

Infective Endocarditis

Objectives :

- Understand Infective Endocarditis definition
- Pathophysiology of endocarditis
- Diagnostic criteria of infective endocarditis
- Recognize the risk factors, signs, and symptoms of infectious endocarditis.
- Anticipate possible complications of infective endocarditis
- Treatment of endocarditis and appreciation of the necessity of rapid treatment.
- Endocarditis prophylaxis

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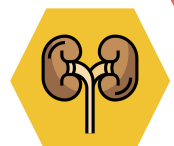
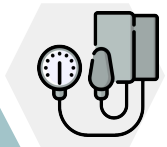
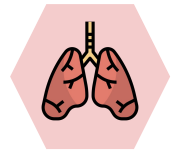
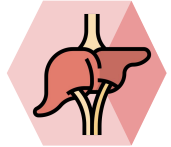
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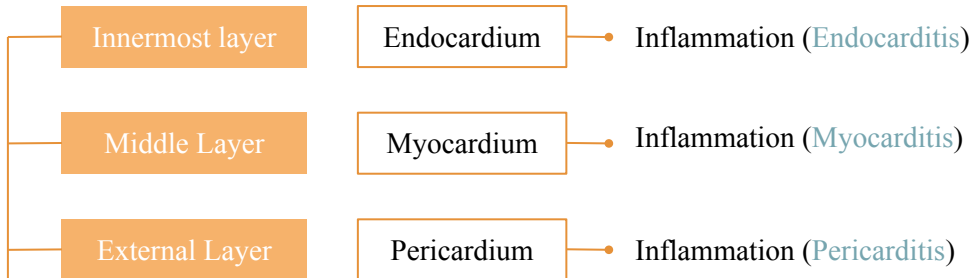
Resources :

436 + 437 slides



Overview of Infective Endocarditis (IE)

The heart wall composed of three layers which includes:



Pancarditis is the inflammation of all layers of the heart.

Inflammatory process whatever it is infective or noninfective it can affect any layer of the heart.

Heavily influenced by the epidemiology of the infection:



Developed countries; acute illness, *Staphylococcus aureus*, with **numerous** anatomic sites of **metastatic foci** of infection and **worse outcomes**.

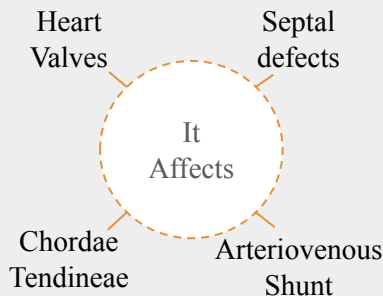


Developing countries (endemic RF); Subacute course, *viridans group streptococci*.

Infective Endocarditis is an infection of the endocardial surface of the heart, which may include; one or more heart valves (native or prosthetic), the mural endocardium, a septal defect or an intracardiac device.

This leads to formation of bulky friable vegetation composed of thrombotic debris and organisms. Often associated with destruction of the underlying cardiac tissue.

- IE develops most commonly on the **mitral valve**, closely followed in descending order of frequency by the aortic valve, combined mitral & aortic valve, tricuspid valve & rarely, the pulmonic valve.
- Mechanical prosthetic & bioprosthetic valves exhibit equal rates of infection.
- More common in **males**



