ΕΝΔΟΚΑΡΔΙΤΙΣ ΦΥΣΙΚΩΝ ΚΑΙ ΠΡΟΣΘΕΤΙΚΩΝ ΒΑΛΒΙΔΩΝ ΝΕΟΤΕΡΑ ΔΕΔΟΜΕΝΑ ΣΤΗΝ ΑΠΕΙΚΟΝΙΣΗ ΚΑΙ ΑΝΤΙΜΕΤΩΠΙΣΗ

ΟΡΙΣΜΟΣ

Infection of valvular tissue or cardiovascular endothelium by a variety of patogens.

Infective Endocarditis: a changing disease

new high-risk subgroups

- *IVDA*
- *elderly*
- *intracardiac devices*
- *nosocomial diseases*

changing microbiology

- *increasing incidence of staphylococcal IE*
- *new microorganisms (Coxiella burnetii, Bartonella spp, Tropheryma whipplei)*

more difficult to prevent
more difficult to diagnose
more difficult to treat

Recent underlying pathologies

- MVP 25%
- AS-AR 12-30%
- Congenital 10-20%
- Prosthetic valves 25%

IE: new guidelines ESC 2009

1. prevention
2. diagnosis
3. treatment
4. specific situations

IE: new guidelines ESC 2009

1. prevention
2. diagnosis
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ΔΙΑΓΝΩΣΗ

- 1) Κλινικά κριτήρια
- 2) Απεικονιστικά κριτήρια
- 3) Μικροβιολογικά κριτήρια

Clinical presentation

IE must be suspected in the following situations

- New regurgitant murmur
- Embolic events of unknown origin
- Sepsis of unknown origin (especially if associated with IE causative organisms)
- **Fever: The most frequent sign of IE**
  - Intracardiac prosthetic material
  - Previous history of IE
  - Previous valvular or CHD
  - Other predispositions for IE
    predisposition and recent intervention with associated bacteriema
  - Evidence of CHF
  - New conduction disturbance
  - Positive blood cultures with typical IE causative organisms or positive serology for chronic Q fever
  - Vascular or immunologic phenomena: embolic event, Roth spots, splinter haemorrhage, Janeway lesions, Osler's node
  - Focal or non-specific neurological symptoms and signs
  - Evidence of pulmonary embolism/infiltration (right-sided IE)
  - Peripheral abscesses (renal, splenic, cerebral, vertebral) of unknown causes

Modified Duke criteria for the diagnosis of IE
(adapted from Li & al)

MAJOR CRITERIA

Blood culture positive for IE

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

  Viridans streptococcus, Streptococcus bovis, HACEK group, Staphylococcus aureus or community acquired enterococci in the absence of a primry focus
- Microorganisms consistent with IE from 2 persistely positive blood cultures

  At least 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 & last sample drawn at least 1 h apart
- Single positive blood culture for *Coxiela burneti* or phase I IgG antibody titer > 1:800

Evidence of endocardial involvement

- Echocardiogram positive for IE *(Vegetation, New partial dehiscence of prosthetic valve)*
- New valvular regurgitation

MINOR CRITERIA

- Predisposition: Predisposing heart condition, injection drug use
- Fever: temperature > 38°C
- Vascular phenomena: major arterial emboli, septic pulmonary infarcts, mycotic aneurysms,
- Intracranial haemorrhages, conjunctival haemorrhages, Janeway lesions
- Immunologic phenomena: glomerulonephritis Osler's node, Roth's spot, rheumatoid factor
- Microbiological evidence: positive blood culture but does not meet a major criterion or serological evidence of active infection with organism consistent with IE

Diagnosis of IE

Diagnosis of IE is definite in the presence of	Diagnosis of IE is possible in the presence of
2 Major criteria or 1 major and 3 minor criteria or 5 minor criteria	1 Major and 1 minor criteria or 3 minor criteria

