MED437
KING SAUD UNIVERSITY

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MICROBIOLOGY
437

Infective Endocarditis (IE)

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Revised by

Important!
Doctor's Notes
Only found in females' slides
Only found in males' slides
Extra Notes

" I'm not telling you it's going to be easy. I'm telling you it's going to be worth it."

Doctor Fawzia's notes

- Rheumatic fever is a complication of pharyngitis caused by GAS that usually affect kids from the age of 5-15.
  - heart murmur is one of the important indicators for RHD
- What's the difference between rheumatic fever and infective endocarditis?
  - RF is indirect infection (immunological disease)
  - IE is direct infection
- The most common valve that will get damaged is the mitral valve.
- Risk factor:
  - RF
  - atherosclerosis
  - congenital issues
- For someone to get endocarditis they should first have a risk factor (a person who has heart disease) and then the bacteria should have access to the blood; how?
  - we're not supposed to have bacteria in our blood but unfortunately we can't avoid this cause its happens daily; when you brush your teeth (dental) or endoscopy.
  - in the PAST if a child who have RF is going to do a tooth extraction which is a good time for the organisms to pass through and reach the bloodstream then reach the heart so those ppl should be given prophylaxis (e.g. amoxicillin)
  - but this changed b/c now up to 70% have no history of of any prior procedure that allows the bacteria to reach the blood (transient bacteria)
- ★ One of the very important diagnostic methods of endocarditis is the isolation of the organism from at least 3 sets of blood culture during differents periods of time and all of them will be positive. Why? because it's a continuous.
- ★ To prove this is endocarditis
  - Clinical → Fever for unknown origin and its for a long period of time, fatigue and loss of weight
  - Radiological: echocardiogram (LOOK FOR VEGETATION)
    - Direct on the chest or transesophageal (the 2nd one is the one we're using now to diagnose IE)
  - Microbiology: high ESR and CRP

Introduction

Definition:

- Infectious Endocarditis (IE): an infection of the heart's endocardial surface, heart valves , congenital defects by bacteria, Rickettsia ,fungi
- Low grade persistent bacteremia
  - The presence of the bacteria will be continuous b/c the immune system won't be able to get rid of it b/c it's the infection of the heart itself. when the heart is infective the bacteria will be persistent.
  - once the organism reach the valves it will start growing w/o being eradicated by the immune system

Importance:

- Serious disease
- Mortality: 30 %
- Damage of heart or other organs
- Follow dental procedures (tooth extraction)
  - Rheumatic heart disease
  - Congenital heart disease

Mortality

- High mortality:
  - Virulence of organism or severe infection
  - Presence of underlying disease
  - Elderly
  - Inadequate treatment

Classifications

Classifications:

- Native Valve IE
- Prosthetic Valve IE
- Intravenous drug abuse (IVDA) IE
- Nosocomial IE

Further classification: Important !!

Acute:

- Affects normal heart valves
- Rapidly destructive
- If not treated, usually fatal within 6 weeks
- Commonly Staph. aureus → Metastatic foci

Subacute:

- Often affects damaged heart valves
- Indolent nature
- If not treated, usually fatal by one year
- Commonly caused by viridans Streptococci

Etiology:

- Susceptible Patient
- Bacteremia

Epidemiology:

- Incidence: 1.7— 6.2 / 100, 000 person years
- Male:Female= 1.7
- It is becoming a disease of the elderly
- Median age

  -PreABx era —35y

Note: years ago it was 35y due to low health care now it is 58y because health care increased the number of old people

  -Now —58y
- Due to two factors
  - The decline of rheumatic heart disease
  - The increasing proportion of elderly

Prosthetic valve:

- 7 -25 % of cases of infective endocarditis
  - Early <12 months
  - Late >12 months
- 0.94 per 100,000 bioprosthetic
- Initially mechanical valves at greater risk for first 3 months, then the is risk same at 5 years
  - 1-3.1% risk at 1 year
  - 2-5.7% at 5 year

Factors Affecting Severity and Outcome

- Bacterial Factors
  - Virulence
  - No bacteria in the blood
- Host Factors
  - Factors increasing susceptibility
    - Local
      - Congenital rheumatic heart disease
      - Prosthetic heart valves
      - Other cardiovascular disease
      - Heart surgery
    - General
      - Underlying disease (diabetes.M)
    - Drugs
      - Iatrogenic (hospital mediation)
        - Immunosuppressive treatment
        - Cytotoxic agents
      - Self-inflicted
        - Alcoholism
        - Addiction (injection drugs)
  - Protective Factors
    - Antimicrobial chemotherapy

Source 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
- Obstetric or gynaecological procedures

هذي الأشياء تجي بالهستوري حق الكيس اللي بيعطونا اياه.