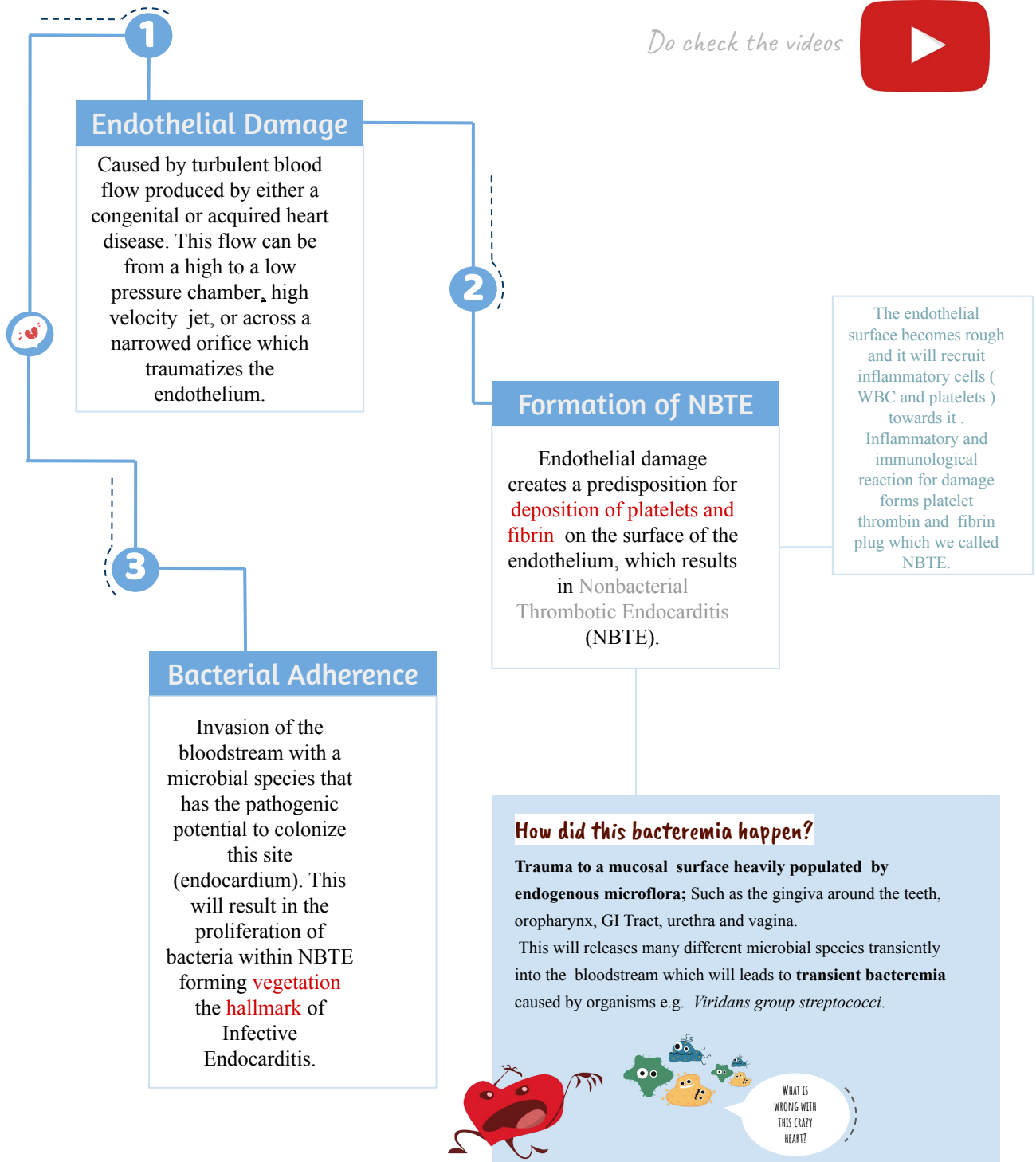
Infective endocarditis can affect :

- 1- valvular apparatus including chordae tendineae & papillary muscle
- 2- endocardium inside wherever there is congenital or structural abnormality. Eg Interatrial septum defect : which can create a shunt Interventricular septum defects
- 3- additional structure like prostheses ; for example if patient has VSD closed with dacron artificial patch (not animal patch) , this patch becomes part of endocardium and can be part of endocarditis as well.

Pathogenesis of IE

Infective endocarditis is the net result of the complex interaction between multiple factors:

- 1- The bloodstream pathogen.
- 2- Matrix molecules (fibrin and thrombin) interact with platelets at sites of endocardial cells damage forming **VEGETATION** which is the **hallmark** of endocarditis.



Determining Risk (important)

Well now we know the risk factors, but what does it mean? It means I can now assess the risk of infective endocarditis in patients and according to it proceed with antibiotic prophylaxis based on if patient is high risk + the type of procedure they will undergo. Determining the risk depends on:

1-Presence or absence of a cardiac condition.

2-The type of **procedure** to be done (mainly deep dental manipulation)

IMPORTANT: You need to know the high risk patients that need antibi prophylaxis for high risk procedures.

High risk and need of antibiotic prophylaxis

Low risk and no need for antibiotic prophylaxis

Dental procedures requiring manipulation of gingival or periapical region of teeth or perforation of oral mucosa

A- Prosthetic cardiac valves or prosthetic material used for cardiac valve repair (400x risk , Highest risk)

B- History of previous endocarditis.

C- Congenital heart defect such as Complex cyanotic disease (Current or prior corrected)

- Unrepaired cyanotic CHD, including palliative shunts/conduits
- Repaired CHD with prosthetic material or device, whether placed surgically or by catheter intervention during first 6 months after the procedure
Re-endothelialization takes up to 6 months, so antibiotic prophylaxis is needed.
- Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch/prosthetic device that inhibits endothelialization

D- Cardiac transplant with valve regurgitation due to a structurally abnormal valve (develop cardiac valvulopathy).

Antibiotic prophylaxis is not recommended in any other form of valvular or congenital heart disease

1-Acquired Valvular heart disease with stenosis or regurgitation.

2-Hypertrophic cardiomyopathy.

3-IV drug abuser.

4-Respiratory Tract procedures.

