

Infective Endocarditis

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Infective endocarditis-1

- **Fever of unknown origin** (FUO) is caused by a wide variety of bacteria ..rarely a fungus or virus.
- **Infective Endocarditis (IE)** commonly associated with FUO.. It is an infection caused by bacteria that enter the bloodstream and settle in the heart lining, a heart valve or a blood vessel.
- Any person with some congenital heart disease have a greater risk of developing **IE**.. A formation of bacterial vegetation.. A **Biofilm** composed of accumulation Bacteria, platelets, fibrin and few leucocytes.
- **The result**: Host defensive immune mechanisms including WBCs can't directly reach the **infected valves** via the bloodstream .. prevent development.

- The lack of blood supply to the valves also has implications on treatment, since antimicrobial drugs have difficulty reaching the **infected valve**.
- Results in congestive heart failure and myocardial abscesses.. Fatal outcome.
- 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**.

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- Historically, **Rheumatic Disease** ..caused by **Group A Streptococci** was considered a frequent pre-disposing factor for **endocarditis**.
- Recently **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**.

- **Acute endocarditis** followed bacteremia..mostly Staphylococci / *S. aureus* & *Viridans Streptococci* .. Few 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..caused by mostly *Strept. Viridans* group less *Enterococcus spp.* causing first subacute bacteremia..Low grade fever & other nonspecific 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.. May cause endogenous infections.. Antibiotic Prophylaxis is recommended before these procedures.

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.
- **Viridans streptococci**.. Normal oral-intestinal flora.. do not possess a specific carbohydrate antigens.. Carry certain **M proteins**. Deposit dextran, adhesins, Fibronectin-binding protein..attract platelets..

Microbial Causes-2

- Development Common causes of **Dental plaque, Gingivitis , Caries.. Oral abscesses.**
- Responsible for the largest percentage of Endocarditis cases (30-40%).. Certain species Viridans streptococci, like ***St. mutans, St. mitis*** accounted for most cases, and tend to be less susceptible to penicillins.
- **Group A Streptococci** (*S. pyogenes*).. Repeat Sore throat infection.. Less skin infection.. Develop Post-streptococcal Diseases ..Rheumatic heart disease developed in Children..observed later in Jung adults.

Streptococci-Staphylococci



Growth Viridans streptococci & S.aureus



Microbial Causes-3

- **Group A Streptococci**..Virulence substance **M-protein** (80 types)..found in fimbriae..Part Cell wall antigens is strongly **anti-phagocytic**.. cross-react with the cardiac muscle tissues.. causing damage .. responsible for **rheumatic myocarditis**.. M-protein Specific Antibodies normally developed.. 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..many virulence factors..**coagulase**
- Chronic staphylococci focus 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 Staphylococcus infection .

Infective agents of Native Valve Endocarditis

Organisms	Cases %
<i>Streptococcus viridans</i>	30-40
<i>Enterococcus species</i>	5-10
Other streptococci	10-25
<i>Staphylococcus aureus</i> / Coagulase-negative staphylococci	10-40 / 1-3
Gram-negative bacilli Brucella, Salmonella	2-13
Fungi (Candida), Aspergillus	2-4
Others	5