ΑΠΕΙΚΟΝΙΣΤΙΚΑ ΚΡΙΤΗΡΙΑ

Role of echocardiography in IE

A. Diagnosis

1. **TTE** is recommended as the first-line imaging in suspected IE
2. **TEE** is recommended in patients with high clinical suspicion of IE and normal TTE
3. **Repeat TTE/TEE** within 7-10 days in case of negative initial examination and if clinical suspicion of IE persists
4. **TEE** should be considered in most of adult patients with suspected IE, even in case of positive TTE
5. **TEE** is not indicated in patients with a good quality negative TTE and low suspicion of IE

ΑΠΕΙΚΟΝΙΣΤΙΚΑ ΚΡΙΤΗΡΙΑ

Role of echocardiography in IE

B. Follow-up under medical therapy

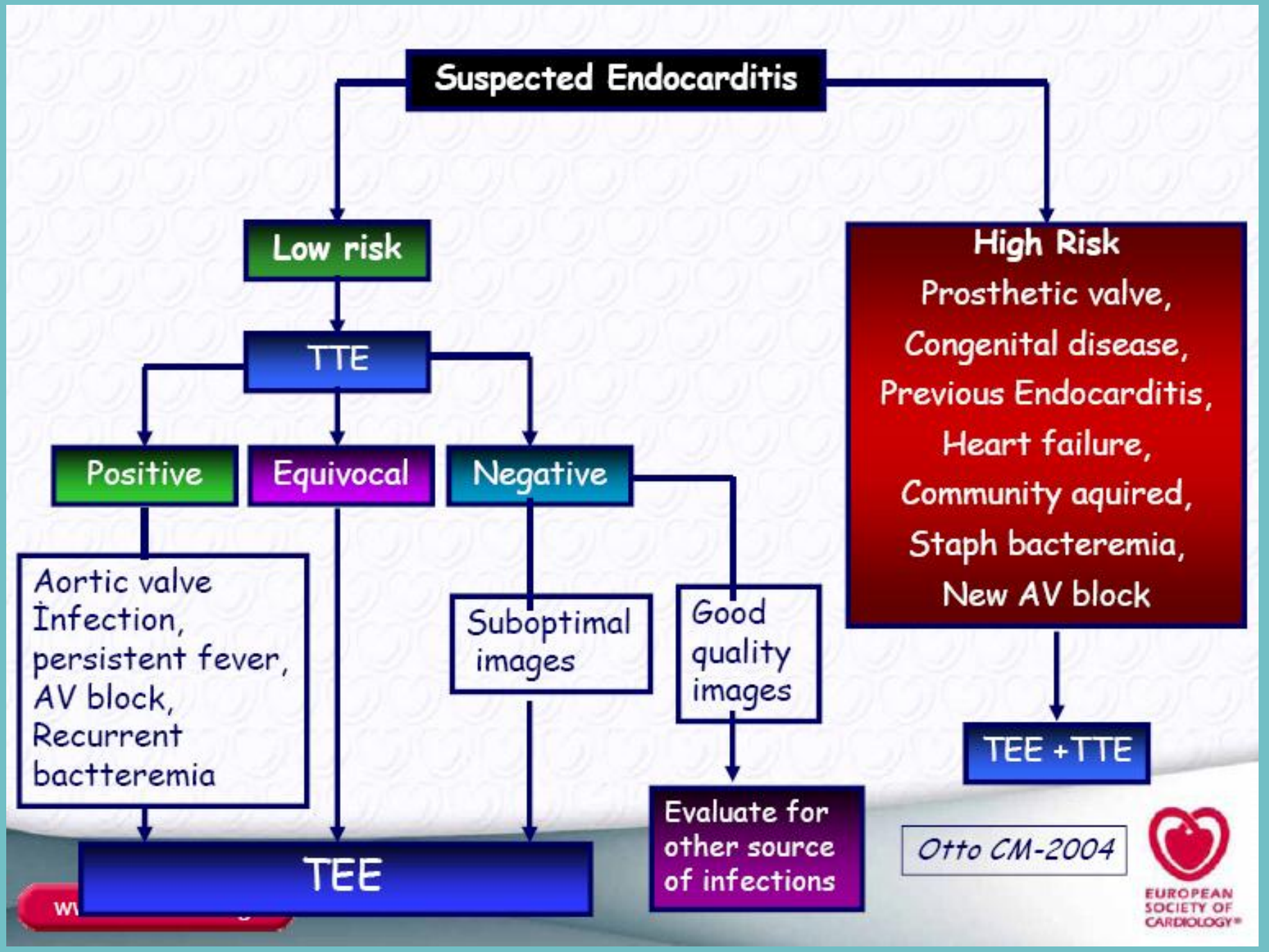
1. **Repeat TTE and TEE** is recommended as soon as a new complication of IE is suspected
2. **Repeat TTE and TEE** should be considered during F.U. of uncomplicated IE: time & mode depend on the initial findings, type of microorganisms and initial response to treatment