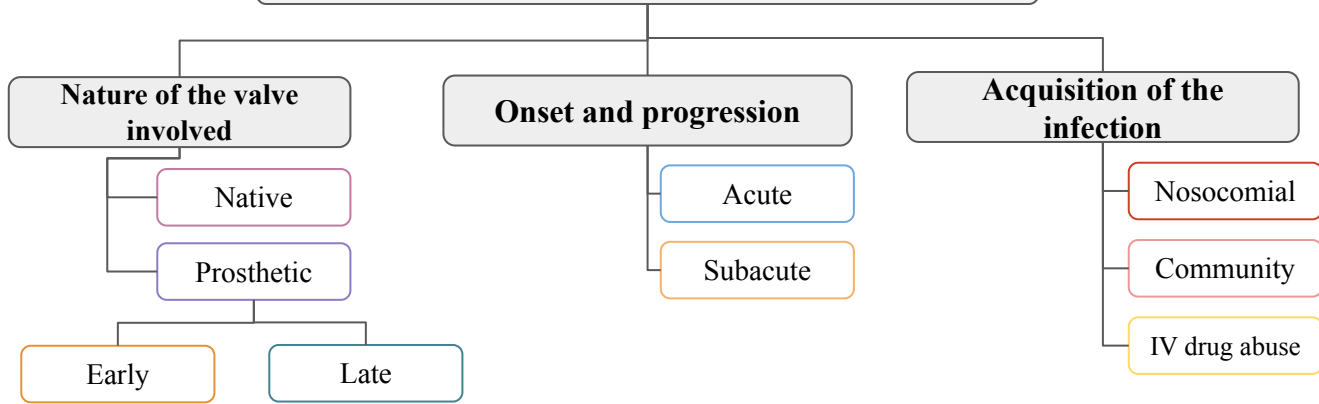
5-GIT or urogenital procedures.

6-Skin and soft tissue procedures.

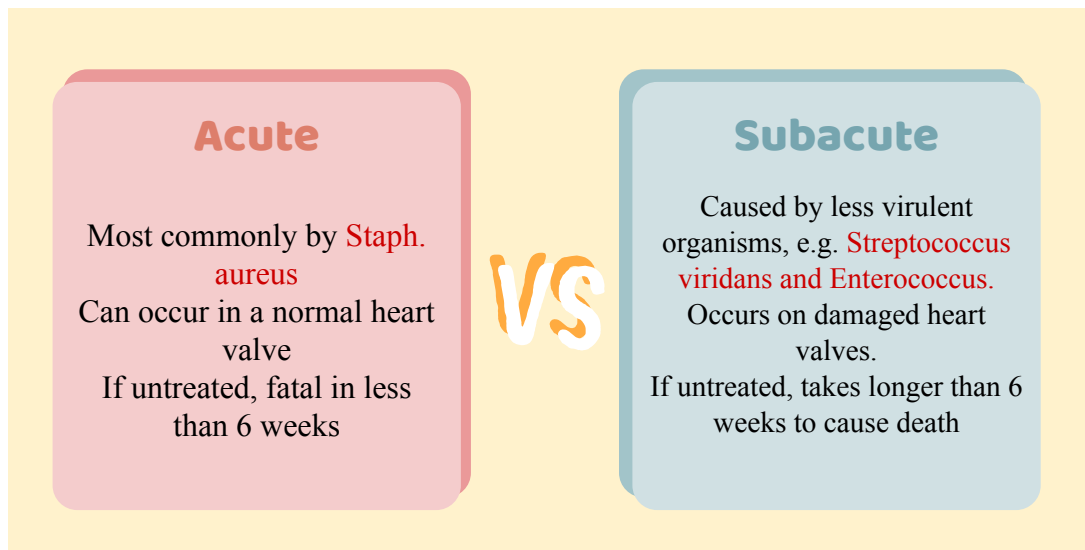
Risk Factors of IE

Patient Factors	Comorbid Conditions
• Age >60 years	• Structural heart disease
• Male sex	• Valvular disease
• Injection drug use	• Congenital heart disease
• Poor dentition or dental infection	• Prosthetic heart valve(s)/TAVR
	• History of infective endocarditis
	• Intravascular device
	• Cardiac implantable electronic device
	• Chronic hemodialysis
	• HIV infection

Classification of IE (classified according to)

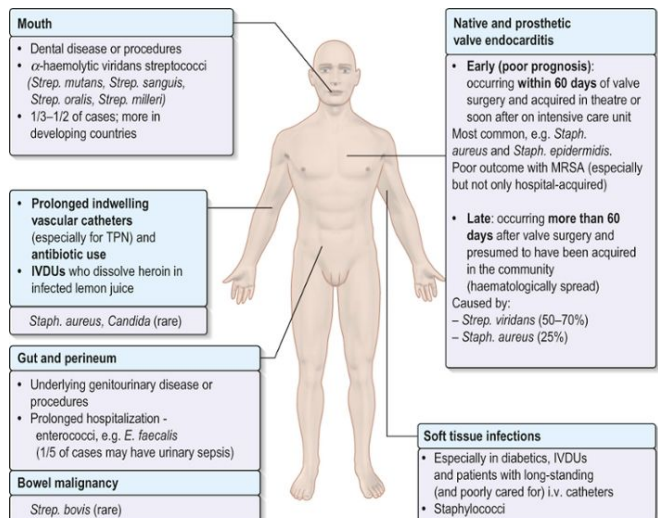


Acute vs. Subacute IE



Others:

- Which one is more risky native or prosthetic valve?
Answer is prosthetic, because it is a metal so there is no blood supply and blood cannot reach it. Thus, antibiotics also cannot reach the valves.



Vary depending on the population:

IV drug abuser

Patients with PHV¹

Hospital acquired vs
Community acquired



The three most common causes of IE worldwide are:

Staphylococci

Streptococci

Enterococci

It is the most common cause of IE in:
-The US & most developed countries.
-Health care-associated IE

Streptococcal IE is a common cause of community-acquired IE

★ IE MOST COMMON causative organism: *Streptococcus viridans*
★ If a patient went through a cardiac surgery then he got infected with IE think about the period of time, if it happened within 60 days after surgery then it is STAPH, if more than 60 days then it is STREPTOCOCCUS viridans.