- Drug abuser who has fever
- A lady who had a rheumatic heart disease and gynaecological procedure
- Man who have heart disease and did endoscopy

Predisposing Factors

A. Cardiac lesions
- Chronic rheumatic valvular disease
- Congenital heart disease and defects
- Atherosclerosis
- Prosthetic valves
  - Immediate (the first 3 months after the surgery and caused by organism from the intraoperative area) Staph epidermidis and staph aureus are the common cause here.
  - Delayed (up to 1 year) Viridans streptococci is the most common cause.
  - Distorted shape causes stasis of blood flow and settee of bacteria on the endocardium
  - Virulent bacteria`, staph. aureus and strept. Pneumoniae can infect normal heart

B. Systemic Factors
- **Immunosuppressive treatment**
- **Immune defects (disease)**
- **Alcoholism**
- **I.V Drugs abuse** (mostly caused by staph aureus)

Portal of entry

- Dental extraction bleeding bacteraemia
  Rocking the tooth in the socket pumping effect on the vessels of periodontal ligament , forces bacteria from gingival pockets into bloodstream 40 – 80 % bacteraemia
  - Sensitivity of blood culture techniques
  - Severity of gingival infection

- Oral irrigation device

Bacteraemia يعني باختصار عمليات خلع الاسنان تساعد على حدوث ال
لان الفم مليان نورمال فلورا ممكن تدخل وتروح الدم

Note:

- Bacteraemia may follow scaling , tooth brushing, endodontic therapy .
- Lack of clinical effect of many bacteraemia is due to small number or low virulence
- They are rapidly cleared by normal body defense (leukocytes)
- Strept. Faecalis may cause endocarditis after genitourinary or gut procedures

Causative Organisms

- Viridans streptococci
  - Most common cause of subacute bacterial endocarditis (SBE)
  - Produce glucagons --. adhere to endocardium
  - E.g.
    - Streptococcus faecalis and streptococcus faecium (for example if they brought a case and said 'colonoscopy' and asked about the organisms you'll choose one of those)
    - Staphylococcus aureus
      - Acute endocarditis
    - Staphylococcus epidermidis
      - Prosthetic heart valves
    - Actinobacillus actinomyces comitans (among the HACEK group and it the bacteria that is mostly the common cause of IE)

Pathophysiology

1. Turbulent blood flow disrupts the endocardium making it “sticky”
2. Bacteremia delivers the organisms to the endocardial surface
3. Adherence of the organisms to the endocardial surface
4. Eventual invasion of the valvular leaflets
5. Formation of vegetations (small masses of fibrin, platelets, blood components and sometimes bacteria)

- IE often occurs when there is an underlying cardiac abnormality that creates a high-low pressure gradient.
- The resultant turbulent blood flow disrupts the endocardial surface by peeling away the endothelium.
- The body’s natural response to endothelial damage is to repair it by laying down a sticky platelet-fibrin meshwork, which is a nidus for infection
- Temporary bacteremia delivers the offending organism to the endocardial surface where is sticks to the platelet-fibrin meshwork. This festers into an infection that eventually invades the cardiac valves.
- The pathophysiology is slightly different with IVDA (intravenous drug abuser).It has been postulated that repeated injections of drugs and particulate material causes microtrauma to the cardiac valves, thereby starting the infection cascade.

Endocarditis Causes: Continuous Bacteraemia:

There are **three** clinical patterns of **bacteremia**:

✓ **Transient:**

- Lasts minutes to hours:

  1- Following manipulation of infected tissues(abscess,furuncle,or during a surgical procedure)

  2- Instrumentation of contaminated mucosal surfaces (dental procedures, cystoscopy,or sigmoidoscopy)

  3- At the onset of bacterial pneumonia, arthritis, osteomyelitis,and meningitis.