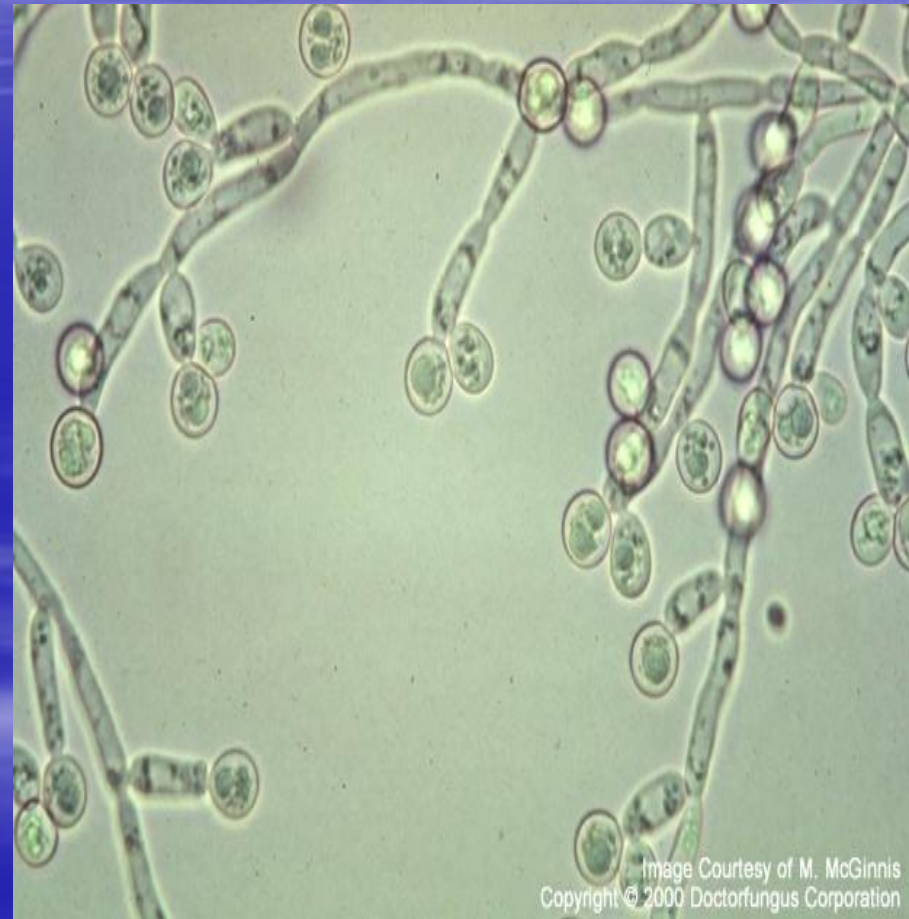
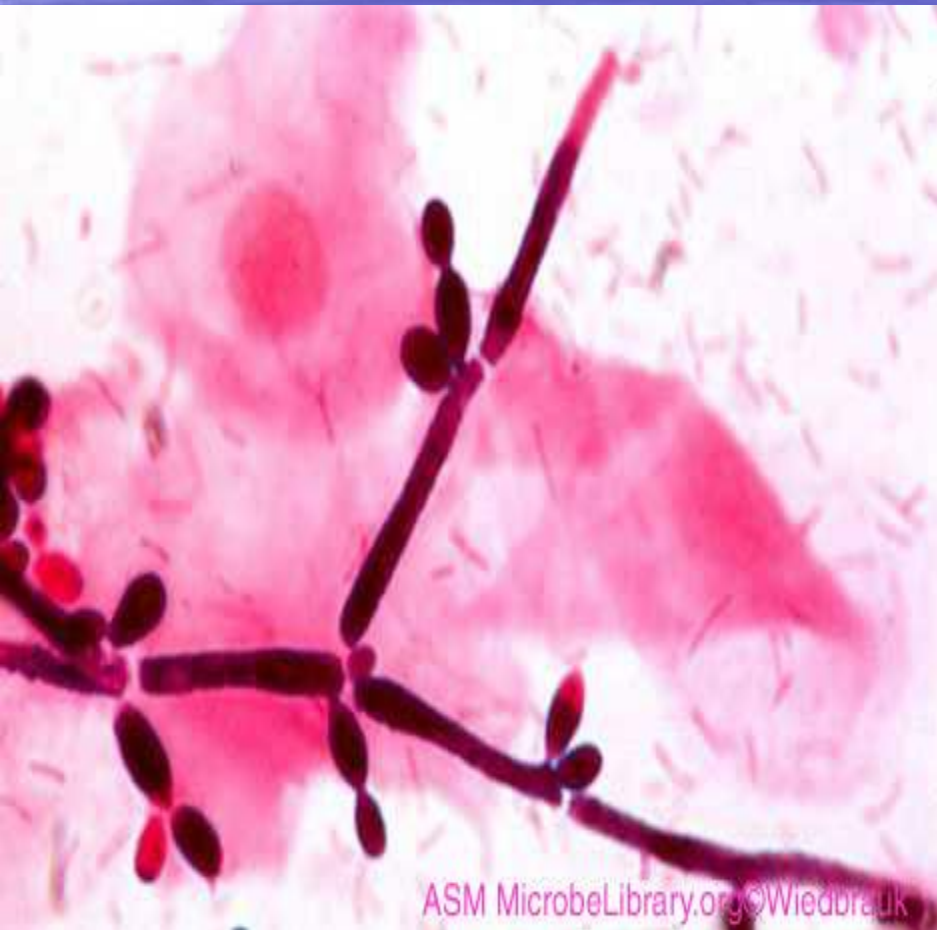
Microbial Causes-6

- 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.. Immunosuppressed 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 **vegetation of bacteria** on the heart valve.
- Suspected case endocarditis ..Collect 3 blood for culture.. within 1-2 days.. Before treatment with antibiotics .. Culture first for bacteria & fungi/Candida
- Antibiotic failure indicates fungal infection.

- 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 & susceptibility test in vitro.
- **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 is recommended for Gram-positive cocci.