★ *Staphylococcus aureus* : 1) Drug abusers. 2) Immediate postoperative period.
★ Patient with *Streptococcus bovis* IE are associated with colonic cancer, consult GI if blood cultures are positive for it.

Native Valve Endocarditis

IV Drug Abusers

Prosthetic Valve Endocarditis

1. **Streptococci: Viridans streptococci (50 - 70%).** (The most common organism)
2. **Staphylococci:** Mostly Coagulase +ve *Staph. Aureus* Or *Staph. Epidermidis* (25%)
3. **Enterococci** (10%)
4. **HACEK:** (If blood culture is negative but there is still signs of IE keep the culture for 14 days, as they HACEK group have delayed growth)
 - Treatment: ceftriaxone
 - *Haemophilus species*
 - Actinobacillus*
 - Actinomyces comitans*
 - Cardiobacterium hominis*
 - Eikenella Kingella*

- 1- ***Staph aureus*** (because it's on the skin) 60%. Skin is the most predominant source of infection. 70 - 100% of Right sided IE results in pneumonia and septic emboli. It commonly affects tricuspid valve.
2. **Streptococci and Enterococci** (20%)
3. **Gram -ve bacilli** (10%)
4. **Fungi** (*Candida* and *Aspergillus*) (5%).

If a **YOUNG man** comes to you with fulminant endocarditis, **SUSPECT DRUG ABUSE !!** then check for an evidence. There may be **NO underlying cardiac condition.** ***Staphylococcus aureus*** is the causative organism in drug abusers. 70-100% will have septic embolization and pneumonia.

A. Early onset: (< 12 months after surgery)

- Reflects perioperative contamination
- Incidence around 1% .
- Microbiology: → ***Staph. Epidermidis*, (30%) *Staph. Aureus* (20%).**

2. **Gram -ve aerobes** (20%) 3. **Fungi** (10%) 4. **Strep and Entero** (5-10%)

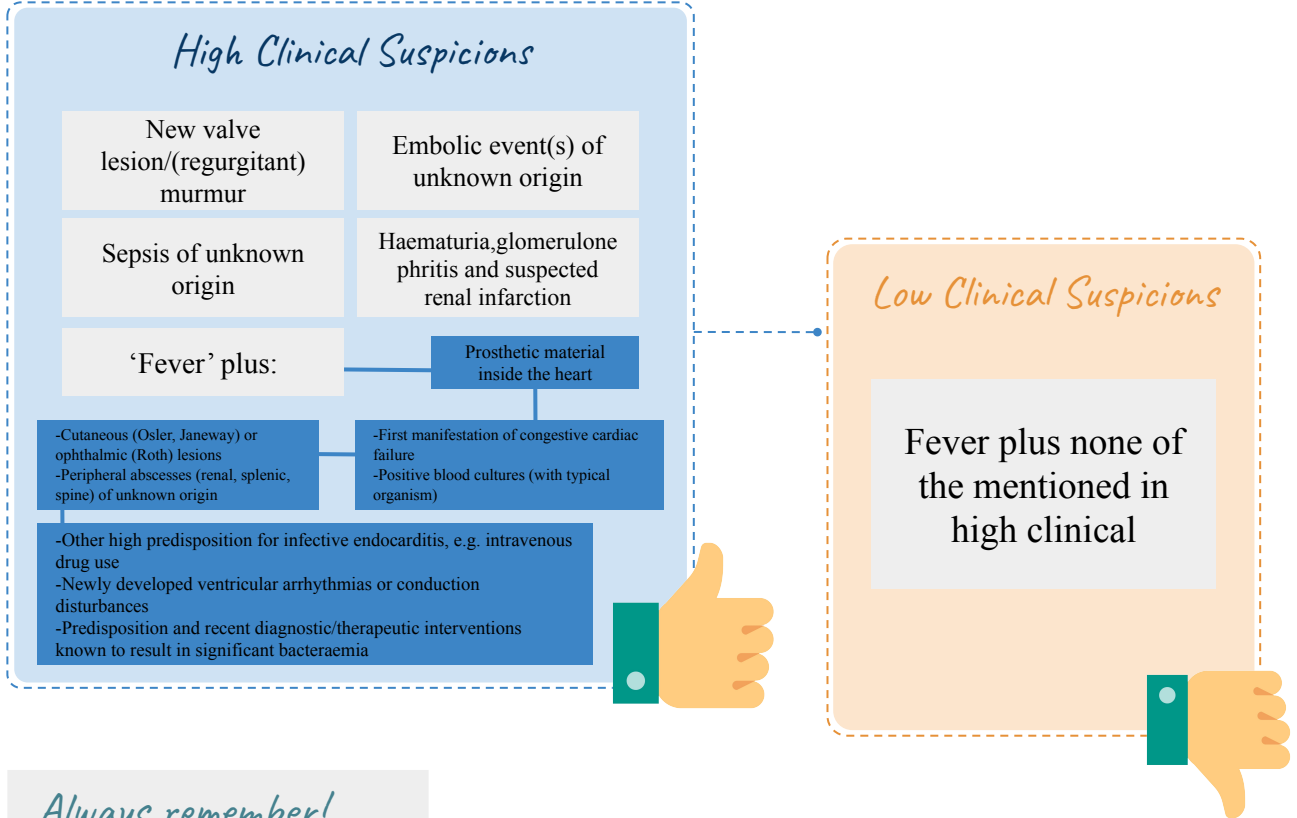
B. Late onset: > 12 month after surgery

- After endothelialization
- Incidence 0.2 -0.5 % / pt. year.
- Transient bacteraemia from dental, GI or GU.

