Infective Endocarditis

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AGENDA

- Definition
- Path-physiology
- The risk factors
- Clinical features
- Diagnosis
- Treatment
- Complication
- Prevention

Infective Endocarditis

Definition :

Infection of endothelium surface of heart either of

1. Heart valves .
2. Septal defects.
3. Chordae Tontine .
4. A.V shunt.

It remains a life-threatening disease with significant mortality (about 20%) and morbidity.

Pathogenesis of IE-1

The IE is the net result of the complex interaction between the bloodstream pathogen with matrix molecules and platelets at sites of endocardial cells damage.

Pathogenesis of IE-2

Endothelial damage

Turbulent blood flow produced by certain types of congenital or acquired heart disease, such as flow from a high- to a low-pressure chamber or across a narrowed orifice, traumatizes the endothelium.

Formation of nonbacterial thrombotic endocarditis (**NBTE**)

Endothelial damage creates a predisposition for deposition of platelets and fibrin on the surface of the endothelium, which results in NBTE.

Bacteremia

Invasion of the bloodstream with a microbial species that has the pathogenic potential to colonize this site ,then result in Proliferation of bacteria within a vegetation and form IE.

Pathogenesis of IE-3

Transient Bacteremia

Mucosal surfaces are populated by :
Dense endogenous microflora.

Trauma to a mucosal surface like:

Gingiva around teeth,
Oro-pharynx,

GI tract,
Urethra,
Vagina,

This will releases many different microbial species transiently into the bloodstream which will leads to Transient bacteremia caused by organism e,g Veridans group streptococci

Pathogenesis: summery-1

Endothelial damage

1.High velocity jet
2.Flow from high pressure to low pressure chamber
3.Flow across narrow orifice of high velocity

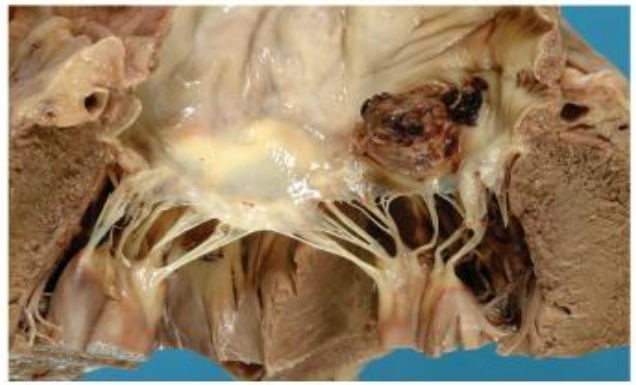
Platelet-fibrin thrombi
(Nonbacterial Thrombotic endocarditis)

Mucosal surface damage - dental

Microorganism adherence (BTE)

Local vegetation

EXTENSON , Perivalvular ,Destructive valve, fistula **and embolization**



Determining Risk of IE

- Cardiac conditions
- Type of Procedure

Cardiac Conditions – High Risk[1]
Old recommendation

- Prosthetic Valves (400x risk[2])
- Previous endocarditis
- Congenital heart disease
  - Complex cyanotic disease (Tetralogy, Transposition, Single Ventricle)
  - Patent Ductus Arteriosus
  - VSD
  - Coarctation of aorta

- Valvular: not included as per now
  - Aortic Stenosis/ Aortic Regurgitations
  - Mitral Regurgitation
  - Mitral Stenosis with Regurgitations

[1]Durack, et al. NEJM 1995

[2]Steckleberg, et al. Inf Dis Clin N Amer 1993

Mod Risk per 1997 AHA guidelines

Cardiac conditions at highest risk of IE

2015 recommendations

Recommendations	Class	Level
Antibiotic prophylaxis should only be considered for patients at highest risk of IE: 1. Patients with any prosthetic valve, including a transcatheter valve, or those in whom any prosthetic material was used for cardiac valve repair. 2. Patients with previous IE. 3. Patients with congenital heart disease. a. Any cyanotic congenital heart disease. b. Any type of congenital heart disease repaired with a prosthetic material whether placed surgically or by percutaneous techniques, up to 6 months after the procedure or lifelong if residual shunt or valvular regurgitation remains.	IIa	C
Antibiotic prophylaxis is not recommended in other forms of valvular or congenital heart disease.	III	C