✓ **Intermittent:**

- Commonly occurs with undrained abscesses.

✓ **Continuous:**

- Reflects an endovascular infection such as endocarditis or endarteritis,suppurative thrombophlebitis,or an infected aneurysm.
- It also occurs in the first two weeks of typhoid fever and brucellosis.

Risk factors

- Injection drug use
  - 100 X ↑ risk in young by *Staphylococcus aureus*
- IVDU
  - Rates 150- 2000/ 100 000 person years
  - Higher among patients with known valvular heart disease
- Structural cardiac abnormality
  - 75% of patients will have a pre existing structural cardiac abnormality
  - 10-20% have congenital heart disease

Other risks:

- Poor dental hygiene
- Hemodialysis
- Diabetes Mellitus
- HIV
- Immunosuppressive treatment
- Cytotoxic agents
- Alcoholism

HIV infection:

A number of cases of IE have been reported in patients with HIV infection
It has been suggested that HIV infection is an independent risk factor for IE in Intravenous drug users.

Risk Factors ; Cardiac Abnormality

High risk

- Previous IE 4.5(2.5 to 9)%
- Aortic valve disease 12 to 30%
- Rheumatic valve disease
- Prosthetic valve
- Coarctation
- Complex cyanotic congenital

Rheumatic valve disease

- Predisposition for young in some countries 37%-76% of cases
- Mitral 85%, Aortic 50%
- Degenerative valvular lesions
- MV Prolapse and associated mitral regurgitation - 5 to 8 times higher IE risk
- Aortic valve disease (stenosis or/and regurgitation) is present in 12 to 30 % of cases

Moderate risk

- Mitral Valve Prolapse with Mitral Regurgitation thickened leaflets- 5 to 8 times (100/100 000 person years)
- Mitral Stenosis
- tricuspid valve
- Pulmonary Stenosis
- Hypertrophic Obstructive Cardiomyopathy (HOCM)

Low/no risk

- Atrial septal defect (secundum)
- Coronary artery bypass graft

Diagnostic approach and symptoms

Diagnostic approach:

- History of prior cardiac lesions
- A recent source of bacteremia

Symptoms:

Acute:

- ✓ High grade fever and chills
- ✓ Shortness Of Breath
- ✓ Arthralgias(joint pain)/ myalgias(muscle aches)
- ✓ Abdominal pain
- ✓ Pleuritic chest pain
- ✓ Back pain

Subacute:

- ✓ Low grade fever
- ✓ Anorexia
- ✓ Weight loss (loss of appetite)
- ✓ Fatigue
- ✓ Arthralgias/ myalgias
- ✓ Abdominal pain
- ✓ Nausea/Vomiting

The onset of symptoms is usually ~2 weeks or less from the initiating bacteremia

Physical examination

First thing you must do is history

- Look for small and large emboli with special attention to the fundi, conjunctivae, skin, and digits
- Cardiac examination may reveal signs of new regurgitation murmurs and signs of CHF
- Neurologic evaluation may detect evidence of focal neurologic impairment

- Signs
  - Fever
  - Heart murmur
  - Nonspecific signs – petechiae, subungual or "splinter" hemorrhages, clubbing, splenomegaly, neurologic changes
  - More specific signs - Osler's Nodes, Janeway lesions, and Roth Spots

Laboratory Diagnosis

1- Serial blood culture: (2-3 sets before antibiotic therapy)
- **Aerobic**
- **Anaerobic**

2- Serological tests:
- CFT (coxiella burnetii)

3- Sensitivity

4- Additional tests :
- CBC, ESR and CRP, Complement levels (C3, C4, CH50)
- RF
- Urinalysis

5- Imaging :

a) Chest x-ray:

- Look for multiple focal infiltrates and calcification of heart valves

b) ECG:

- Rarely diagnostic
- Look for evidence of ischemia, conduction delay, & arrhythmias

c) Echocardiography (the most b/c it's the most sensitive & the best for diagnosis)

- Looking for vegetation

Technique for collection of blood for culture

- Blood for culture contaminated by normal skin flora e.g.
  - Staphylococcus epidermidis
  - Diphtheroids and
  - Propioniobacteria (anaerobic diphtheroids)
- So first we have to clean the site (mainly antecubital fossa)with alcohol 70%and leave for (1-1.5 minutes) or chlorhexidine or iodine
- Blood culture by automated machines e.g. Bactec or Bact Alert- upto 5 days when signal positive, the specimen is gram stained → reported to clinician then cultured, identified and tested for antimicrobial susceptibility.

