015 // Endocarditis

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The prevalence of endocarditis associated with prothetic valves and pacemaker leads is on the increase.

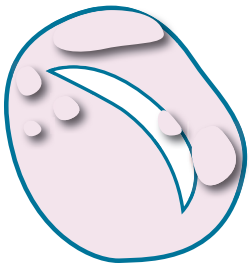
PRINCIPLES OF ENDOCARDITIS

Definition

Endovascular microbial infection of cardiovascular structures

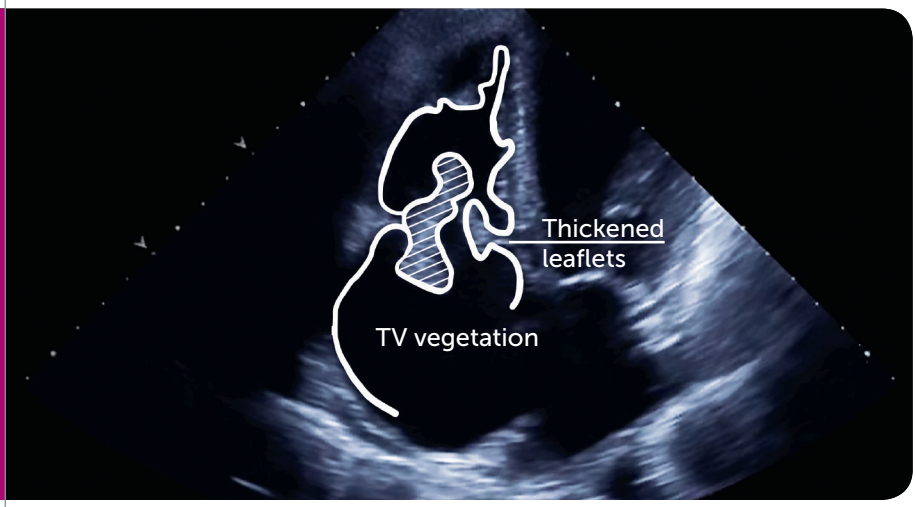
Location

- Valves
- Large intrathoracic vessels
- Ventricular and atrial endocardium
- Prosthetic material
- Polymere associated structures (lines)
- Eustachian valve



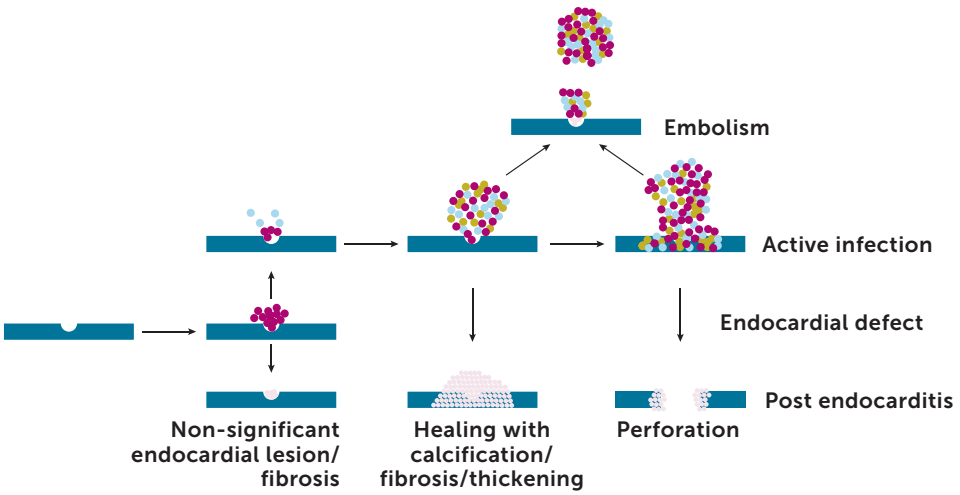
TRICUSPID VALVE ENDOCARDITIS – apical four-chamber view RV optimized/2D

Endocarditis with a large vegetation attached to the native tricuspid valve.



Vegetation is an infected mass attached to endocardial structures, such as valves or implanted intracardiac material. On 2D echo they frequently appear as oscillating structures of variable size and morphology.