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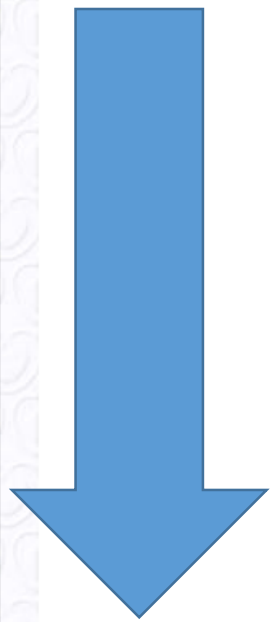
Procedures at highest-risk of IE

Recommendations	Class	Level
A. Dental procedures • Antibiotic prophylaxis should only be considered for dental procedures requiring manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa.	IIa	C
• Antibiotic prophylaxis is not recommended for local anaesthetic injections in non-infected tissues, treatment of superficial caries, removal of sutures, dental X-rays, placement or adjustment of removable prosthodontic or orthodontic appliances or braces, or following the shedding of deciduous teeth or trauma to the lips and oral mucosa.	III	C
B. Respiratory tract procedures • Antibiotic prophylaxis is not recommended for respiratory tract procedures, including bronchoscopy or laryngoscopy, transnasal or endotracheal intubation.	III	C
C. Gastrointestinal or urogenital procedures or TOE • Antibiotic prophylaxis is not recommended for gastroscopy, colonoscopy, cystoscopy, vaginal or caesarean delivery or TOE.	III	C
D. Skin and soft tissues procedures • Antibiotic prophylaxis is not recommended for any procedure.	III	C

2015 recomendations



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Prophylaxis against IE ACC 2017

Is reasonable before dental procedures that involve manipulation of:

- gingival tissue, peri-apical region of teeth, or perforation of the oral mucosa

  in patients with the following:

1. Prosthetic cardiac valves, including trans-catheter-implanted prostheses & homografts.

2. Prosthetic material used for cardiac valve repair, such as annuloplasty rings & chords.

3. Previous IE.

4. Unrepaired cyanotic congenital heart disease or repaired congenital heart disease, with residual shunts or valvular regurgitation at the site of or adjacent to the site of a prosthetic patch or prosthetic device.

5. Cardiac transplant with valve regurgitation due to a structurally abnormal valve.

CLASSIFICATION OF IE

- Type of lesion
  - *Native. Congenital*
  - *Prosthetic.*
- Onset & progress
  - *Acute.*
  - *Sub acute.*
- Acquire of infection
  - *Nosocomial* .
  - community

DIAGNOSIS OF IE

Clinical suspension

Blood culture

Echocardiography

Clinical Features-1

Onset usually within 2 weeks of infection

› **Indolent course:**

-fever

- **Malaise**
- **Fatigue**
- **Night sweats**
- **Anorexia**
- **Weight loss**

› **Explosive course:**

- CCF , murmur new onset or changing characters,
with severe systemic sepsis

Other Clinical Features-2

- Spleno-megaly ~ 30%
- Petechiae 20 - 40%
  - Conjunctivae
  - Buccal mucosa
  - palate
  - Skin in supra-clavicular regions
- Osler's Nodes 10 - 25%
- Splinter Haemorrhages 5 - 10%
- Roth Spots ~ 5%
- Musculoskeletal (arthritis)