- Bacteraemia may follow scaling , tooth brushing, endodontic therapy .
- Lack of clinical effect of many bacteraemia is due to small number or low virulence
- They are rapidly cleared by normal body defence (leukocytes)
- Strept. Faecalis may cause endocarditis after genitourinary or gut procedures
- Staph (aureus / epidermidis) → drug abusers

Diagnostic approach

1-Positive blood culture results

- A minimum of three blood cultures should be obtained over a time period based upon the severity of the illness

2-Additional laboratory Nonspecific test

- An elevated ESR and/or an elevated level of CRP is usually present
- Most patients quickly develop a normochromic normocytic anemia
- The WBC count may be normal or elevated

Three blood culture = 6 bottles , 3 bottles anaerobic and 3 bottles aerobic to cover all the possibilities

Other aspects clinical diagnosis

- Which valve? Right or Left where would emboli go?
- Heart Function?
- Pump, acute valve dysfunction conduction
- Look for evidence emboli
- Bleed (intracranial, elsewhere mycotic aneurysm)

Additional laboratory tests

- **abnormal urinalysis**
  - The combination of RBC casts on urinalysis and a low serum complement level may be an indicator of immune-mediated glomerular disease
- **ECG**
  - New AV, fascicular, or bundle branch block... .? PERIVALVULAR INVASION monitoring, ?? pacing

1-Native Valve IE

- Strep. (55%), mostly *S. viridans*
- Staph. (30%), mostly *S. aureu*
- Enterococci (5-10%),
- GNB=HACEK (5%),
- Fungi

2- Prosthetic Valve IE

- Early (0-2 mo) 1 - 3.1%
  - 50% Staphylococci S. epidermidis > *S. aureus*, gnb, enterococci
- Late (>12 mo) 2 - 5.7%

3- IE in IV drug abusers

- Staph. aureus(50-60%) S.aureus is common in I.V. abuser (so ask about history)

Case Definition: IE

- Duke criteria
- In 1994 investigators from Duke University modified the previous criteria to include
- The role of echocardiography in diagnosis
- They also expanded the category of predisposing heart conditions to include intravenous drug use

Modified Duke criteria

- Proposed: 2000, Addresses TEE, Broad "possible categories.
- *S. aureus* risks (13-25% S. aureus bacteremia have IE)

- Definite IE
  - Microorganism (via culture or histology) in a valvular vegetation, embolized vegetation, or intracardiac abscess
  - Histologic evidence of vegetation or intracardiac abscess

- Possible IE
  - 2 major
  - 1 major and 3 minor
  - 5 minor
- Rejected IE

  Resolution of illness with four days or less of antibiotics

Modified Duke criteria

Major criteria

1. MICROBIOLOGY
   a. Typical organism from 2 separate cultures OR
   b. Microorganism from persistently positive BC OR
   c. Single BC + for Coxiella burnetii, or titer >1:800
2. ENDOCARDIAL INVOLVEMENT
   a. New (not changed) murmur of regurgitation
3. POSITIVE ECHO
   a. (TEE if prosthetic valve, complicated, or pretest probability possible IE

Minor criteria

Predisposition (heart condition or IV drug use)

1. Fever >/= 38°C
2. Vascular phenomenon (excludes petechiae, splinter hemorrhage)
3. Major arterial emboli:
   a. Mycotic aneurysm, intracranial or conjunctival hemorrhages. Janeway lesions
4. Immunologic phenomena
   a. RF,.Roth's spots glomerulonephritis, Osler's nodes
5. Microbiologic evidence
   a. Not meeting major criteria single BC not CNS, serology

Petechiae

1. Nonspecific
2. Often located on extremities or mucous membranes

Splinter Hemorrhages

1. Nonspecific
2. Nonbranching
3. Linear reddish-brown lesions found under the nail bed
4. Usually do NOT extend the entire length of the nail

Splinter hemorrhages that extend the entire length of the nail or are primarily located at the proximal end of the nail (near the cuticle) are like due to trauma.