• **Microbiology : – resembles native valve endocarditis → Streptococci**

Clinical Features of IE:

The clinical presentation of infective endocarditis is dependent on the organism and the presence of predisposing cardiac conditions. Infective endocarditis may occur as an acute, fulminating infection but also as a chronic or subacute illness with low-grade fever and nonspecific symptoms. A high index of clinical suspicion is required to identify patients with infective endocarditis and certain criteria should alert the physician.



Always remember!

F ever	J aneway lesions
R oth Spots	A nemia
O sler nodes	N ail bed hemorrhage
M urmur	E mboli



Do you know her?
?G

The onset is usually within 2 weeks of infection :

Indolent course

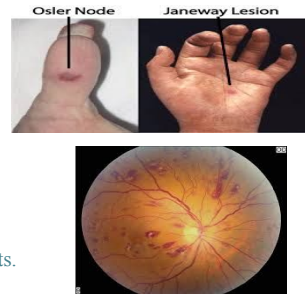
-fever, malaise, fatigue, night sweats, anorexia and weight loss. It is infective so, there will be fever, fatigue, malaise, lethargy, poor appetite and loss of weight (Constitutional Sx).

Explosive course

Congestive cardiac failure (CCF), new/changing murmur with severe systemic sepsis. Local destruction : vegetation complexes will cause damage to tissues which will result in mitral regurgitation, AR, papillary muscle destruction,..etc

Immunological manifestations
(They disappear with Abx)

- ★ **Osler's Nodes**: painful, red, raised lesions found on the distal hands and feet "PIC A"
- ★ **Roth Spots** "PIC B"(retinal hemorrhages with white or pale centers) (seen best in slit line exam)
- ★ **Glomerulonephritis** due to embolization to kidney
- ★ **+ve Rheumatoid Factor**
- Once you're suspecting IE, look for : Splinter hemorrhage, osler's node and roth spots.



Other clinical features

Vascular and septic emboli

- ★ **Splinter (Or subungual) Haemorrhages**. "See image"
- ★ **Musculoskeletal** (arthritis).
- ★ **Janeway Lesion** : painless hemorrhagic skin lesion in the palm and sole
- ★ **Sub-conjunctival Hemorrhage**
- ★ **Mycotic Aneurysm** embolization to Brain leads to stroke
- ★ **Arthritis**
- ★ **Hematuria** embolization to kidney



Others

- Splenomegaly
- Petechiae (conjunctival, buccal mucosa, palate & skin in supraclavicular area) (can occur anywhere)
Petechiae: bleeding under the mucus

Investigation:



Hematology

- CBC for leukocytosis or anemia (anemia because of hematuria and bleeding under the skin and eyes)
- ESR High (sensitive), all IE patients will have high ESR
- Blood cultures +ve for suspected organisms



Nephrology

- Renal Function Because there could be glomerulonephritis and causes AKI (increase in creatinine)
- Urinalysis for hematuria or bacteriuria



Cardiac

- ECG for conduction defects (AV blocks due to paravalvular abscess compression)
- Chest X-ray for septic abscess in the lung secondary to embolization, Heart failure
- ★ **Echocardiogram: GOLD STANDARD** for vegetations. If TTE does not detect it, we can do TEE

Diagnostic Criteria of IE (Duke Criteria):

Major Criteria

1 Blood Culture positive for IE (Need to be taken from different sites):

A- Typical microorganisms consistent with IE from 2 separate blood cultures

- viridans streptococci, streptococcus gallolyticus (S. bovis), HACEK, staphylococcus aureus ;or
- Community acquired enterococci in the absence of a primary focus; or

B- Microorganisms consistent with IE from persistently positive blood cultures:

- ≥ 2 positive blood cultures of blood samples drawn >12 hrs apart; or

C- single positive culture for coxiella burnetii or phase I IgG antibody titre $> 1:800$

(Note that you need to collect both aerobic and anaerobic samples)

2 Imaging positive for IE:

A- Echocardiogram positive for IE:

- **Vegetation** : echo shows us the size and extension of vegetations
- Abscess , pseudoaneurysm ,intracardiac fistula
- Valvular perforation or aneurysm
- New partial dehiscence of prosthetic valve

B- Abnormal activity around the site of prosthetic valve implantation detected by F-FDG PET/CT (only if the prosthesis was implanted for >3 months) or radiolabeled leukocytes SPECT/CT.

C- Definite paravalvular lesion by cardiac CT.