Immonuligical

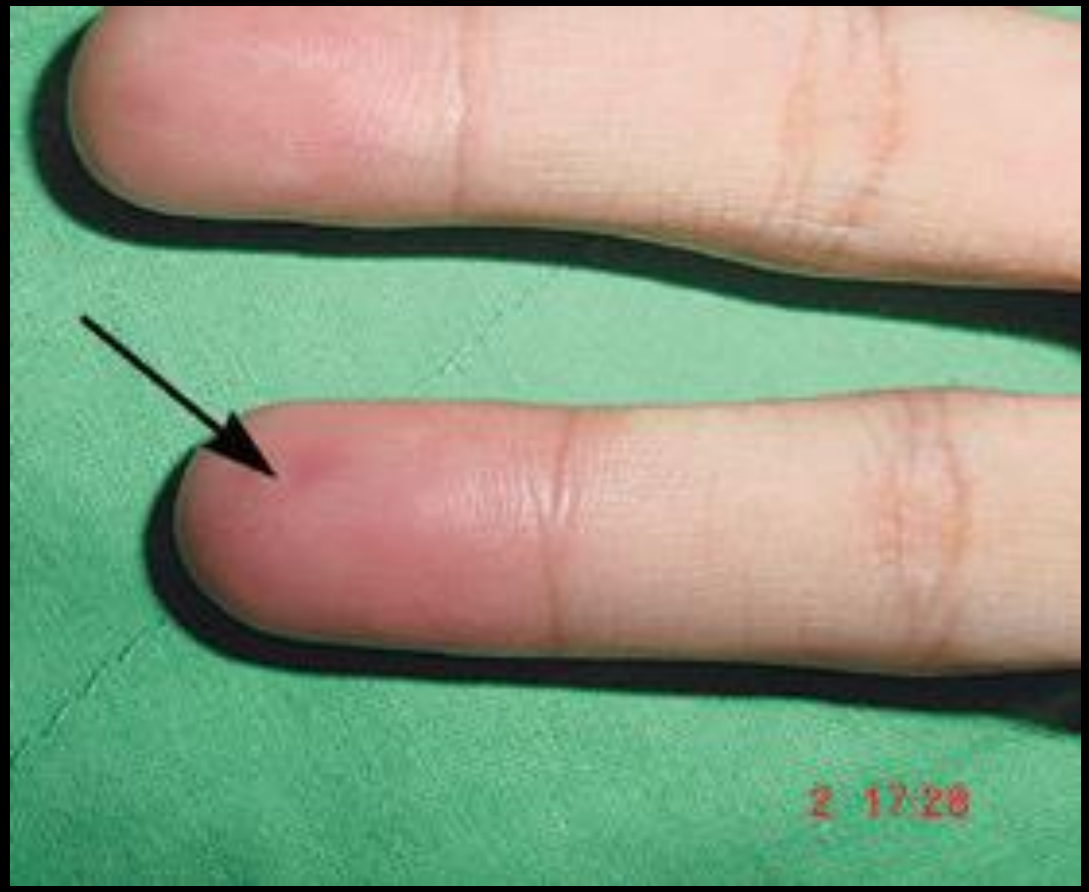
- Osler nodes
- Roth spot
- Gomeriolo-nephritis
- Rheomatoid factor +

Vascular and septic emboli

- Splinter hemorrhage
- Janway lesion : painless skin lesion in the palm and sole.
- Sub-conjuctival hemorrhage
- Mycotic aneurysm
- Arthritis
- hematurea

Clinical features- immunological phenomina (glumerolo-nephriti, osler nodes, roth spot , RF +ve)

