

M7 - Cardiovascular & Bloodstream

3 more properties

Learning Objectives

- Understand the pathophysiology of endocarditis and endovascular infections
- Name the common causative agents for different types of cardiovascular infections
- Know how endocarditis is diagnosed
- Remember the principles of treatment for endocarditis

- Antibiotics (Bactericidal - 全滅 ; Intravenous Injection ; At least 4 weeks prolonged Treatment)
- Surgical removal of infected regions (e.g.: Valve; Vessel; Thrombi)

Bloodstream infections

Basic Introduction to Bloodstream infections

Bacteraemia	Bacteria in Blood
Viraemia	Viruses in Blood
Fungaemia	Fungi in blood
Parasitaemia	Parasite in blood

Transient / Intermittent bacteremia & Infections

Requirement of Bacteria Colonization

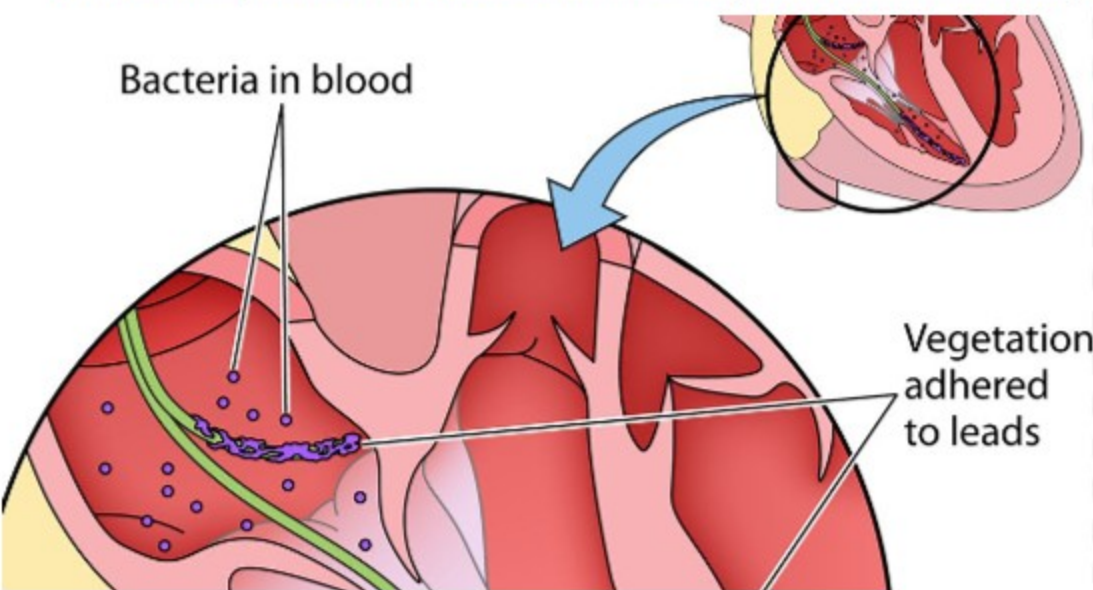
- Transient or Intermittent Bacteremia
- Alteration of Endothelial cell Surface

Site	Alteration	Chinese Translation
Heart	Endocarditis	心内膜炎
Artery	Mycotic aneurysm	真菌性动脉瘤
Vein	Suppurative thrombophlebitis	化脓性血栓性静脉炎

- Fibrin & Platelets (纤维蛋白和血小板)

Symptoms of Bacteria Colonization

→ After bacterial proliferation & Accumulation of fibrin, platelets and inflammatory cells