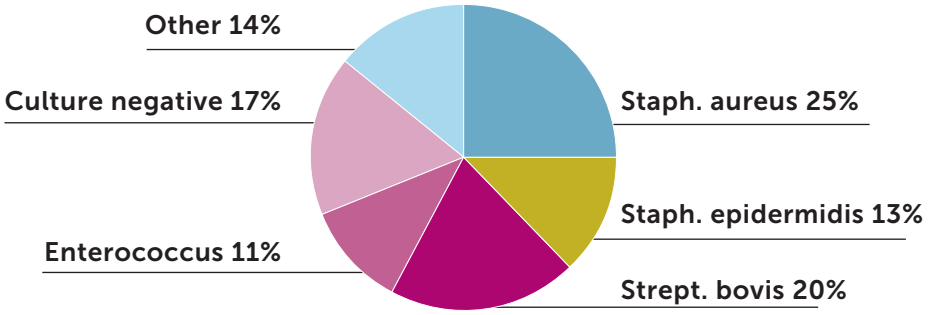
Pathophysiology of Endocarditis

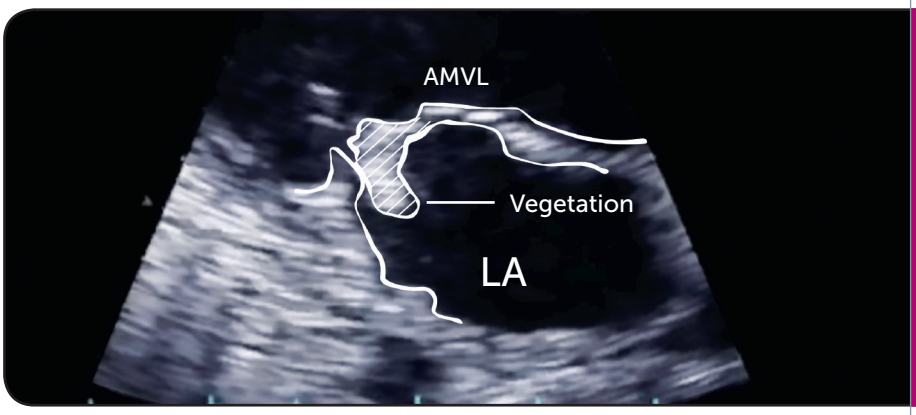


Principle of a "super-infected" thrombus: The endothelial lesion initiates a repair process which involves thrombus formation. In the presence of bacteremia this thrombus may be super-infected. Further consequences include repair ad integrum, tissue destruction, embolism, and defect healing.

PRINCIPLES OF ENDOCARDITIS

Microbiology





MITRAL VALVE ENDOCARDITIS – PLAX zoomed/2D

A vegetation is attached to the tip of the anterior mitral valve leaflet.

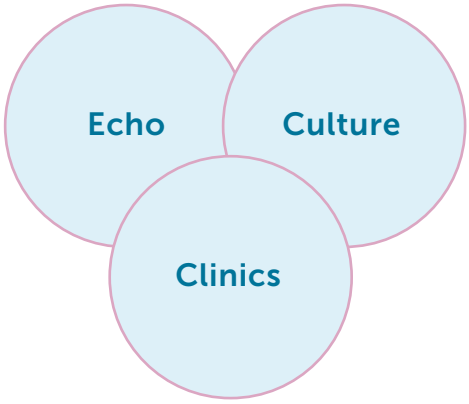
Epidemiologic Facts on Endocarditis

- Large geographical variations in the incidence of endocarditis (3–10 episodes/100.,000 person-years)
- Increase in the elderly population
- Sclerosis and aging also predispose to endocarditis

NATIVE VALVE ENDOCARDITIS

Diagnosis, Symptoms and Findings

- Fever/night sweat
- Predisposing factors
- Conjunctival petechiae
- Janeway lesions
- Roth spots
- Splinter hemorrhages
- Vegetations
- Regurgitations
- Complications of endocarditis (abscessive destruction)
- Pericardial effusion



NOTES

Staph. aureus infection predisposes to abscess formation and complications of endocarditis!