Janeway Lesions

1. More specific
2. Erythematous, blanching macules
3. Nonpainful
4. Located on palms and soles

Osler's Nodes

1. More specific
2. Painful and erythematous nodules
3. Located on pulp of fingers and toes
4. More common in subacute IE

Complications

Four etiologies:

- Embolic
- Local spread of infection
- Metastatic spread of infection (via blood)
- Formation of immune complexes e.g. glomerulonephritis and arthritis

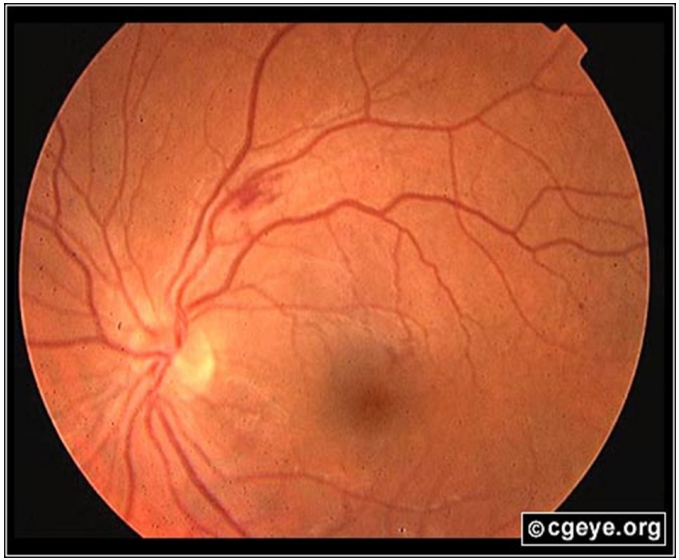
Embolic Complication

- Occur in up to 40% of patients with IE
- Predictors of embolization
  - Size of vegetation
  - Left-sided vegetations
  - Fungal pathogens, S. aureus, and Strep. Bovis
- Incidence decreases significantly after initiation of effective antibiotics

- 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)

Septic Pulmonary Emboli

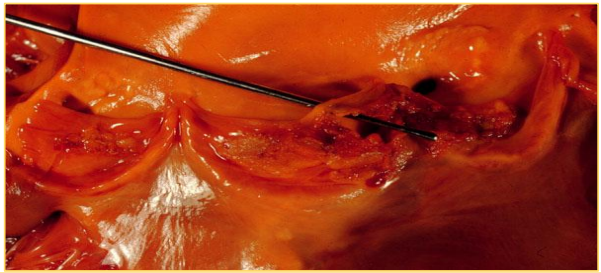
Septic Retinal embolus



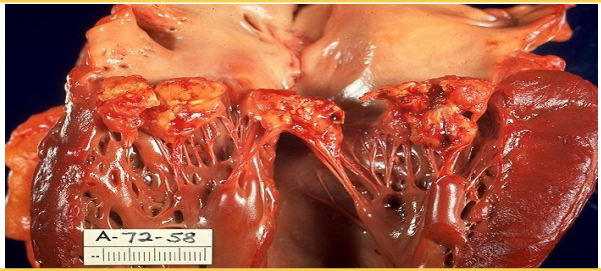
ممكن تسأل ليش نأخذ كل هالتفاصيل و الاعراض ؟
لانه في بعض الحالات ما يبين لنا الا سيمبتوم واحد فقط ف ضروري اننا نعرفها كلها
e.g. In some Fungal infection when see Septic Retinal embolus only

Local Spread of Infection

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



Acute *S. aureus* IE with perforation of the aortic valve and aortic valve vegetations.



Acute *S. aureus* IE with mitral valve ring abscess extending into myocardium.

Metastatic Spread of Infection

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

Poor Prognostic Factors

- Female
- *S. aureus*
- Vegetation size
- Aortic valve
- Prosthetic valve
- Older age

- Diabetes mellitus
- Low serum albumin
- Apache II score
- Heart failure
- Paravalvular abscess
- Embolic events

Echocardiographic findings

1. Oscillating intracardiac mass
   - ➢ On valve or supporting structure,
   - ➢ In the path of regurgitation jets,
   - ➢ On implanted material, in the absence of an altenate anatomic explanation
2. Abscess
   a. New partial dehiscence of prosthetic valve
   b. New valvular regurgitation (increase or change in pre-existing murmur not sufficient)

Improved diagnostic value of echocardiography patient with inductive endocarditis by transesophageal approach A prospective study :

- Eur heart J 1988 Jan(i) 43.5396 patient were studied consecutively with TEE and TTE.
- TEE sensitivity 100% for vegetation as compared to 63% with TTE
- Both TTE and TEE had specificity of 98%.
- 25% of vegetation less than **5mm.**
- 69% of vegetation **6-10 m**m .
- 100% of vegetation greater than **11mm.**
- They are detected by TEE were also observed with TTE.