Osler nodes , painful lesion in distal finger



Roth Spots

Vascular Phenomina -Septic emboli

Janway , vascular Painless hemorrhagic cutaneus lesion in the palm and sole

Splinter hg

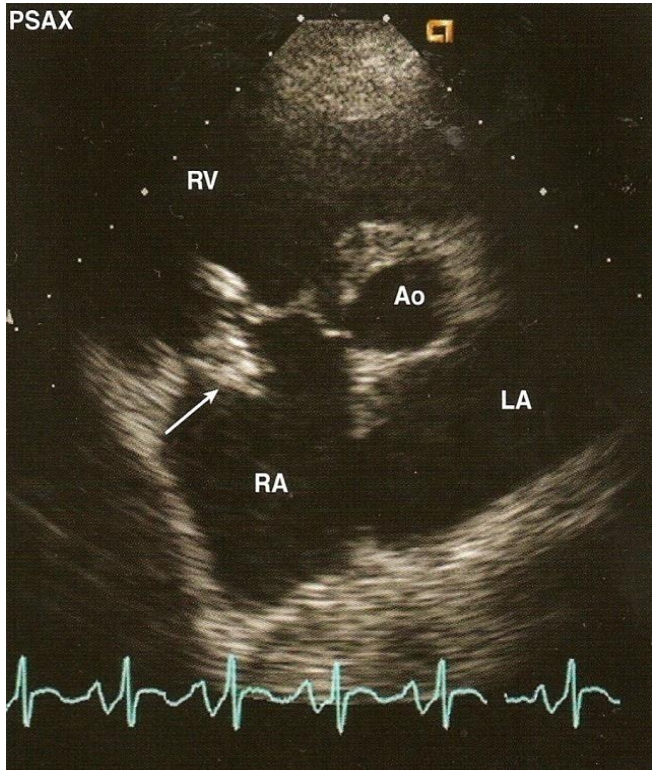
Subconjunctival Hemorrhages

A common mnemonic for the signs and symptoms of endocarditis FROM JANE

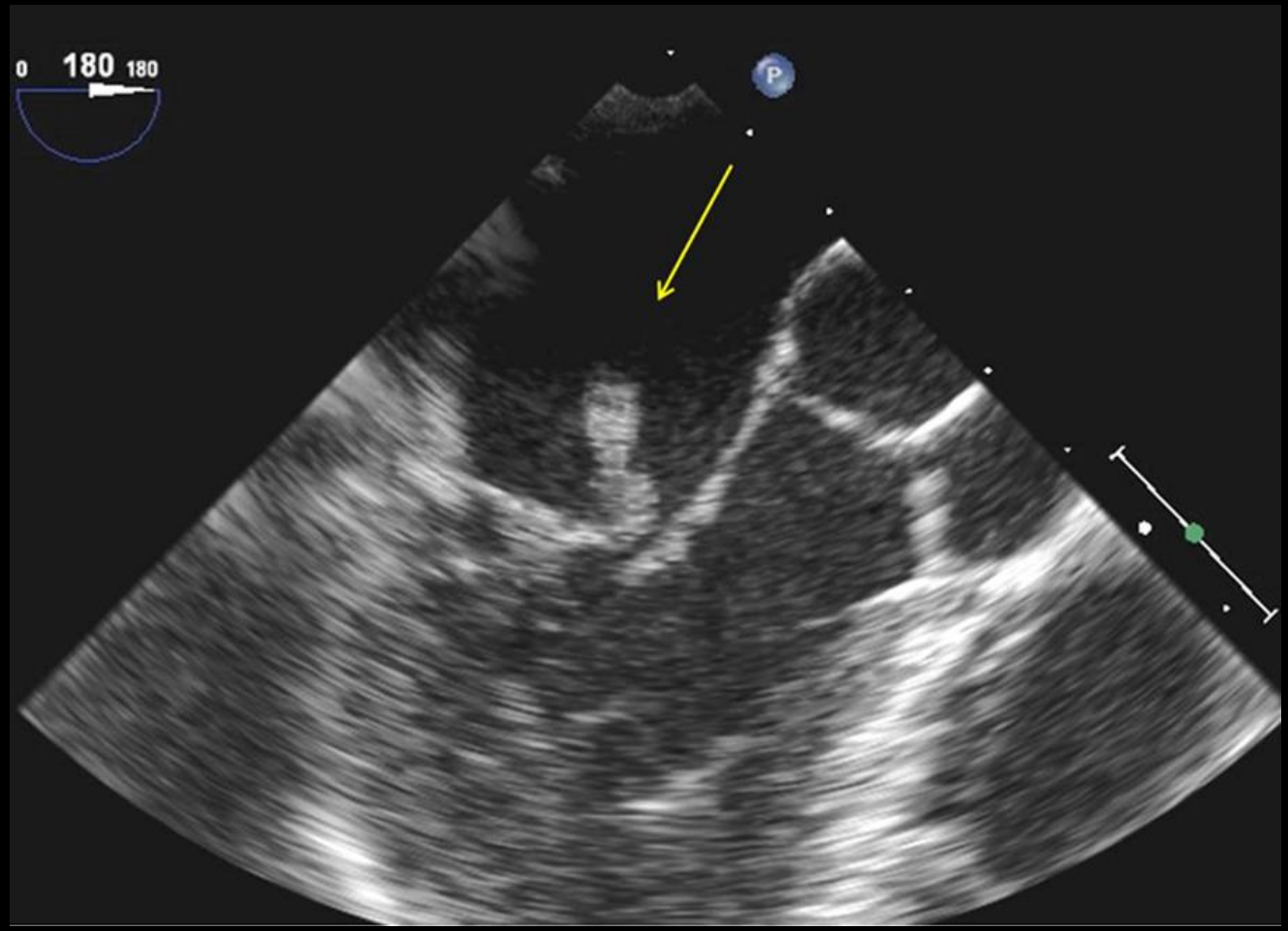
- F FEVER
- R ROTH
- O OSLER
- M MURM
- J- EANWAY
- A ANEMIA
- N NAIL HG (SPLINTER
- E EMBOLI

