tr>
<tr>
<td>Brucella, Salmonella</td>
<td></td>
</tr>
<tr>
<td><em>Fungi (Candida), Aspergillus</em></td>
<td>2-4</td>
</tr>
<tr>
<td>Others</td>
<td>5</td>
</tr>
</tbody>
</table>
Microbial Causes-6

- A group of fastidious gram-negative bacteria can cause rarely endocarditis: Gram-ve bacteria: *Brucella, Salmonella, Haemophilus, Cardiobacterium, Eikenella, Gram+ve Actinobacillus* part of Normal oral flora
- Clinically, these bacteria spp. causing subacute or chronic course, and often present with embolic lesions from large biofilm vegetations in heart valves.
- Most cases of fungal endocarditis occur in patients who are receiving prolonged antibiotics or intravenous nutrition through central vascular catheters. Immuno-compromised patients.
Yeast & Filamentous Fungi

- The most common species is *Candida albicans*, followed by other less common *Candida spp.* (C. glabrata, C. krusei, C. tropicalis).

- *Candida* part of human normal flora.. Oral-intestinal-Urinary tract (Vagina).. Infection often followed often using catheters or respiratory intubation.

- Endocarditis due to *Histoplasma capsulatum / Aspergillus* species is very rare.. Immuno-suppressed patients.
Candida albicans Pseudohyphae
Diagnosis & Treatment

- **Clinical Diagnosis** is usually suspected based upon the patient's history, symptoms, and findings. Mild continues fever.

- **Echocardiogram & Ultrasound** study of the heart muscle and valves may be helpful in identifying a clump of bacteria on the heart valve.

- Suspected Endocarditis.. Collect 3 blood for culture within 1-2 days. Before treatment with antibiotics.

- Culture first for bacteria. Second for fungi if treatment with antibiotic failed.
About 10-50% of patients with clinically-suspected endocarditis will have negative blood cultures for any organism due to Previous/partial antibiotic treatment.

Antibiotic treatment according to type of bacteria/fungi & susceptibility test.

Antibiotic therapy must continue for at least a month. Most patients respond rapidly to appropriate antibiotics and becoming fever free within 1-2 weeks. Beta-lactam antibiotic/ vancomycin combined with gentamicin in Gram-positive cocci.