Endocarditis may be manifested in many ways, many of which may be atypical
In the setting of infection, heart murmur or atypical symptoms, think of endocarditis. Early diagnosis saves lives.

Blood culture and other signs of infection (CRP, leukocytes, etc.) are equally important. A negative blood culture does NOT rule out endocarditis.

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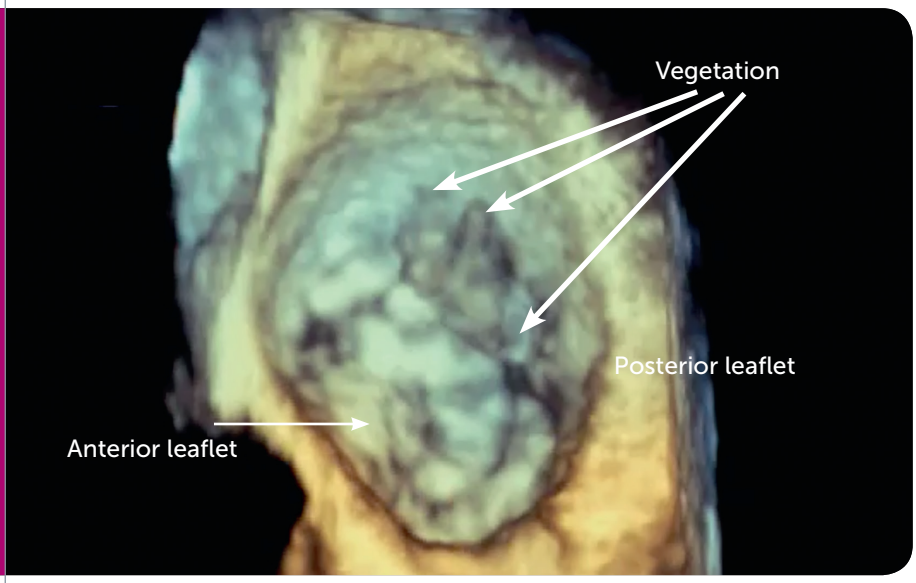
MITRAL VALVE ENDOCARDITIS – TEE surgical view/3D

Large vegetation on the posterior leaflet prolapsing into the left atrium

NATIVE VALVE ENDOCARDITIS



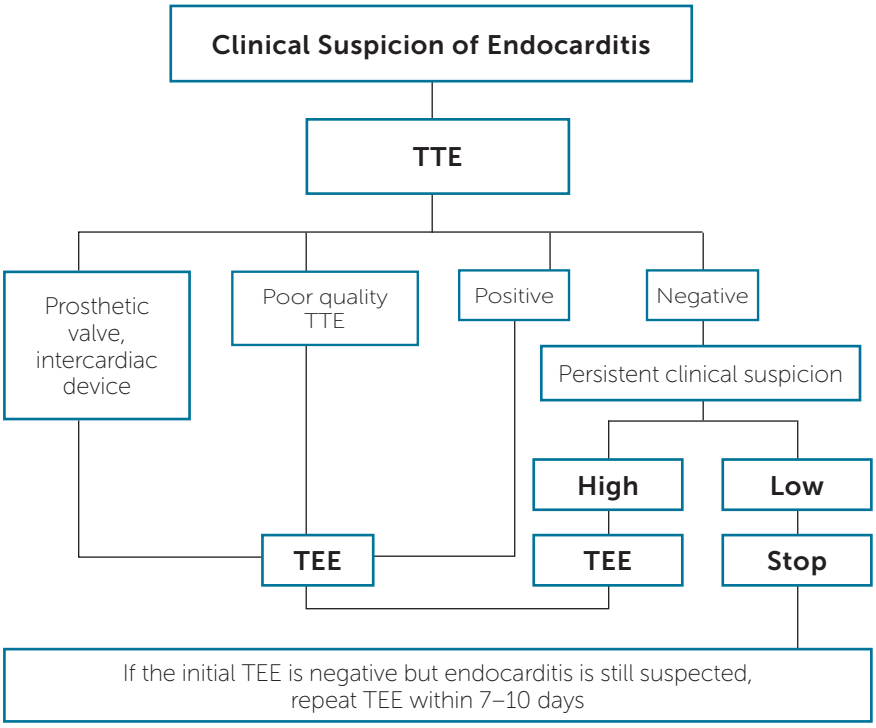
Follow-up studies help to make an accurate diagnosis (progression?).

