



# Microbiology Team 431

## Team Members:

Dalal Fatani  
Sameeha AlJetaily  
Haifa AlAbdulkarim  
Bayan AlTassan  
Noha Khalil  
Abeer AlSwailam  
Noura AlSwaidan  
AlAnoud Asiri  
Jumana Alshammari  
Jazeel Almulla  
Lama Mokhlis  
Maymona Alabdely

## Team Members:

Faisal Al Rashed  
Abdullah Al Turki  
Abdullah Baqais  
Ghassan Al Kharboush

# INFECTIVE ENDOCARDITIS (IE)

---

**Infective endocarditis:** Infection or colonization of endocardium, heart valves, congenital defects by bacteria, rickettsiae, fungi.

- Low grade persistent bacteraemia **((FEVER OF UNKNOWN REASON))**
- Serious disease with 30% mortality
- Causes damage of heart or other organs (Systemic)
- It could follow dental procedures (**tooth extractions**) (or any exposure of blood to normal flora), Rheumatic heart disease, congenital heart disease.

\*90% of infective endocarditis patients suffer from abnormal hearts whether it is congenital or rheumatic fever

USUALLY AFFECTS OLD PEOPLE AND THE BACTERIA IS MAINLY STREP FAECALIS due to catheter use in elderly

(rheumatic fever → abnormal valves with verrucae → causes turbulence of passing blood → sterile thrombus formation → exposure to bacteria “even weak bacteria like strept viridins” → infective endocarditis)

## CLASSIFIED INTO FOUR GROUPS:

- Native valve IE
- Prosthetic valve IE
- IV drug abuse IE
- Nosocomial (hospital) IE

### ACUTE:

Affects **NORMAL** heart valves

**Rapidly destructive**

**Metastatic foci**

**\*\*STAPHYLOCOCCUS\*\***

**if not treated, fatal within 6 weeks**

### SUBACUTE:

Affects **DAMAGED** heart valves

**Indolent nature**

**if not treated, fatal by one year**

**ETIOLOGY:** 1- susceptible patient (**WITH HEART ABNORMALITY**) 2- bacteremia

## **FACTORS AFFECTING SEVERITY AND OUTCOME:**

### **1-Bacterial factors:**

-Virulence

-No bacteria in the blood

### **2-Host factors:**

#### Factors increasing susceptibility:

1. Local Congenital or rheumatic heart disease, Prosthetic heart valves, other cardiovascular disease, Heart surgery.
2. General Underlying disease (diabetes mellitus)
3. Drugs:

\* Iatrogenic: immunosuppressive treatment, cytotoxic agents (in cancer treatment).

\* Self- inflicted: alcoholism, addiction (injected drugs).

Protective factors: Antimicrobial chemotherapy. (antibiotics)

## **SOURCES OF INFECTION:**

- -Dental extraction and other dental procedures
- Cardiac surgery (prosthetic valves)-
- -Intravenous medication
- -Iv. Drug addiction
- -Intracardiac or intravenous catheters
- -Obstetric or gynaecologic procedures (**VAGINA IS FILLED WITH BACTERIA**)

## **PREDISPOSING FACTORS:**

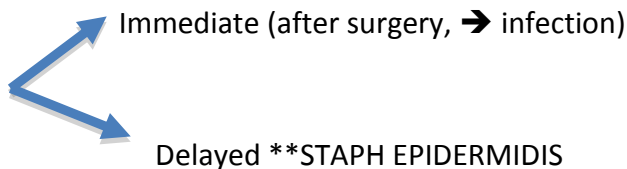
### A- Cardiac lesions

-Chronic rheumatic valvular disease

-Congenital heart disease and defects

-Atherosclerosis

-Prosthetic valves



-Distorted shape causes stasis of blood flow and settle of bacteria on the endocardium.

-Virulent bacteria, **staph. Aureus** (AFTER SURGERY) and strept. Pneumoniae can infect normal heart.