INVESTIGATIONS

- C.B.C
- ESR
- Blood cultures
- RFT
- URINE
- ECG
- CXR
- ECHO



TEE



IE in IV Drug Abusers

- Skin most predominant source of infection
- 70 - 100% of Rt. sided IE results in pneumonia and septic emboli
- Microbiology
  - Staph aureus ~60%
  - Streptococci and Enterococci ~20%
  - Gram -ve bacilli ~10%
  - Fungi (Candida and Aspergillus ~5%

Prosthetic Valve Endocarditis
Classification

- **Early (< 60 days)**

- Reflects perioperative contamination
- Incidence around 1%
- Microbiology
  - Staph (45 - 50%)
    - Staph. Epiderm (~ 30%)
    - Staph. Aureus (~ 20%)
  - Gram -ve aerobes (~20%)
  - Fungi (~ 10%)
  - Strep and Entero (5-10%)

- **Late (> 60 days)**

- After endothelialization
- Incidence 0.2 -0.5 % / pt. year
- Transient bacteraemia from dental, GI or GU
- Microbiology
  - resembles native valve endocarditis

ESC 2015 modified criteria for diagnosis of IE:

Major criteria

1. Blood cultures positive for IE

a. Typical microorganisms consistent with IE from 2 separate blood cultures:
- *Viridans streptococci, Streptococcus gallolyticus (Streptococcus bovis), HACEK group, 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 h apart; or
- All of 3 or a majority of ≥4 separate cultures of blood (with first and last samples drawn ≥1 h apart); or

c. Single positive blood culture for *Coxiella burnetii* or phase I IgG antibody titre >1:800

2. Imaging positive for IE

a. Echocardiogram positive for IE:
- Vegetation
- 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 ^{18}F-FDG PET/CT (only if the prosthesis was implanted for >3 months) or radiolabelled leukocytes SPECT/CT.

c. Definite paravalvular lesions by cardiac CT.

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ESC 2015 modified criteria for diagnosis of IE:

Minor criteria
1. Predisposition such as predisposing heart condition, or injection drug use.
2. Fever defined as temperature >38°C.
3. Vascular phenomena **(including those detected only by imaging)**: major arterial emboli, septic pulmonary infarcts, infectious (mycotic) aneurysm, intracranial haemorrhage, conjunctival haemorrhages, and Janeway's lesions.
4. Immunological phenomena: glomerulonephritis, Osler's nodes, Roth's spots, and rheumatoid factor.
5. Microbiological evidence: positive blood culture but does not meet a major criterion as noted above or serological evidence of active infection with organism consistent with IE.

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DUKE CRITERIA BE-FEVEER(SUMMARY)