Minor Criteria

1.Fever : defined as temperature $>38C$.

2.Echo Finding: (Any finding not involved in the major criteria) (calcifications for example)

3-Vascular Phenomena (including these detected only by imaging):

major arterial emboli , septic pulmonary infarcts , infectious (mycotic) aneurysm , intracranial hemorrhage , conjunctival hemorrhage and janeway's lesions.

4.Evidence from Microbiology : positive blood culture but does not meet a major criterion as noted above (in major criteria

1) or serological evidence of active infection with organism consistent with IE.

5.Risk factors and Predisposition: such as heart condition or injection drug user.

6.Immunological Phenomena : glomerulonephritis , osler's nodes , Roth's spots and Rheumatoid factor.

● **Valvular dehiscence is IE until proven otherwise.**

● **Blood culture and imaging +ve for IE are the most likely investigations that provide definitive diagnosis of IE.**

BE-FEVER

B Blood Culture +ve
E ENDOCARDIAL INVOLVEMENT
F FEVER
V VASCULAR PHENOMINA
EE EVIDENCE FROM MICROBIAL
R RISK FCTOR FOR IE VALVE DISEASE

Status of IE Diagnosis:



Definitive infective endocarditis

- **Pathologic criteria:**
Microorganisms or pathologic lesions:
demonstrated by culture or histology in a vegetation, or in a vegetation that has embolized, or in an intracardiac abscess.
- **Clinical criteria: (You need a positive blood culture or vegetations seen in echocardiography)**
Based on modified DUKE's criteria 2015 by either:
2 major criteria , 1 major + 3 minor criteria or 5 minor criteria.



Possible infective endocarditis

- findings consistent of IE that fall short of “definite”, but not “rejected”
- IE considered in presence of 1 major + 1 minor or 3 minor
- Based on the physician's experience, he/she will decide to diagnose and treat or not.



Rejected infective endocarditis

(like for example patient have the all manifestation but it is because other disease) (does not consider as IE) (According to the doctor it's not important)

- Firm alternate Diagnosis for manifestation of IE
- Resolution of manifestations of IE, with antibiotic therapy for ≤ 4 days
- No pathologic evidence of IE at surgery or autopsy, after antibiotic therapy for ≤ 4 days
- **SLE disease can cause Libman sacks endocarditis (non-infective endocarditis)**

Management of Infective Endocarditis



(Generally native valve 2-4 weeks, prosthetic valves 6-8 weeks)

MEDICAL (ANTIBIOTIC)

Principles of Medical Management: treat vegetations with antibiotics **prolonged , high dose and bactericidal.**

Acute onset

Blood culture and start treatment **within three hours** with your clinical suspicion of organism

Sub-acute onset

Blood culture then antibiotic can be started **within three days.**

Management of Infective Endocarditis



(Generally native valve 2-4 weeks, prosthetic valves 6-8 weeks)

MEDICAL (ANTIBIOTIC)

Penicillin Susceptible Streptococcus Viridans or Bovis

- Once daily **ceftriaxone** (third generation cephalosporin) (or i.v. penicillin G or i.v. amoxicillin) for 4 weeks ;or
- Ceftriaxone 2g for 2 weeks followed by oral **amoxicillin** for 2 weeks.
- In B-lactam allergic patients: Vancomycin. Prosthetic valve may need longer treatment durations

Methicillin susceptible Staphylococcus

- Flucloxacillin**
- (In b-lactam allergic patients: Vancomycin).**
- Empirical treatment depends on the mode of presentation, the suspected organism, and whether the patient has a prosthetic valve or penicillin allergy.
- If the presentation is acute, flucloxacillin and gentamicin are recommended, while for a subacute or indolent presentation, benzyl penicillin and gentamicin are preferred.
- If you suspect the patient to be **IVDU** use **vancomycin** to cover for MRSA.

SURGICAL

Whenever indicated for example in prosthetic valve infective endocarditis.

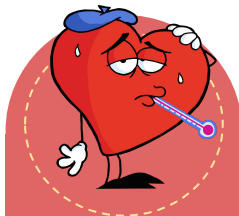
Indications for surgery :

- 1-Prosthetic valve endocarditis
- 2-large Vegetation
- 3-Embolization (recurrent while on antibiotics)
- 4-heart failure due to valve damage
- 5-Fungal Endocarditis
- 6-Abscess

Complications of IE



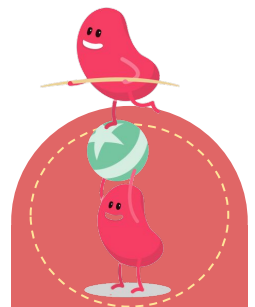
EMBOLIC



LOCAL SPREAD



METASTATIC SPREAD



FORMATION OF IMMUNE COMPLEXES

Complications of IE

Embolic

- Stroke: can either embolic or due to ICH from a ruptured mycotic aneurysm or **hemorrhagic transformation** of stroke. Major embolism to MCA (will lead to neurological manifestations 1/3 of cases)
- MI, PE (Septic emboli "Pulmonary cavitation")
- Ischemic limb, Mesenteric ischemia
- Splenic or renal infarction
- Digital infarcts