Vegetation → Shedding of bacteria in blood at constant rate

Clinical Features

Clinical Features	Symptoms	Chinese Translation
Constitutional symptoms	Fever, chills, and rigors	发热，寒战和寒战
	Anorexia	厌食
	Generalized malaise	全身不适
Destruction of heart valves	Heart murmur	心脏杂音
	Arrhythmias (heart block)	心律失常（心脏传导阻滞）
	Heart failure	心力衰竭
Destruction of arteries	Palpable pulsatile mass	可触及的搏动性肿块
	Hypovolemic shock if ruptured	如破裂则低血容量休克
Destruction of veins	Engorgement of veins	静脉曲张血
Embolic phenomena	Brain abscess (Left-sided endocarditis)	脑脓肿（左心内膜炎）
	Septic pulmonary emboli (Right-sided endocarditis)	化脓性肺栓塞（右心内膜炎）
	Splinter hemorrhages	纵行出血线
	Janeway lesions	Janeway 损害
	Retinal hemorrhages	视网膜出血
	Conjunctival hemorrhages	结膜出血
	Antigen-antibody deposition	Osler's nodes
	Roth's spots	Roth 斑点
	Glomerulonephritis	肾小球肾炎
	Arthritis	关节炎

Investigation

- Multiple blood cultures
 - 3 Times (Each Taken per Hours)
 - Central Line + Peripheral Lines

Classification of Bloodstream Infections

Type	Transient bacteremia	Continuous bacteremia	Intermittent bacteremia
Translation	短暂菌血症	持续菌血症	间歇性菌血症
Mechanism	Breakthrough of normal flora of skin & mucosal surfaces	Endocarditis Endovascular Infections	Deep-seated focus of infection
Transmission method	Skin Oral lesions /dental procedures		Undrained abscess (未排水脓肿) Osteomyelitis (骨髓炎) spondylitis (脊椎炎)

More about Transient Bacteremia

Site	Type of Bacteremia	Name of Bacteria
Skin	Normal Host	Staphylococci spp. Enterococci β-haemolytic Streptococci
Skin	IVDA	Staphylococci spp. Environmental bacteria
Skin	Patients with iv access	Staphylococci spp. Environmental bacteria
Oral lesions / dental procedures	Normal Host	Viridans Streptococci Haemophilus spp. Aggregatibacter spp. Cardiobacterium hominis Eikenella corrodens Kingella kingae

Remarks:

- Staphylococci spp. (Coagulase-Negative Staphylococci, S. aureus)
- IVDA stands for Intravenous Drug Abuse.
- HACEK → Cause endocarditis. [Haemophilus, Aggregatibacter, Cardiobacterium, Eikenella, and Kingella.]