MAJOR

- B BLOOD CULTURE +VE
- E ENDOCARDIAL INVOLVEMENT

MINOR CRITERIA

- F FEVER
- E ECHO FINDING
- V VASCULAR PHENOMINA
- EE EVIDENCE FROM MICROBIAL

- R RISK FCTOR FOR IE VALVE DISEASE

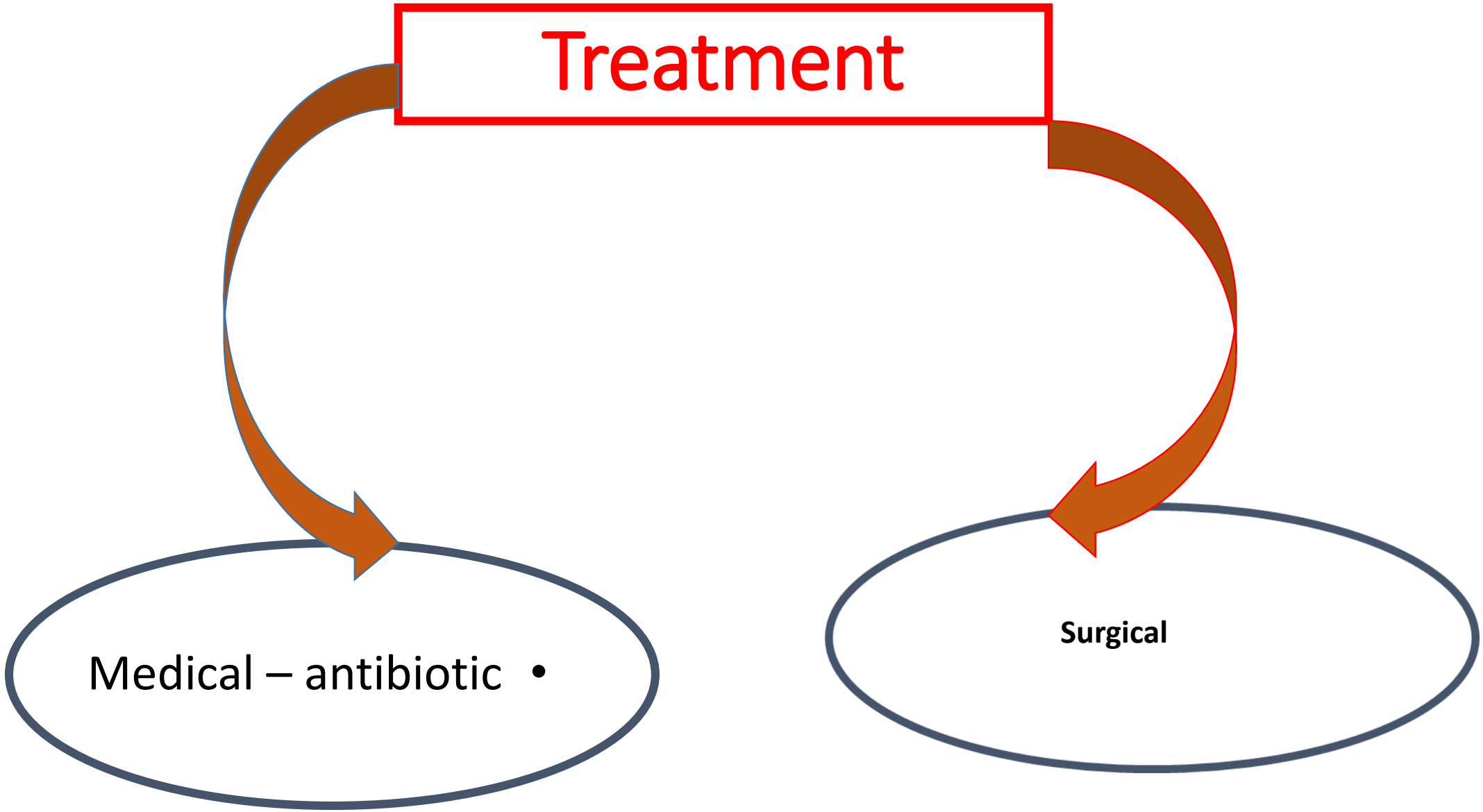
Diagnostic (Duke) Criteria

- 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 (as above)
    - Two major criteria, or
    - One major and three minor criteria, or
    - Five minor criteria

Diagnostic (Duke) 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
- Rejected
  - Firm alternate Dx for manifestation of IE
  - Resolution of manifestations of IE, with antibiotic therapy for $\leq$ 4 days
  - No pathologic evidence of IE at surgery or autopsy, after antibiotic therapy for $\leq$ 4 days

Treatment



Principles of Medical Management

Antibiotic needs :

prolonged , high dose and bactericidal.

Acute onset:

blood culture and start treatment within three hours.

Sub acute onset ;

Blood culture then antibiotic can be started within three days.