Differential Diagnosis

- Fibrosis/calcification
- Myxomatous degeneration (e.g. mitral valve prolapse)
- Lambl's excrescence/strands
- Tangential imaging of structures
- Old vegetations
- Tumors/thrombi

Transesophageal echocardiography is not mandatory in isolated right-sided native valve endocarditis with good transthoracic quality.

Indication for Transthoracic Echo in Suspected Endocarditis



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NATIVE VALVE ENDOCARDITIS

What Else to Look For?

- Involvment of other valves
- Regurgitations and resulting volume overload
- Myocardial function (right + left)
- Pericardial/pleural effusion
- Valve obstruction (large vegetations, rare)
- Coronary embolization of vegetation leading to wall motion abnormalites (rare)

NOTES

"Healing" usually leads to some degree of fibrosis or calcification of the affected valve.

COMPLICATIONS OF NATIVE VALVE ENDOCARDITIS

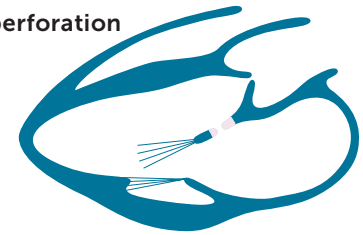
Complications

- Embolism
- Valve destruction
- Regurgitation/heart failure
- Abscess
- Pseudoaneurysm
- Perforation
- Fistula
- Mycotic aneurysm

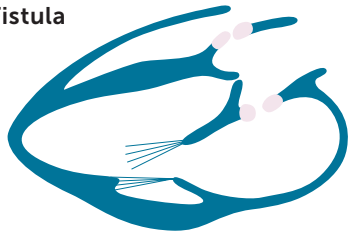
Embolization is the primary manifestation of endocarditis in 28–47% of all patients. The risk of embolization depends on the size (>10 mm) and mobility of the vegetation.
Exclude endocarditis in the setting of stroke and fever.

Types of Valve Destruction

MV perforation



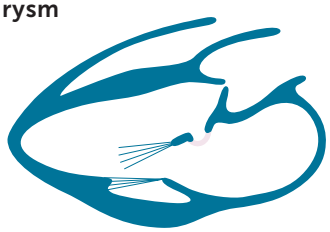
Fistula



Valve perforation is a hole in the cusp or leaflet which appears as an interruption in endocardial tissue continuity, best seen with color Doppler. In contrast, a fistula is a communication with neighbouring cavities that does not directly involve the valve (for instance, between the aorta and the left atrium).

Pseudoaneurysm – intervalvular fibrosa

MV pseudo-aneurysm



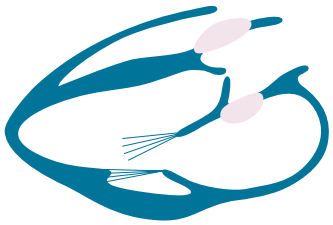
Pulsatile perivalvular (echo-free) cavity communicating with the cardiovascular lumen.

NOTES

COMPLICATIONS OF NATIVE VALVE ENDOCARDITIS

Types of Valve Destruction

AV ring abscess

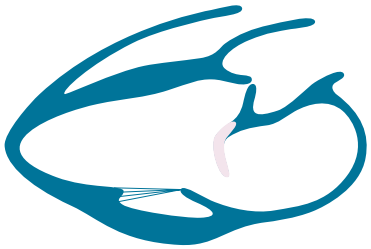


MV annular abscess

Perivalvular cavity filled with infectious material which has a non-homogeneous (echodense/echolucent) appearance