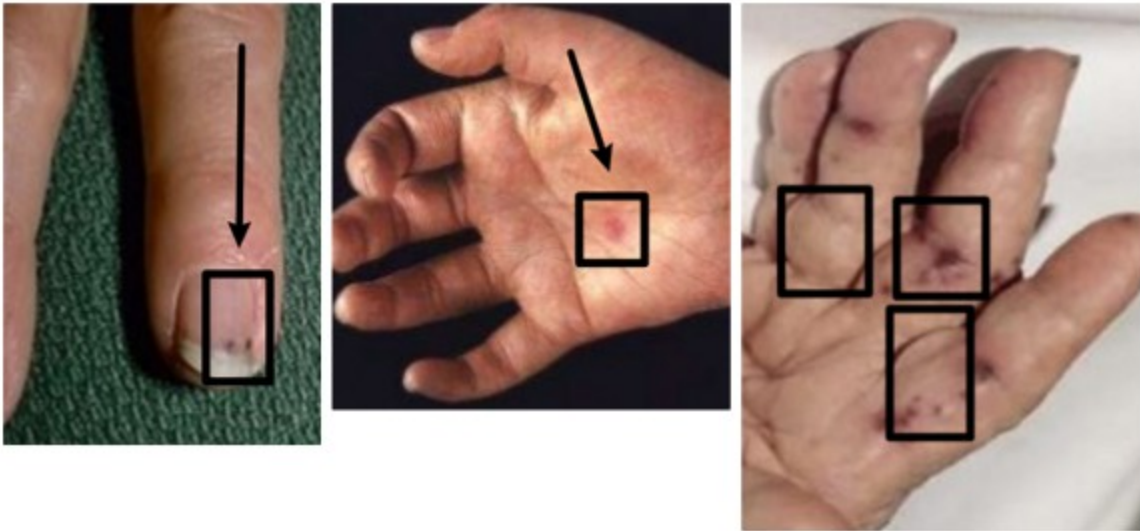
Multiple blood cultures

Category	Pathogen
Native valve	
Community onset	★ Viridans streptococci ★ Staphylococcus aureus ★ Streptococcus bovis ★ Enterococcus spp.
Health-care associated	★ S. aureus ★ Enterococcus spp. ★ Staphylococcus epidermidis
Intravenous drug user (IVDA)	★ S. aureus ★ Gram-negative rods such as Pseudomonas spp. ★ Candida spp. (念珠菌属)
Prosthetic valve	
Early	★ S. epidermidis ★ S. aureus
Late	★ S. aureus ★ Viridian streptococci ★ Enterococcus spp. ★ S. epidermidis
Pacemaker or defibrillator	★ S. epidermidis ★ S. aureus
Culture-negative	★ Bartonella spp. ★ Coxiella burnetii (烧伤柯西氏菌) ★ Brucella spp.

Some Symptoms related to Cardiovascular Infection

Splinter Hemorrhages	Janeway Lesions	Osler's Nodes
- Non-Specific - Non-blanching (无灼热感) - Linear reddish-brown lesions under nail bed	- More Specific - Erythematous→ Blanching macules - Non-painful	- More Specific - Erythematous nodules → Painful - @ Pulp of Fingers and toes - Common in Subacute Infective Endocarditis
- 非特定 - 无灼热感 - 在指甲床下的线状红褐色病变	- 更具体 - 红斑 → 消退斑点 - 无痛感	- 更具体 - 红斑结节 → 疼痛 - @ 手指和脚趾的骨髓 - 在亚急性感染性心内膜炎中常见