C. Intraoperative echocardiography

Recommended in all cases of IE requiring surgery

D. Following completion of treatment

TTE is recommended at completion of antibiotic treatment for evaluation of cardiac and valve morphology and function


Suspected Endocarditis
Low risk
High Risk
Prosthetic valve,
Congenital disease,
Previous Endocarditis,
Heart failure,
Community aquired,
Staph bacteremia,
New AV block
TTE
Positive
Equivocal
Negative
Aortic valve
İnfection,
persistent fever,
AV block,
Recurrent
bactteremia
Suboptimal
images
Good
quality
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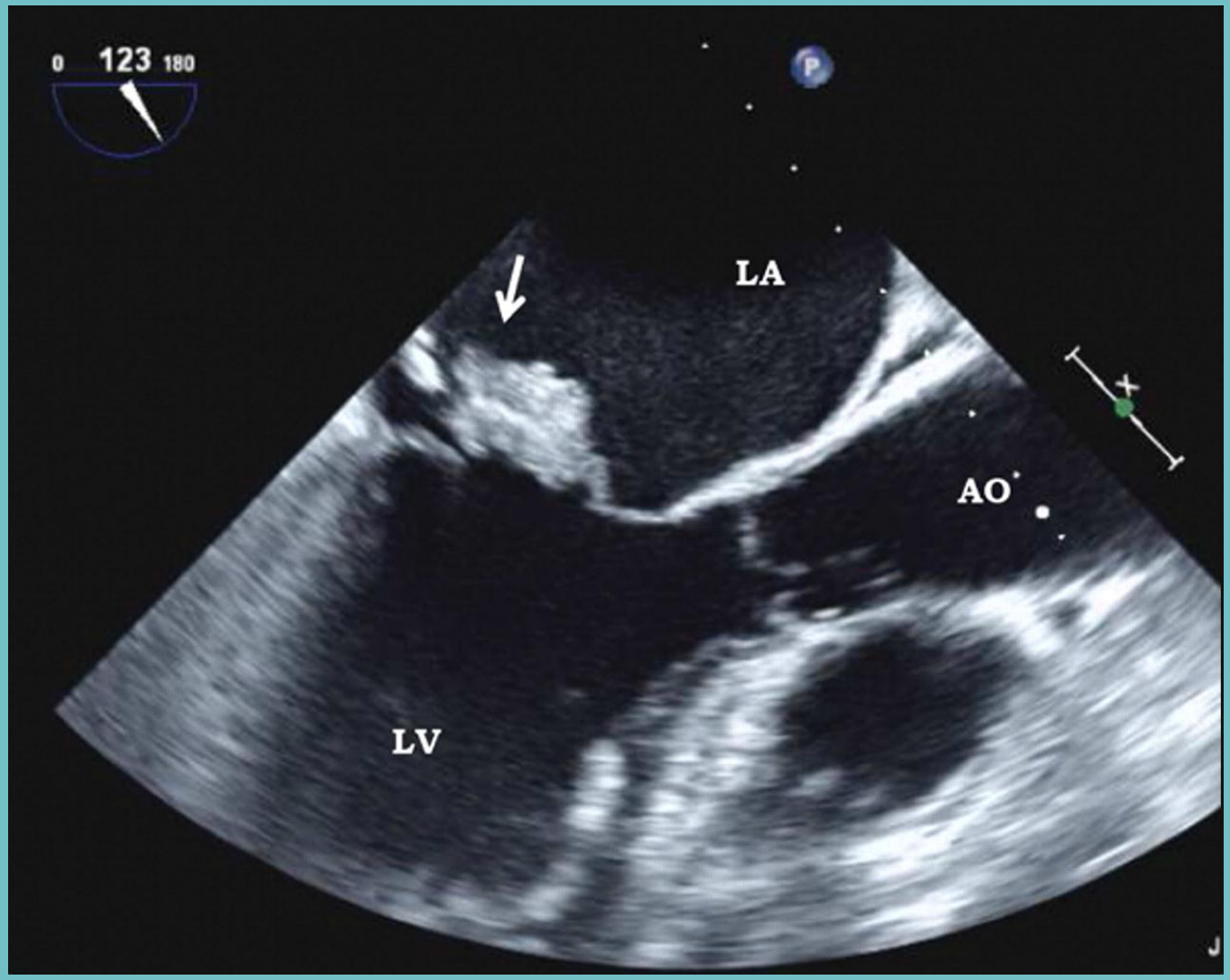
TEE +TTE
TEE
Evaluate for
other source
of infections
Otto CM-2004
EUROPEAN
SOCIETY OF
CARDIOLOGY®