Risk factors:

- Size of vegetation (>10 mm)
- Left side vegetations
- Staph. Aureus
- Fungal pathogens

Uncommon after 2 weeks of effective treatment

Local spread

- 1-Congestive Heart failure (most common): Extensive valvular destruction, ruptured chordae tendineae, fistulas, valve obstruction, Myocarditis, Coronary artery embolism and MI (STEMI due to emboli)
- 2-Paravalvular abscess: Most common in aortic valve, IVDA, staph, aureus
- 3-AV block / conduction disorders: Myocardial abscesses
- 4-Pericarditis

Metastatic spread

- Rt. Sided vegetations:** Lung abscesses, Pyothorax / Pyo-pneumothorax
 - Lt. Sided vegetations:** Pyogenic Meningitis, Splenic Abscesses, Pyelonephritis, Osteomyelitis
 - Metastatic abscesses
 - Septic arthritis
 - Renal impairment and glomerulonephritis
- Vegetation can cause local destruction or distant embolisation

Formation of immune complexes

- Immune complex glomerulonephritis leading to ARF
- Arthritis
- As a result of immunological phenomena.



Persistence of Fever

causes. It is only Dr. Nouf's slides

- Abscess
- Septic embolization
- An extracardiac site of infection (native or prosthetic)
- Infected indwelling catheters or devices
- Inadequate antibiotic treatment of resistant organism
- An adverse reaction to the antibiotic therapy itself

Prophylaxis and Prevention

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Main Principles of Prevention

Prophylaxis

1. The principle of antibiotic prophylaxis when performing procedures at risk of IE in patients with predisposing cardiac conditions is maintained.
2. Antibiotic prophylaxis must be limited to patients with highest risk of IE undergoing the highest risk dental procedures.
3. **Good oral hygiene and regular dental review are more important than antibiotic prophylaxis to reduce the risk of IE.**
4. Aseptic measures are mandatory during venous catheter manipulation and during any invasive procedures in order to reduce the rate of healthcare-associated IE.
5. Whether the use of antibiotic prophylaxis is really associated with a change in the incidence of IE needs further investigations.
6. Avoid unnecessary use of antibiotic to reduce the resistance

Situation	Antibiotic	Single-dose 30–60 minutes before procedure	
		Adults	Children
No allergy to penicillin or ampicillin	Amoxicillin or Ampicillin ^a	2 g orally or i.v.	50 mg/kg orally or i.v.
Allergy to penicillin or ampicillin	Clindamycin	600 mg orally or i.v.	20 mg/kg orally or i.v.

^aAlternatively, cephalexin 2 g i.v. for adults or 50 mg/kg i.v. for children, cefazolin or ceftriaxone 1 g i.v. for adults or 50 mg/kg i.v. for children.

^cCephalosporins should not be used in patients with anaphylaxis, angio-oedema, or urticaria after intake of penicillin or ampicillin due to cross-sensitivity^c.

(if patient has cardiac disease problem and he will undergo procedure that could expose to bacteremia like tooth extraction we give antibiotic)

Summary

<p>Risk factors</p>	<ul style="list-style-type: none"> ● Prosthetic heart valves (Highest risk) ● Hx of infectious endocarditis ● Certain types of congenital heart disease ● Post-heart transplant (patients who develop a cardiac valvulopathy)
<p>Microbiology</p>	<ul style="list-style-type: none"> ● Staphylococcus Aureus: IV Drug Abuse, Aggressive, Acute. ● Staph. Epidermidis: Foreign body infection/Prosthesis, Nosocomial infections ● Strep. Bovis: Associated w/ polyps and colon cancer, Very sensitive to Penicillin ● HACEK: Long IP
<p>Clinical Features</p> <p>FROM JANE</p>	<p>F- FEVER (Most common) R- ROTH SPOT O- OSLER NODE M- MURMUR J- JANEWAY LESION A- ANEMIA N- NAIL HG (SPLINTER HG) E- EMBOLI</p> <ul style="list-style-type: none"> ● Osler nodes, Roth spot, Gomeriolo-nephritis, Rheumatoid factor + are immunological reactions ● Remember: IVDA infective endocarditis almost always results in septic emboli and pneumonia, TV is most commonly involved
<p>Investigations</p>	<ul style="list-style-type: none"> ● Generally: <ul style="list-style-type: none"> ○ CBC ○ ESR and CRP. CRP can help in monitoring response to therapy (follow up) ○ Blood cultures (MOST IMP) ○ Renal Function Test ○ Urinalysis (hematuria/proteinuria) ○ Echocardiogram (TEE or TTE) ○ Serology for culture negative IE ● To detect complications: <ul style="list-style-type: none"> ○ ECG ○ CXR ○ CT brain ○ MRI
<p>Treatment</p>	<ul style="list-style-type: none"> ● Penicillin susceptible VGS or bovis: <ul style="list-style-type: none"> ○ Ceftriaxone or Penicillin G ○ If B-lactam allergic: Vancomycin ● Oxacillin susceptible Staphylococcus: <ul style="list-style-type: none"> ○ Flucloxacillin or oxacillin ○ If allergic to penicillin: Cefazolin ● Oxacillin resistant Staphylococcus <ul style="list-style-type: none"> ○ Vancomycin
<p>Prophylaxis (procedures that involve gingival manipulation)</p>	<ul style="list-style-type: none"> ● Conditions in which prophylaxis is indicated: <ul style="list-style-type: none"> ○ Prosthetic heart valves (Highest risk) ○ Hx of infectious endocarditis ○ Certain types of congenital heart disease ○ Post-heart transplant (patients who develop a cardiac valvulopathy) ● Rx: <ul style="list-style-type: none"> ● Amoxicillin or Ampicillin ● If allergic: Clindamycin

Questions:

Q1: Which of the following is a major Modified Duke Infective Endocarditis criterion?