Remarks: Photos for Splinter Hemorrhages, Janeway Lesions, Osler's Nodes

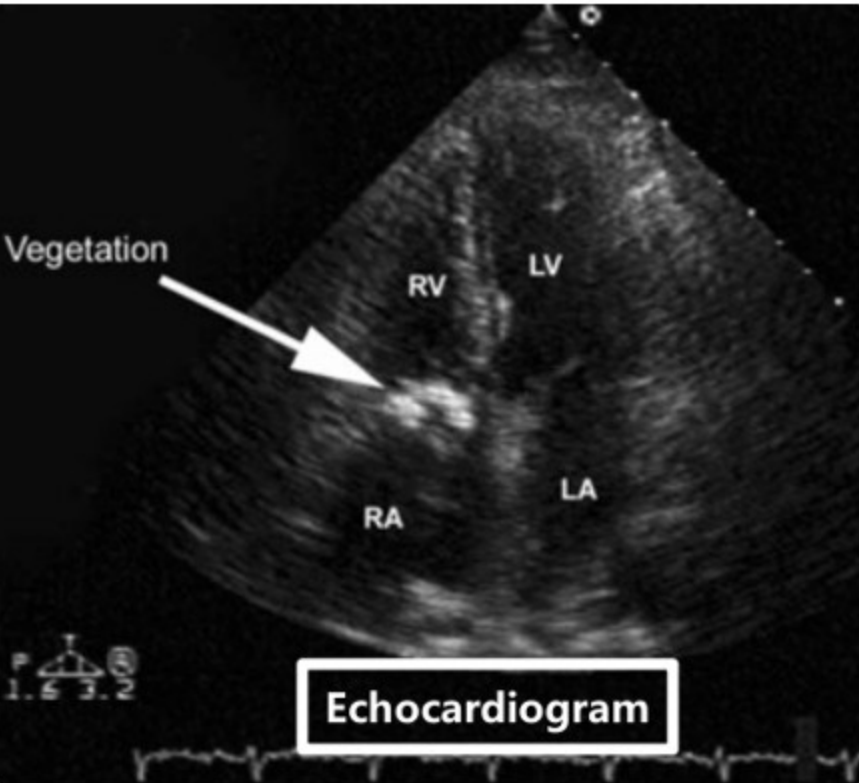


Diagnosis of Endocarditis

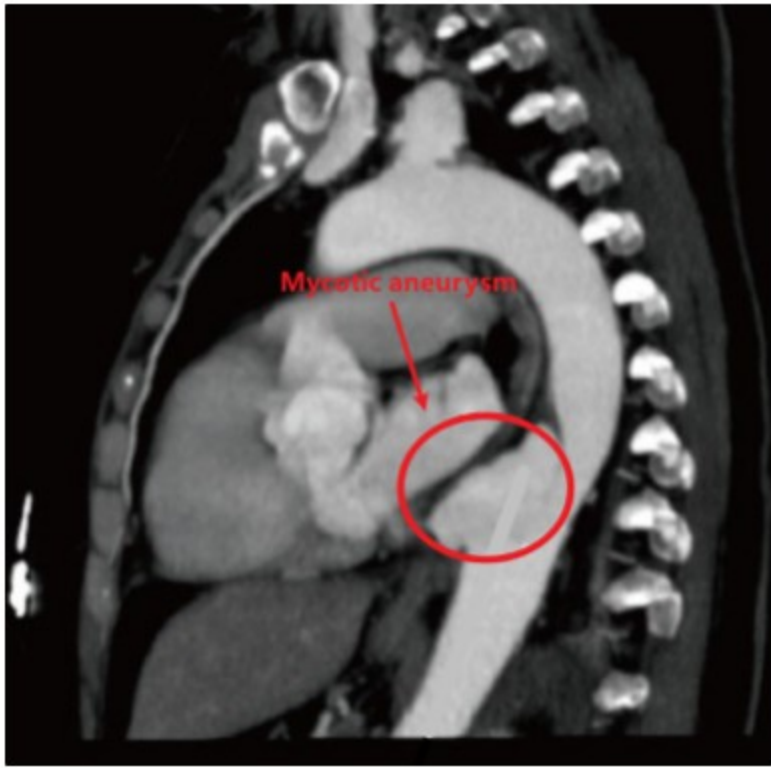
Investigation

Remarks	Culture-(-) Endocarditis	Imaging
Description	- Prior antibiotics - Not Culturable fastidious organisms ★ Bartonella spp. ★ Coxiella burnetii	- Echocardiogram for vegetations - CT angiogram for mycotic aneurysm (真菌性动脉瘤) - Doppler ultrasonography for thrombophlebitis (血栓性静脉炎)