Big Veg. Mitral Valve



Anatomic and echo definitions

	Surgery / Necropsy	Echocardiography
Vegetation	Infected mass attached to an endocardial structure or an implanted intracardiac material	Oscillating or non oscillating intracardiac mass or other endocardial structures or non implanted intracardiac material
Abscess	Perivalvular cavity with necrosis and purulent material not communicating with the cardiovascular lumen	Thickened non-hogeneous perivalvular area with echodense or echolucent appearance
Pseudoaneurysm	Perivalvular cavity communicating with the cardiovascular lumen	Pulsatile perivalvular echo-free space with colour-Doppler flow detected
Perforation	Interruption of endocardial tissue continuity	Interruption of endocardial tissue continuity traversed by colour Doppler flow
Fistula	Communication between 2 neighbouring cavities through a perforation	Colour-Doppler communication between 2 neighbouring cavities through a perforation
Valve aneurysm	Saccular outpouching of valvular tissue	Saccular bulging of valvular tissue
Dehiscence of a prosthetic valve	Dehiscence of the prosthesis	Paravalvular regurgitation identified by TTE/TTE with or without rocking motion of the prosthesis

Echocardiographic Positive Features for a Vegetation

- Low reflectance
- Attached to valve, upstream site
- Irregular shape, amorphous
- Mobile, oscillating
- Associated tissue changes, valvular regurgitation