- A. Fever > 38C
- B. Intravenous drug use
- C. Osler's nodes
- D. Positive blood culture

Q2: A patient that recently had mitral valve replacement (38 days ago) was admitted to the clinic with persistent fever and malaise. Endocarditis is suspected, and the most likely etiology is:

- A. Group A streptococci
- B. Viridans streptococci
- C. Staphylococcus epidermidis
- D. Enterococcus faecalis

Q3: In a patient with subacute endocarditis, which of the following laboratory findings do not support the diagnosis?

- A. Normocytic, normochromic anemia
- B. Proteinuria
- C. Decreased erythrocyte sedimentation rate
- D. Thrombocytopenia

Q4: The following situations may lead to "culture negative" endocarditis except:

- A. The use of antibiotics prior to blood culture sampling.
- B. Subacute left-sided infective endocarditis
- C. Nonbacterial organisms
- D. gram-negative bacteria from the HACEK group

Q5: You are volunteering with a dental colleague in a community indigent clinic. A nurse has prepared a list of patients who are scheduled for a dental procedure and may need antibiotic prophylaxis beforehand. Of the patients listed below, who would be most likely to benefit from antibiotic prophylaxis to prevent infective endocarditis?

- A. 17-year-old adolescent boy with coarctation of the aorta
- B. 26-year-old woman with a ventricular septal defect repaired in childhood
- C. 42-year-old woman with mitral valve prolapse
- D. 65-year-old man with prosthetic aortic valve

Answers:

- 1. D
- 2. C
- 3. C
- 4. B
- 5. C

Questions:

Q6: A 69-year-old man with rheumatic heart disease presents to the emergency department complaining of a fever and weakness on his left side. On physical examination the patient is weak in his left upper extremity and he draws only the right half of a clock. Shortly after his presentation, the patient dies, and an autopsy revealed vegetations in his native mitral valve. Which of the following is a risk factor for the vegetations?

- A. Coronary artery disease
- B. Hypertension
- C. Mitral valve prolapse
- D. Prolonged bedrest

Q7: Which of the following peripheral manifestations causes painless plaques when it occurs?

- A. Janeway lesions
- B. Osler nodes
- C. Petechiae
- D. Splinter hemorrhage

Q8: A 27 year old male with history of IV drug abuse presents to the emergency department complaining of fever and shortness of breath. Upon examination it is revealed that he has painful red nodes on his hands, he also has subconjunctival hemorrhage and splinter hemorrhage. Which one of the following is the most likely causative organism?

- A. Group A streptococci
- B. Viridans streptococci
- C. Staphylococcus aureus
- D. Enterococcus faecalis

Q9: Which one of the following drugs should be used to treat infective endocarditis caused by staphylococcus aureus in a patient allergic to penicillin?

- A. Ceftriaxone
- B. Nafcillin
- C. Daptomycin
- D. Cefazolin

Answers:

- 6. C
- 7. A
- 8. C
- 9. D

Questions:

Q10: Which of the following would be the most appropriate oral prophylactic antibiotic for a patient who is allergic to penicillin?

- A. Amoxicillin
- B. Ceftriaxone
- C. Clindamycin
- D. Vancomycin

Q11: Which of the following statements is false regarding IE?

- A. Coagulase-negative staphylococci are the predominant organism causing PVE.
- B. Patients with HACEK organisms present acutely.
- C. IVDUs are at an increased risk of developing IE caused by less common organisms.
- D. A patient is more likely to present as a culture-negative if recently received antimicrobials.

Q12: A 40-year-old male patient presents to the emergency room with a 1-week history of fever, rigors, and generalized weakness. The patient denies recent travel or sick contacts but admits to intravenous drug use. On examination, he has splinter and subconjunctival hemorrhages. Cardiac examination shows a holosystolic murmur over the left lower sternal border. There are no other localizing signs. Chest x-ray and urinalysis are negative. After obtaining blood cultures, the patient is started on intravenous antibiotics and admitted to the medical floor. Twenty-four hours later, all sets of blood culture grow gram-positive cocci in clusters. A transthoracic echocardiogram is negative for vegetations. Which of the following is the best course of action?

- A. Place a peripherally inserted central catheter (PICC) and start vancomycin.
- B. Repeat blood cultures to confirm the positive cultures were not contaminants.
- C. Order a transesophageal echocardiogram.
- D. Order a three-phase bone scan.

Answers:

- 10. C
- 11. B
- 12. C