## B. Systemic factors

- Immunosuppressive treatment
- Immune defects (disease)
- Alcoholism
- Iv. Drug abuse

### **PORTAL OF ENTRY:**

1. Dental extraction → bleeding → bacteraemia
  - Sensitivity of blood culture techniques
  - Severity of gingival infection (gingival=relating to gum)
2. Oral irrigation device

- Bacteremia may follow scaling, tooth brushing, endodontic therapy. (endodontic=inside tooth)
- Lack of clinical effect of many bacteraemia is due to small number or low virulence
  - They are rapidly cleared by normal body defense (leucocytes)

**Strept. Faecalis may cause endocarditis after genitourinary or gut procedures → different treatment.**

### **CAUSATIVE ORGANISMS:**

#### **1. Viridans streptococci: Most common cause of sub- acute bacterial endocarditis (SBE)**

Produce glucagons → adhere to endocardium

E.g. : **Streptococcus mutans (DENTAL PLAQUE)**, Streptococcus sanguis (RESISTANT TO PENICILLIN)  
(those are called green streptococci ,why green? Because they are alpha hemolytic)

#### **2. Streptococcus faecalis \*\* Streptococcus faecium, Streptococcus pneumonia,**

**Staphylococcus aureus** <<after surgery>> (Acute endocarditis),\*\*

Staphylococcus epidermidis (Prosthetic heart valve).

#### **Rarely:**

Brucella species (WITH ANIMALS)

Actinobacillus actinomycetes comitans, Rickettsia, Fungi,

**Coxiella burneti Q FEVER cannot be treated with penicillin) \*\*\* WHY? CAUSED BY RICKETSIA**

Candida albicans (hard to treat).

## **PATHOGENESIS:**

How the vegetation forms? **NOT IMPORTANT**

Fibrin, platelets (thrombi) and bacteria colonies accumulate and attach to heart valves. Later, this breaks off (emboli) to distant organs like the kidney and brain this induces an immune reaction (type 3) antigens and antibodies are deposited this IMMUNE COMPLEX causes glomerular damage in the kidney → haematuria This also leads to HEART FAILURE because of valve damage

\*drug addicts use non sterile I.V lines. This goes directly to the RIGHT heart chambers (tricuspid, pulmonary valves) → LUNG EMBOLI.

## **CLINICAL FEATURES/ SIGNS AND SYMPTOMS:**

Onset is insidious (gradual effect) (SBE) – 3 weeks after extraction

Fever (mild and prolonged),

Malaise, weight loss, weakness

Changing murmurs

Anaemia, leukocytosis

Petechiae

Splenomegaly

Splinter haemorrhage (lines of blood under nails),

Hypergammaglobulinaemia.

**Petechiae:** are red or purple spots on the body. **Nonspecific** often located on extremities or mucous membranes

**Osler's Nodes:** More specific Painful and erythematous nodules Located on pulp of fingers and toes more common in subacute IE

## **MORTALITY:**

With antibiotic treatment → 30% High mortality .

This depends on : 1.Virulence of the organism

2. Presence of underlying disease

3. Elderly

4. Inadequate treatment

if the infection is from Candida, Staph, Coxiella burneti (may need to remove valve) or any gram negative bacteria, the prognosis is poor (bad outcome)

## LABORATORY DIAGNOSIS:

A – Serial **blood culture** (2-3 sets before antibiotic therapy)