Culture negative IE :

- How hard did you look?
- (50% culture neg are due to previous antibiotics)
- **HACEK** : 2-3 weeks incubation, subculturing
- Tend to see subacute w/ valve destruction/CHF
- Note from 436 : If you culture for 3 days and nothing appears, and they were sure it is IE, it is culture negative IE

- **HACEK** is :
- Hemophilus
- paraphrophilus,
- aphrophilus.
- Parainfluenzae
- Aggregatibacter (Actinobacillus) actinomycetemcomitans
- Cardiobacterium hominis
- Eikenella corrodens (from Human bites)
- Kingella spp.

Lab Diagnosis! Etiologies "Culture Negative" IE Based on clinical setting :

- **PCR of vegetation/emboli :**
- Tropheryma whippelii , bartonella.
- **Histology/stain /culture of vegetation/emboli :**
- Fungus
- **Prolonged, enriched cultures :**
- **HACEK**
- **Lysis centrifugation system (Isolator) :**
- Bartonella, legionella (BCYE),fungal
- **Serology :**
- Endemic fungi, bartonella, Q fever, brucella, legionella, chiamydia
- **Thioglycolate or cysteine supplemented media :**
- S.aureus satellitism: Abiotrophia (NVS)

TREATMENT

General Considerations

- Antimicrobial therapy should be administered in a dose designed to give sustained **bactericidal** serum concentrations throughout much or all of the dosing interval.
- In vitro determination of the **minimum inhibitory concentration** of the etiologic cause of the endocarditis should be performed in all patients.
- The **duration** of therapy has to be sufficient to eradicate microorganisms growing within the valvular vegetations.
- The need for prolonged therapy in treating endocarditis has stimulated interest in using **combination** therapy to treat it.

- Disk diffusion test (not sufficient
- MIC , MBC.
- Criteria of antibiotic:
  - Bactericidal
  - Parenteral
  - High dose
  - Prolonged

- **Viridans streptococci:**
  1. Benzyl penicillin I.V (4 MU الدوز) every 4 hrs for 4 weeks*
  2. (OR) penicillin + gentamicin
- Streptococcus faecalis
  1. ampicillin + gentamicin I.V
- Recurrence after cure is common in: (drug addicts /immunodeficient patients)

Doctor's notes

1- Duration must be sufficient

2- We have to do MBC test (minimum bactericidal Concentration) to determine the lowest concentration of antibacterial agent "antibiotic" required to kill this pathogen.

3- Also we need to do MIC test (minimum inhibitory concentration) to determine the lowest concentration of chemicals needed to stop the growth of pathogen. (bacteriostatic)

4- We need prolonged + combination therapy to treat endocarditis

Indications for surgery in IE

- Combined therapy generally advised with
- Refractory CHF (mortality 56-86% w/o surgery vs 11-35% w/surgery)
- Perivalvular invasive disease
- Uncontrolled infection on maximal medical therapy
- Recurrent systemic emboli, particularly in the presence of large vegetations
- Some pathogens: Pseudomonas, brucella, coxiella, fungi, enterococci

Prosthetic same as native valve endocarditis

- Perivalvular infection valve
- Dehiscence
- Excessively mobile prosthesis on echo results in hemodynamic instability
- Prosthetic valve endocarditis that one may attempt medical treatment alone:
  1. >l2mo post surgical
  2. VGS or HACEK or enterococci
  3. No perivalvular extension
- Recurrence after surgery about 7% / 6 years
- Relapse,
  - S. aureus usually means surgery
  - S. aureus- RR death 0.18 in surgery plus AB vs ABx alone

