

Infective endocarditis (IE):

is an inflammation of the endocardium [inner of the heart muscle and the epithelial lining of heart valves]

rare but life-threatening disease (**fatality rate > 30%**) and has long lasting effects among patients who survive and are cured

can involve almost any organ system in the body (**multisystem disease causes cardiac and extra-cardiac manifestations**) and can be fatal if left untreated

Epidemiology

Incidence 1-10 cases per 100,000 person-years

2 major shifts have occurred:

1- population: in the past it was diagnosed retrospectively using autopsy for patients **less than 30 years**. Now it is diagnosed in patients **more than 50 years**. that's happened because **rheumatic heart disease** (post group A streptococcal infections) were more common in the past and now due to the good hygiene and the treatment it becomes less common.

2- microbiology: the causative agents differ geographically. In the past, viridans group streptococci (VGS) was the common cause. Now, in the developed countries it is Staph aureus while in the developing countries it is viridans group streptococci (VGS).

* VGS includes sanguinis, anginosus and mitis

Predisposing factors for endocarditis (high risk groups)

1- rheumatic disease caused by group A streptococci – **immune mediated endocarditis (antibodies cross reaction)**

2- congenital heart disorders, prosthetic heart valves/ pacemaker

3- minor procedures (associated with mucosal or skin commensal flora) – **antibiotic prophylaxis is recommended**

4- IV drug abusers

5- nosocomial by using catheters

Microbiology overview

- **90% of IE cases are caused by gram +ve cocci** (staphylococcus, streptococcus, enterococcus – group D streptococci)
- **Developed countries → Staph aureus** **Developing countries → viridans group streptococci (VGS)**
- **Gram –ve cocci** (HACEK bacteria (Haemophilus, Aggregatibacter, Cardiobacterium, Eikenella corrodens, kingella)) + **gram –ve bacteria** (Brucella and Salmonella) can cause IE
- **fungi** (candida albicans <- most common + aspergillus flavus) can also cause IE **especially in immunocompromised patients or after cardiac surgery mostly on prosthetic valves**

Remember that: Staph aureus is **catalase +ve** (unlike streptococci and enterococci) and appears yellow on **MSA agar** + **VGS causes alpha hemolysis** while enterococci causes either alpha, beta or gamma hemolysis / candida albicans can be differentiated by using **sabouraud dextrose agar (SDA)** and noticing the presence of **Chlamydo-spore formation** or by the presence of **globular waxy creamy colony**

Pathophysiology

❑ The healthy cardiac endothelium is resistant to frequent bacteremia caused by daily activities such as chewing and tooth brushing.

❑ For development of IE, three factors must be present:

1- presence of bacteria in blood (bacteremia)

2- presence of heart problem around the valves (congenital or acquired) -- prosthetic heart valve

3- colonization (establishment of the infection) on the leaflets of the valves – **vegetation** [**biofilm formation = accumulation of bacteria, platelets, fibrin and leucocytes**]

The vegetation dislodgement (emboli) can cause infarction, stroke, kidney failure

Clinical features

1- **acute** → is a hectically febrile illness that **rapidly** damages cardiac structures, seeds extracardiac sites, and, if untreated, progresses to death within weeks. [with Staph aureus]

2- **subacute / chronic** → follows an **indolent** course; causes structural cardiac damage only slowly, if at all; rarely metastasizes; and is gradually progressive unless complicated **by a major embolic event or a ruptured mycotic aneurysm** / cause embolic lesions from large biofilm vegetations in heart valves / extracardiac manifestations are more obvious

✓ Because of cytokine production, fever, night sweats and weight loss will be present

✓ **Cardiac manifestations**

Cardiac murmurs

CHF develops in 30 – 40 % of patients as a consequence of valvular dysfunction

✓ **Noncardiac manifestation [minor criteria]** [immune mediated]

Janeway lesions – discoloration, not painful, not raised

Osler's nodes – painful, above the skin level

Subungual hemorrhage

Retinal hemorrhage (Roth spot)

→ **A patient with fever of unknown origin and heart murmurs has IE until proven otherwise**

Diagnosis

Microbiological (blood culture) and echocardiography evidence [major criteria] → **diagnosis needs 2 major criteria or 1 major and 2 minor/ extracardiac criteria**

Non-blood culture tests (serological tests culture)

Management

Empiric treatment: vancomycin (IV) + Gentamicin initiated immediately **after** blood samples are taken for cultures

Surgical treatment

Prevention

Antibiotics administration prior to many bacteremia inducing procedures **especially for the high-risk groups**