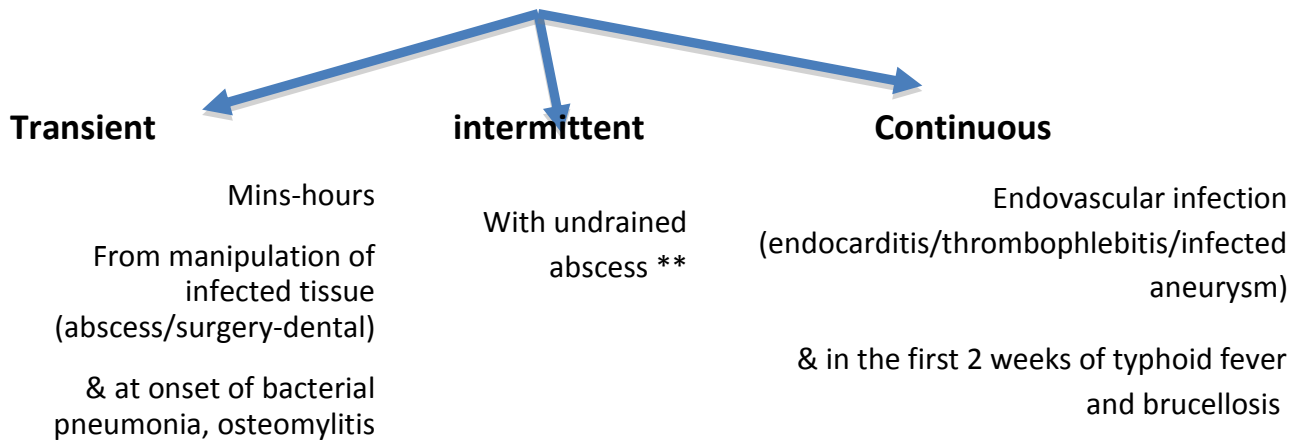
Aerobic and Anaerobic

CBC, ESR and CRP (c-reactive protein test), Complement levels (C3, C4, CH50) RF, Urinalysis

B- Serological tests: CFT (coxiella burniti) → cant culture it

C- sensitivity test (for antibiotic choice)

## ENDOCARDITIS CAUSES → CONTINUOUS BACTERAEMIA



## TECHNIQUE FOR COLLECTION OF BLOOD FOR CULTURE:

Blood for culture contaminated by normal skin flora e.g.

A-**Staphylococcus epidermidis**

B-Diphtheroids and

C-Propionibacteria(anaerobic diphtheroides)

So first clean the skin (alcohol/cholorhexidine/iodine)

Blood culture by automated machines e.g. Bactec or Bactalert-upto 5 days

test for antimicrobial susceptibility.

## Imaging:

-Chest x-ray → multiple focal infiltrates and calcification of heart valves

-ECG Rarely diagnostic → evidence of ischemia, conduction delay, and arrhythmias

-Echocardiography

## LOCAL SPREAD OF INFECTION:

- Heart failure << from extensive valvular damage>>
- Paravalvular abscess (30-40%):
- Most common in aortic valve, IVDA, and S. aureus.
- May extend into adjacent conduction tissue causing arrhythmias.<<Higher rates of embolization and mortality>>
- Pericarditis
- Fistulous intracardiac connections

## EMBOLIC COMPLICATIONS:

- Stroke
- Myocardial Infarction
- Fragments of valvular vegetation or vegetation-induced stenosis of coronary ostia
- Ischemic limbs
- Hypoxia from pulmonary emboli
- Abdominal pain (splenic or renal infarction)

## METASTATIC SPREAD OF INFECTION:

- Metastatic abscess (Kidneys, spleen, brain, soft tissues)
- Meningitis and/or encephalitis
- Vertebral osteomyelitis
- Septic arthritis

## TREATMENT:

### BACTERICIDAL + PARENTRAL + HIGH DOSE + PROLONGED 4 WEEKS

- Disk diffusion test (not sufficient)
- MIC, MBC
- MIC: minimum inhibitory concentration (min amount that will inhibit the organism)
- MBC: minimum bactericidal concentration (min amount that will kill bacteria)

- Viridans streptococci –Benzyl penicillin I.V

**penicillin + gentamicin\*\*\***

Streptococcus faecalis → **ampicillin + gentamicin I.V**

: **Recurrence after cure is common in**

Drug addicts and immunodeficient patients.

GIVE PROPHYLAXIS ANTIBIOTIC BEFORE SURGERY

## Questions

1. Which one of the following is a characteristic of subacute IE?

- a) commonly staph
- b) rapidly destructive
- c) often affects damaged heart valves
- d) if not treated fatal within 6 weeks

2. which one of the following organisms may cause endocarditis after genitourinary or gut procedures?

- a) staphylococcus aureus
- b) Staphylococcus epidermidis
- c) Viridans streptococci
- d) Streptococcus faecalis

3. what is the proper treatment of Streptococcus faecalis?

- a) penicillin
- b) penicillin + gentamicin
- c) Benzyl penicillin
- d) ampicillin + gentamicin

ans (1c, 2d, 3d)