Prophylaxis

- For High or Mod. cardiac risk conditions (previous list)
- For Dental, rigid bronchoscopy, esophageal procedures, G I mucosal procedures, cystoscopy, prostate surgery
- Antibiotic Prophylaxis (American Heart Assoc. JAMA
- **Timing**
- One hour prior to procedure:
  - 2gm Amoxicillin orally or
  - 600 mg Clindamycin orally or
  - 2gm Cephalexin orally or
  - 500mg Clarithromycin orally or
  - 2 gm Ampicillin intramuscular

Dr's Notes:

- In case he has prosthetic valve or abnormal valve he is more susceptible to be infected .
- We give prophylaxis for certain people
- يعني مانعطي أي شخص لازم أشخاص معينين بحالات معينة ونعطيهم قبل العملية (غالبا) بساعة – نص ساعة
- Mainly gram +ve bacteria → clindamycin , amoxicillin , cephalexin (orally) , ampicillin (IM)
- We give prophylaxis for :
- 1- previous history with cardiac disease (previous endocarditis)
- 2- dental extraction
- 3- bronchoscopy and others.

Dental procedures where endocarditis prophylaxis indicated:

1.Extraction
2.Periodontal procedures
3.Implants
4.Root canal
5.Subgingival antibiotics fiber/strips
6.Initial orthodontic bands (not brackets)
7.Intraligamentary local anesthetic
8.Cleaning of teeth/implants if bleeding anticipated

Dental procedures where endocarditis prophylaxis <u>NOT</u> indicated:

1. Filling cavity or local anesthetic
2. Placement of rubber dam
3. Suture removal
4. Orthodontic removal
5. Orthodontic adjustments
6. Dental X-rays
7. Shedding of primary teeth

Dr. Ali said these tables are important!

VGS, NVS, streptococcus MIC (ug/ml)	Native valve	Prosthetic valve
<0.1	PenG or Ceph3 4wk	PenG 6wk plus Gent 2wk
>0.1 —0.5	PenG 4wk plus Gent 2wk	PenG 6wk Plus Gent 4wk
>0.5	PenG or Amp plus Gent for 4-6 wk	Total 6 wk
MSSA/ MRSA: Most common org	Cloxacillin / Vancomycin 4-6 wk +/- gent X 3-5d	Cloxacillin / vancomycin 6wk, gentamicin 2wk, rifampin 6 wk
IDU w/ R sided IE	Clox plus gent 2 wk, (not if complicated or febrile >lwk, large vegetations)	
HACEK	Cephalosporin 3rd generation for 4wk	6wk
Bartonella	Aminoglycoside and fluoroquinolones(or B-Lactam)	
Q-fever	Doxycycline +or-hydroxychloroquine 26 months until the titer below 1:400	35% surgical

Left valves are more serious
Treatment :
1- streptococci viridians; Penicillin , gentamycin
2-Staph.areus : Colaxcillin , Vancomycin
Prophylaxis is used usually for Dental , Rigid Bronchoscopy , Esophageal procedures , GI mucosal procedures , Cystoscopy , Prostate surgery. Antibiotics used for prophylaxis Clindamycin, Cephalexin , clarithromycin.

Doctor's Notes

- Dr. Ali note in Musculoskeletal block:
  - When I was in Canada I had a case of a 35 years old man who was drunk at the night and he had a fight with another man in the bar the other man bit him. A few days later he came to the ER suffering from fever, chest pain and joint pain culture was negative for the first few days. Days later the culture showed Eikenella corrodens and the diagnosis was "Septic Arthritis" and "Endocarditis"

Notes: Doctor's notes

- Infective endocarditis has 2 types Native , prosthetic:
1-native Acute: staph aureus (most common) , sub acute: streptococci viridians
2-Prothetic : staph epidermis
- General Risk factors: old age , HIV , Cardiac (valvular Heart diseases) , bad dental hygiene , DM, IV drug uses , congenital heard disease.
- Moderate Risk factors: stenosis , prolapse.
- High Risk factors : Rheumatic valve , prosthetic valve
- There has to be bacteremia in order for endocarditis to occur , YOU MUST do a minimum of 3 blood cultures
-Physical examination signs Fever , Murmur , Positive Blood cultures , thrombus
-Infection of the endocardium is very serious.
-I.V drug user at a high risk. *I want you to remember they are at risk *
-20% to 30% of patients with S.aureus bacteremia develop Nosocomial Infective Endocaditis
-IE can be acute, chronic, and subacute. *only focus on acute and subacute*
-Acute IE patients usually develops within 1-3 days present with Heart failure, shortness of breath and high fever. They seem to be very sick.
---Mainly staph organisms "staph. aureus"
-Subacute will develop over weeks. They will have vomiting, loose of weight, nausea and they will start to have shortness of breath and mild fever.
-Don't worry about numbers.
-I.V drug users have right sided Endocarditis.
=Poor hygiene is risk factor that's why we give them prophylactics before procedures.