AV cusp rupture

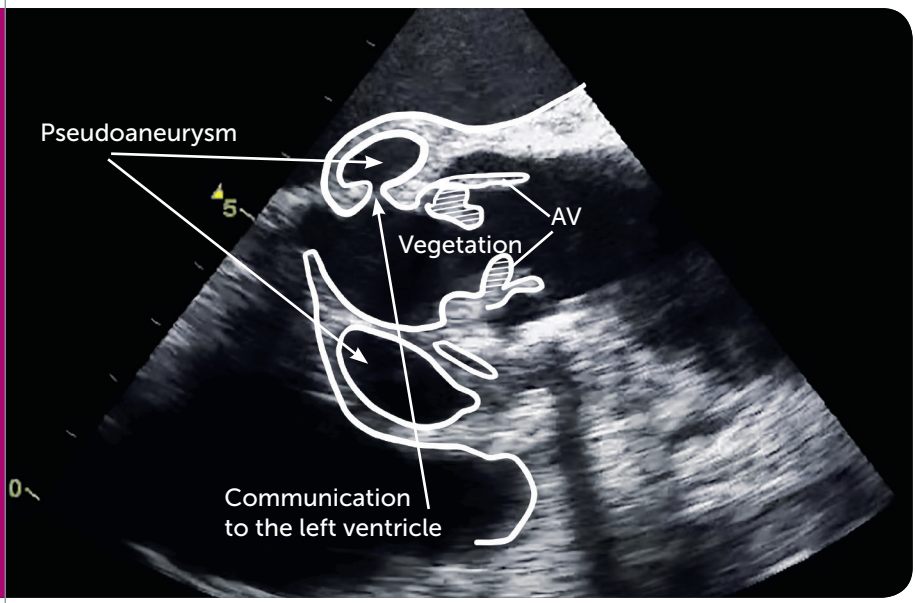
MV flail leaflet



Tear in the aortic cusp or chordal rupture, which usually leads to excentric regurgitation jets.

PSEUDOANEURYSM IN AV ENDOCARDITIS – TEE long-axis view/2D

A pulsating cavity surounds the aortic valve (pseudoaneurysm). Numerous vegetations are present at the aortic cusps.



RIGHT HEART ENDOCARDITIS

Causes of TV Endocarditis

- Intravenous drug abuse
- Immunocompromised
- Indwelling catheters
- Pacemaker

Tricuspid Valve Endocarditis – Facts

- The most common organisms are Staphylococcus aureus (60–80%) and Pseudomonas.
- Pulmonary hypertension, pulmonary embolism or tricuspid regurgitation may result in right heart failure.
- The prognosis is relatively good (10% inhospital mortality), but is poor in fungal infection.
- High recurrence rates.
- Endocarditis frequently causes a flail tricuspid valve leaflet..
- Tricuspid valve endocarditis may also occur in patients without predisposing factors.

Complications

- Valve destruction
- Involvement of neighbouring cardiac structures
- Septic pulmonary embolism
- Lung abscess

PROSTHETIC VALVE ENDOCARDITIS

Risk Factors

- Heart failure
- Wound complications
- Direct contamination during cardiac surgery
- Valve degeneration
- Prior history of endocarditis
- Prosthesis thrombi (super-infection)

Differential Diagnosis

- Artefacts
- Subvalvular residuals
- Surgical materials
- Strands
- Thrombus
- Hematoma

Compare your findings with previous studies.

NOTES

Tricuspid valve endocardits is very likely in patients with pulmonic abscess + drug abuse + new heart murmur.

Use atypical views to image tricuspid valve endocarditis and also look for pleural effusion (secondary to pulmonary infection).

Tricuspid valve vegetations may become very large.

Prosthetic valve endocarditis is difficult to detect.
Transesophageal echo is recommended in case of suspicion.
Find out which operation was performed, talk to the surgeon.
Surgical material such as suture material or patches may mimic endocarditis.