Treatment

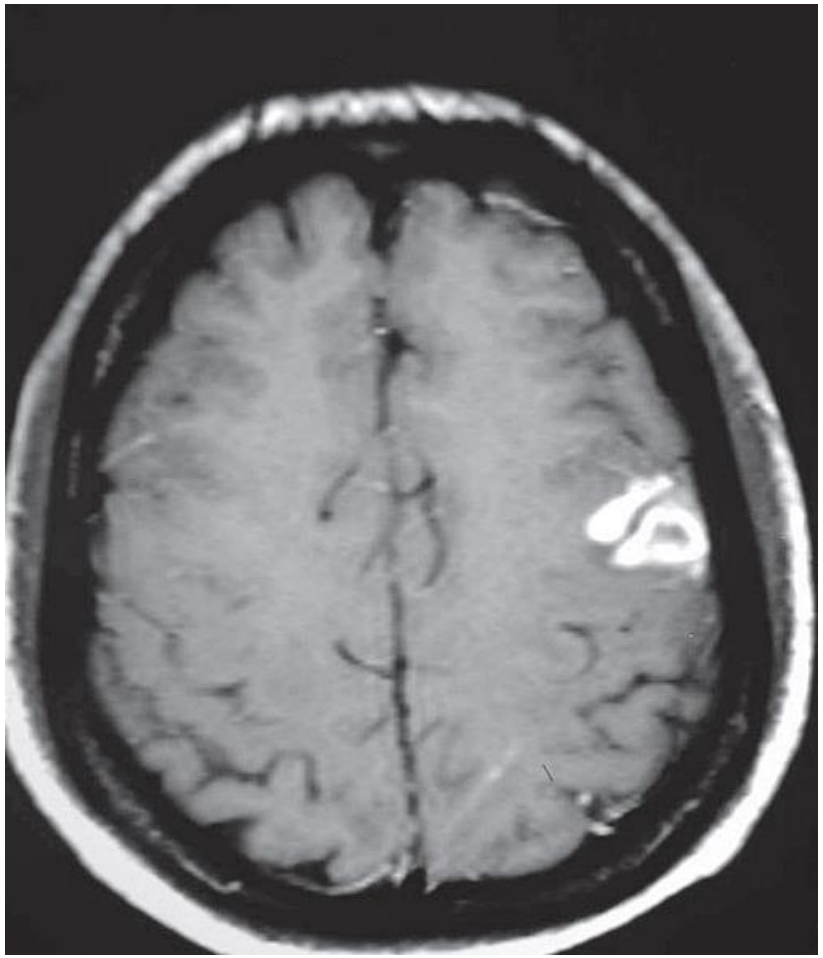
- Pre-antibiotic era - a death sentence
- Antibiotic era

  Microbiologic cure in majority of patient
- Highly penicillin-susceptible Streptococcus viridans or bovis
  - Once-daily ceftriaxone for 4 wks
    - cure rate > 98%
  - Once-daily ceftriaxone 2 g for 2wks followed by oral amoxicillin qid for 2 wks
  - Prosthetic valve may need longer treatment durations.

Complications-1

- **Congestive Cardiac Failure (Commonest complication)**
  - Valve Destruction
  - Myocarditis
  - Coronary artery embolism and MI
  - Myocardial Abscesses
- **Neurological Manifestations (1/3 cases)**
  - Major embolism to MCA territory ~25%
  - Mycotic Aneurysms 2 - 10%

Neurological Complication



Complications-2

- **Metastatic infections**
  - **Rt. Sided vegetations**
    - **Lung abscesses**
    - **Pyothorax / Pyo-pneumothorax**
  - **Lt. Sided vegetations**
    - **Pyogenic Meningitis**
    - **Splenic Abscesses**
    - **Pyelonephritis**
    - **Osteomyelitis**
- **Renal impairment , Glomerulonephritis**

Prevention

Main principles of prevention in IE

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 the 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 health care-associated IE.
5. Whether the reduced use of antibiotic prophylaxis is really associated with a change in the incidence of IE needs further investigations

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Prophylaxis for dental procedures at risk

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.

[a]Alternatively, 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.

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

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Antibiotic treatment
Oral *Streptococci* and *Streptococcus bovis* group

Antibiotic	Dosage and route	Duration (weeks)	Class	Level
Strains penicillin-susceptible (MIC ≤0.125 mg/L) oral and digestive streptococci				
Standard treatment: 4-week duration				
Penicillin G	12–18 million U/day i.v. either in 4–6 doses or continuously	4	I	B
	or			
Amoxicillin	100–200 mg/kg/day i.v. in 4–6 doses	4	I	B
	or			
Ceftriaxone	2 g/day i.v. or i.m. in 1 dose	4	I	B
In beta-lactam allergic patients				
Vancomycin	30 mg/kg/day i.v. in 2 doses	4	I	C

Staphylococcus

Flocloxacilline
Or
Vancomycine

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