-HACEK organisms grow slowly so they will keep it in the lab for additional 2 weeks. طلب منتا نحفظ اسمائهم
Dr. Ali asked this question: What is indication of surgery in patients with endocarditis? To correct any damage and to treat serious Abnormalities.

Notes: Doctor's notes

متى نحتاج نسوي سيرجيري عشان نأخذ عينة من الفالف؟
1) Heart Failure 2) not Responding to medical treatment
3) Recurrent systemic emboli (we have stop it by the surgrey)
also in case some pathogen ------> pseudomonas , fungi ,coxiella and Entrococci

Left valves are more serious
- Treatment :
- 1- streptococci viridians; Penicillin , gentamycin
- 2-Staph.areus : Colaxcillin , Vancomycin
- Prophylaxis is used usually for Dental , Rigid Bronchoscopy , Esophageal procedures , GI mucosal procedures , Cystoscopy , Prostate surgery. Antibiotics used for prophylaxis Clindamycin, Cephalexin , clarithromycin.

-For diagnosis: Simple for majority of them : take as much as you can of blood cultures, at different intervals.
SAQالجاي قال انه سؤال
-Q1/ A patients with sign of Endocarditis comes to the ER, what's the first thing you do to him?
You take his history and then physical exams and then microbiological exam "lab culture and urine analysis" and then other laboratory test including CBC and chemistry tests followed by Echocardiogram and then ECG.
-Q2 what is the most likely organisms:
If acute Staph.aureus mostly , viridians may cause it but it is less common . HACEK organisms are possible but it's less common In acute as well.
-if he has prosthetic valves then:
causative organisms are coagulase negative staph in early cases
in later diseases it will be S.aureus
If he tells you he had a surgery 3 days ago or even a week and he presented with shortness of breath, what is the mostly organism? Coagulase - , late onset?>> Staph.aureus.

If the patient has splinter hemorrhage +fever+ vegetation= infective endocarditis
If the patient has splinter hemorrhage +fever+ animal bite= infective endocarditis

Quiz

1-Intravenous drug abuse IE affect which of the following valve in the heart?
A-bicuspid valve (mitral valve)
B-tricuspid valve
C-aortic valve
D- pulmonary valve

2-Saad 20 year he has endocarditis and he was took Iv drugs which of the following causative organism?
A-*S.areus*
B-fungi
C-*Streptococcus Viridans*
D-*S.epidermidis*

3-Which of the following is used to treatment endocarditis caused by HACEK?
A-cefuroxime
B-cephalexin
C-ceftriaxone
D-cefaclor

4-Which of the following clinical features is characterized by erythematous nodule and painful ?
A-petechiae B-osler's Node

C-Janeway lesions D-splinter hemorrhage

5-Omar 40 years old and he has endocarditis we do culture and after 3 days nothing appears and they were sure it is IE (negative culture IE) which of the following organism cause it ?
A-*S.areus* B-*S.epidermidis*
C-*S.pneumonia* D-*Kingella spp*

6-Which of the following cause endocarditis after genitourinary or gut procedures ?
A-*S.faecalis* B-*S.pneumonia*
C-*S.mutnas* D-*Legionella*

7-Mohammed 25 years old he complaine from low grade fever ,Anorexia ,weight loss and fatigue and we do blood culture and then gram stain we found Gram + cocci in chain which of the following is best treatment to use?

A-penicillin + gentamycin B-cephalosporins third generation
C-aminoglycoside+ flouroquinolone D-cloxacillin + vancomycin

8-How many blood culture we have to obtain to diagnosis of the IE ?
A-1
B-3
C-4
D-5

1)B 2)A 3)C 4)B 5)D 6)A 7)A 8)B

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