NOTES

PROSTHETIC VALVE ENDOCARDITIS

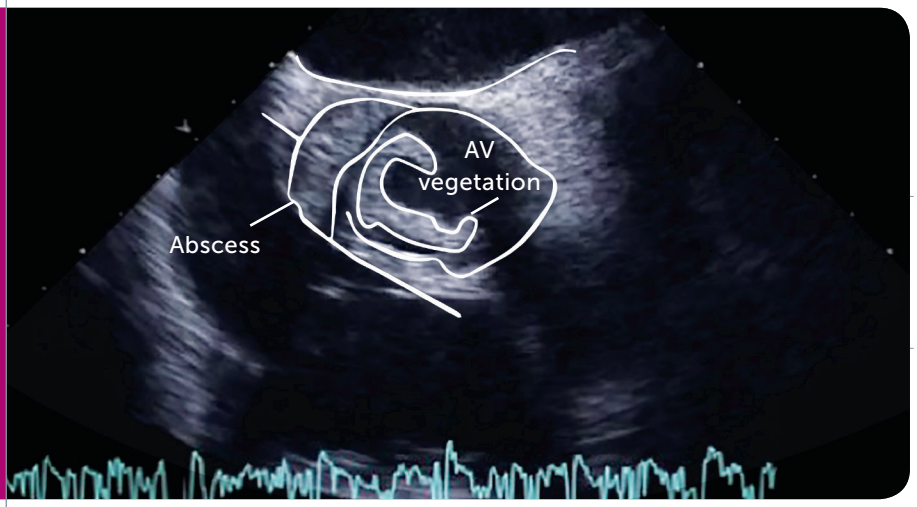
Prosthetic valve endocarditis is a life-threatening condition and is associated with a poor prognosis.

Complications

- Periannular abscess
- Pseudoaneurysms
- Paravalvular leaks
- Valve dehiscence
- Valve obstruction
- Fistula

PERIANNULAR PROSTHETIC VALVE ABSCESS – TEE short-axis/2D

The echodense area surounding the prosthesis corresponds to a periannular abscess. Additionally, a large vegetation is seen on the rim of the cusps.



PACEMAKER/POLYMER-ASSOCIATED ENDOCARDITIS

Pacemaker lead infection is difficult to diagnose. A negative study does not rule out endocarditis. Combine transthoracic and transesophageal echo to visualize as many portions of the leads as possible.

Predisposing Factors

- Pouch/Pocket infection
- Impaired immunity
- Systemic infection
- Temporary pacing before implantation
- Diabetes
- The surgeon's experience
- Advanced age

Clinical Presentation

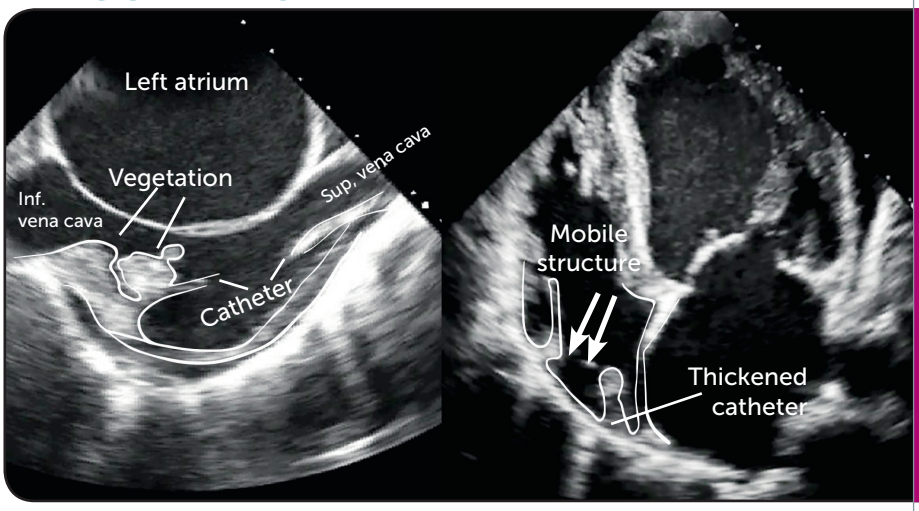
- Fever, subfebrile (recurrent)
- Pulmonary embolism
- Local complications
- Septic shock (acute)
- Poor general condition

Lead infection usually occurs at sites where the leads are in contact with the endothelium.