Example of Image Investigation

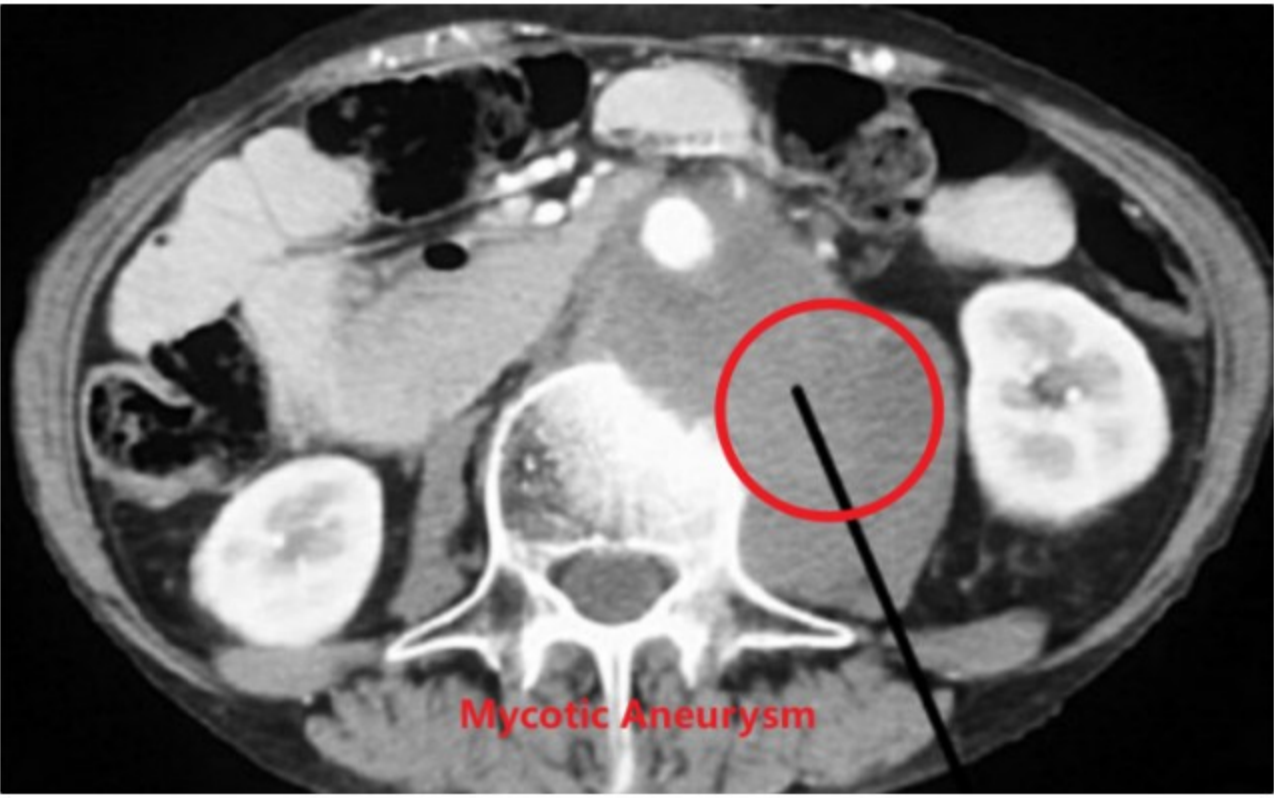


Trans thoracic echocardiogram



CT scan of thorax:

- Mycotic aneurysm in descending aorta



CT scan of abdomen:

- Erosion of the lumbar vertebrae
- contained rupture into the left psoas muscle（左腰肌断裂）

Summary of Diagnosis of Endocarditis

Major Criteria:

- Positive blood cultures for IE.
对感染性心内膜炎（IE）的血液培养结果呈阳性。
 - Typical microorganisms for IE from two separate blood cultures.
两次独立血液培养中发现了IE的典型微生物。
 - Persistently positive blood cultures with a microorganism consistent with IE.
持续阳性的血液培养结果与IE相关的微生物。
 - Single positive blood culture for Coxiella burnet IgG antibody titer>1:800
单次血液培养中Coxiella burnet IgG抗体滴度>1:800，呈阳性。。
- Evidence of endocardial involvement.
有心内膜受累的证据。
- Positive echocardiogram for IE.
IE的超声心动图呈阳性。
- New valvular regurgitation.
新发瓣膜反流。

Minor Criteria:

- Predisposing heart condition or history of intravenous drug use.
心脏病病史或静脉注射药物使用史。
- Fever, defined as temperature>38.0°C.
发热，定义为体温>38.0°C。
- Vascular phenomena(e.g. major arterial emboli, mycotic aneurysm, Janeway lesions)
血管现象（如主要动脉栓塞、真菌性动脉瘤、Janeway 病变）。
- Immunologic phenomena (e.g. glomerulonephritis, Osler's nodes, Roth spots).
免疫学现象（如肾小球肾炎、奥斯勒结节、罗斯斑点）。
- Microbiologic evidence not meeting major criteria as noted above.
未满足上述主要标准的微生物学证据。

▼ Prevention of Endocarditis & More Infections

More Diseases due to Infections — Alteration in endothelial cells

Underlying heart valve diseases	Congenital heart disease
Prosthetic valves	Small atrial septal defect
Rheumatic heart disease	Ventricular septal defect

Prevention

- Prophylactic antibiotics prior to certain procedures
 - Dental procedures
 - Surgery involving respiratory mucosa
 - Surgery of infected tissues

▼ Myocarditis

- Inflammation of myocardium → Heart failure
- Hematogenous spread of Viruses ← Spread from adj. structure
 - Example: Coxsackie viruses

▼ Pericarditis — Chest pain, Friction rub

- Inflammation of the pericardium [Closely associated with myocarditis]
 - Fascial sac covering the heart ← Coxsackie viruses / Mycobacterium tuberculosis

%Pericarditis → Pericardial effusion → Cardiac tamponade & heart failure