Typical Sites of Infection

- Vena cava superior
- Right atrium
- Tricuspid valve
- Tricuspid annulus

PACEMAKER/POLYMER-ASSOCIATED ENDOCARDITIS



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CENTRAL LINE ENDOCARDITIS – apical four-chamber view/2D &TEE bicaval view/2D

Central line with its tip in the right atrium. Mobile vegetation attached to the catheter (thickened tip) on transthoracic echo (left) and the adjacent wall (right) seen in TEE.

NON-INFECTIVE/ABACTERIAL ENDOCARDITIS

Types

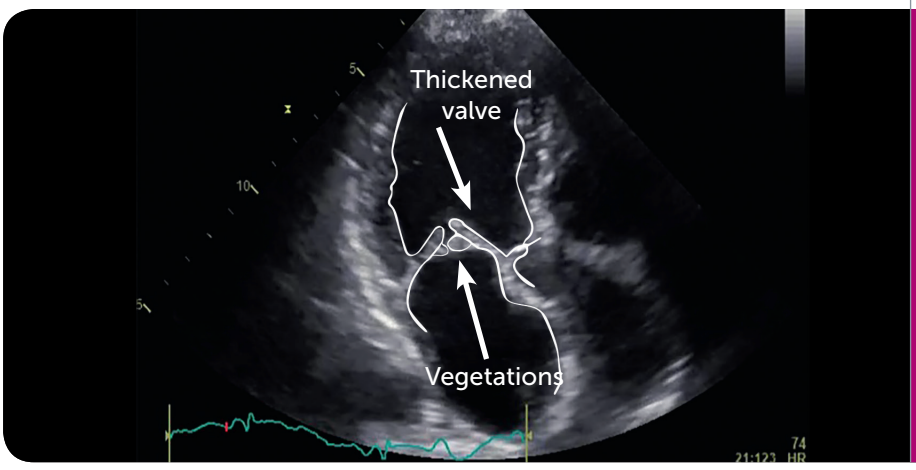
- Marantic endocarditis
- Hypercoagulable state
- Libman-Sacks endocarditis
- Antiphospholipid syndrome

Echo Characteristics

- Valve thickening
- Mild or moderate regurgitation
- Small vegetations
- Pericardial effusion

Cardiac Manifestations of Libman-Sacks Endocarditis

- Valve thickening and vegetations
- Mural thrombus
- Spontaneous contrast
- Left + right ventricular dysfunction
- Pericardial effusion



LIBMAN-SACKS ENDOCARDITIS – apical three-chamber view/2D

Patient with lupus and antiphospholipid syndrome. Several small vegetations are seen on the mitral valve.

NOTES

INDICATIONS FOR SURGERY

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Recommendations for Surgery in Infective Endocarditis (IE)

Heart Failure	Timing	Class	Level
Aortic or mitral IE with severe acute regurgitation or valve obstruction, causing refractory pulmonary edema or cardiogenic shock	Emergency	I	B
Aortic or mitral IE with fistula into a cardiac chamber or pericardium causing refractory pulmonary edema or shock	Emergency	I	B
Aortic or mitral IE with severe acute regurgitation or valve obstruction and persistent heart failure or echocardiographic signs of poor hemodynamic tolerance (early mitral closure or pulmonary hypertension)	Urgent	I	B
Aortic or mitral IE with severe regurgitation and no HF	Elective	IIa	B
Uncontrolled Infection			
Locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation)	Urgent	I	B
Persistent fever and positive blood cultures > 7 – 10 days	Urgent	I	B
Infection caused by fungi or multiresistant organisms	Urgent elective	I	B
Prevention of Embolism			
Aortic or mitral IE with large vegetations and one or more embolic episodes despite appropriate antibiotic therapy	Urgent	I	B
Aortic or mitral IE with large vegetations (>10 mm) and other predictors of complicated course of disease (heart failure, persistent infection, abscess)	Urgent	I	B
Isolated very large vegetations (>15 mm)	Urgent	IIb	B