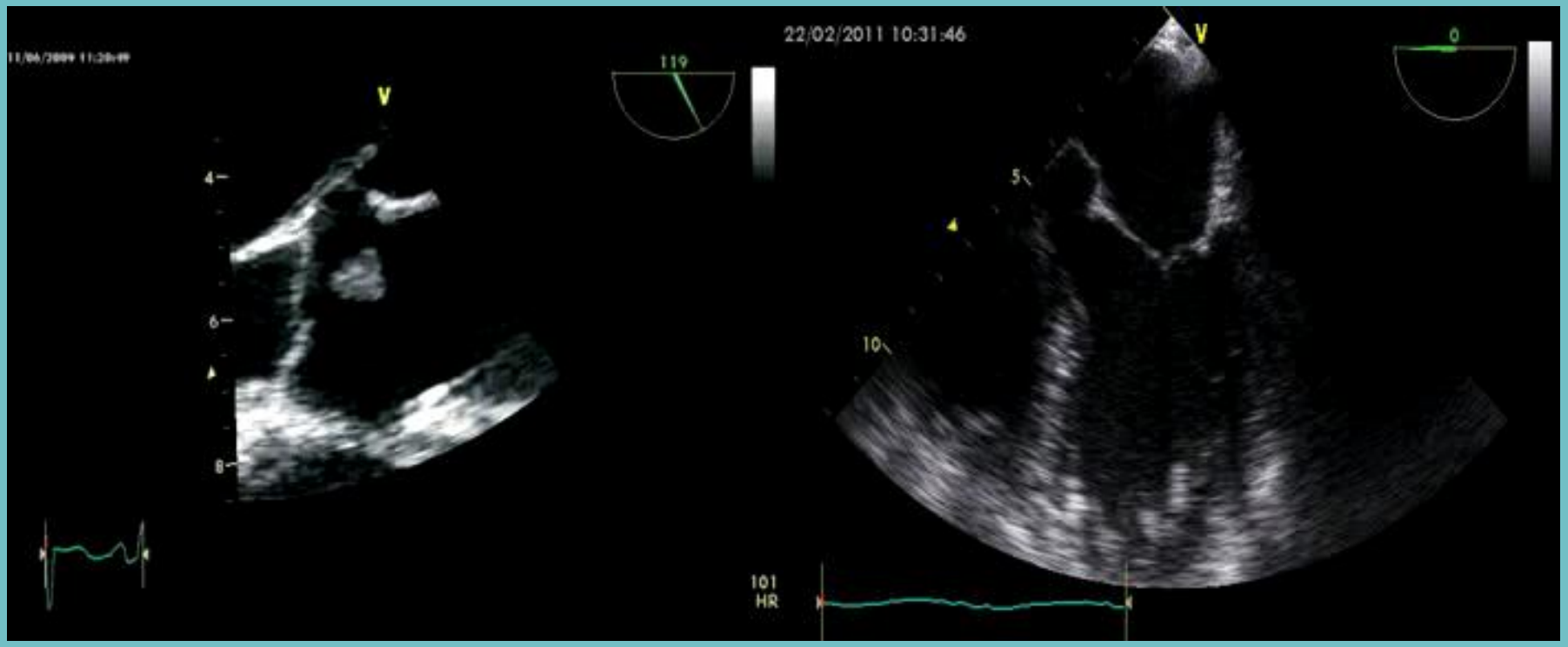
The Goals of Echo in Pts with IE

- Presence, location, size, number of valv. veg.
- Valvular regurgitation
- Anatomy of the valve
- LV size and systolic function
- Complications of IE (abscess, pericardial effusion)
- Prognosis, embolization, surgery

Differential Diagnosis of Vegetation

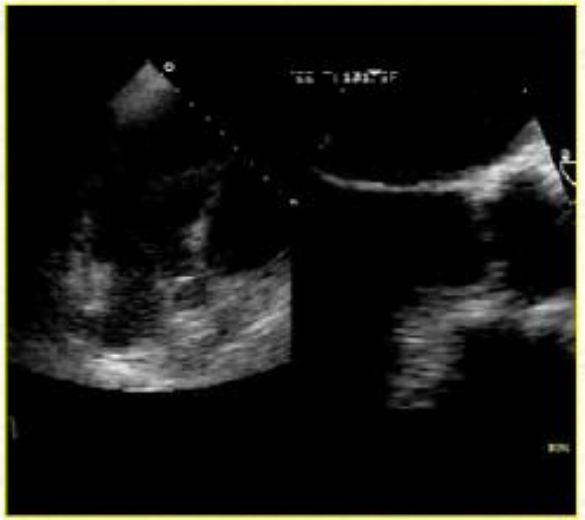
- Papillary fibroelastoma
- Myxomatous mitral valve disease
- NBTE
- SLE-Libman Sacks
- Thrombus
- Beam width artifact
- Lambl's excrescence or nodul of Arantius

Big Veg. Aortic Valve



Detection of Vegetation

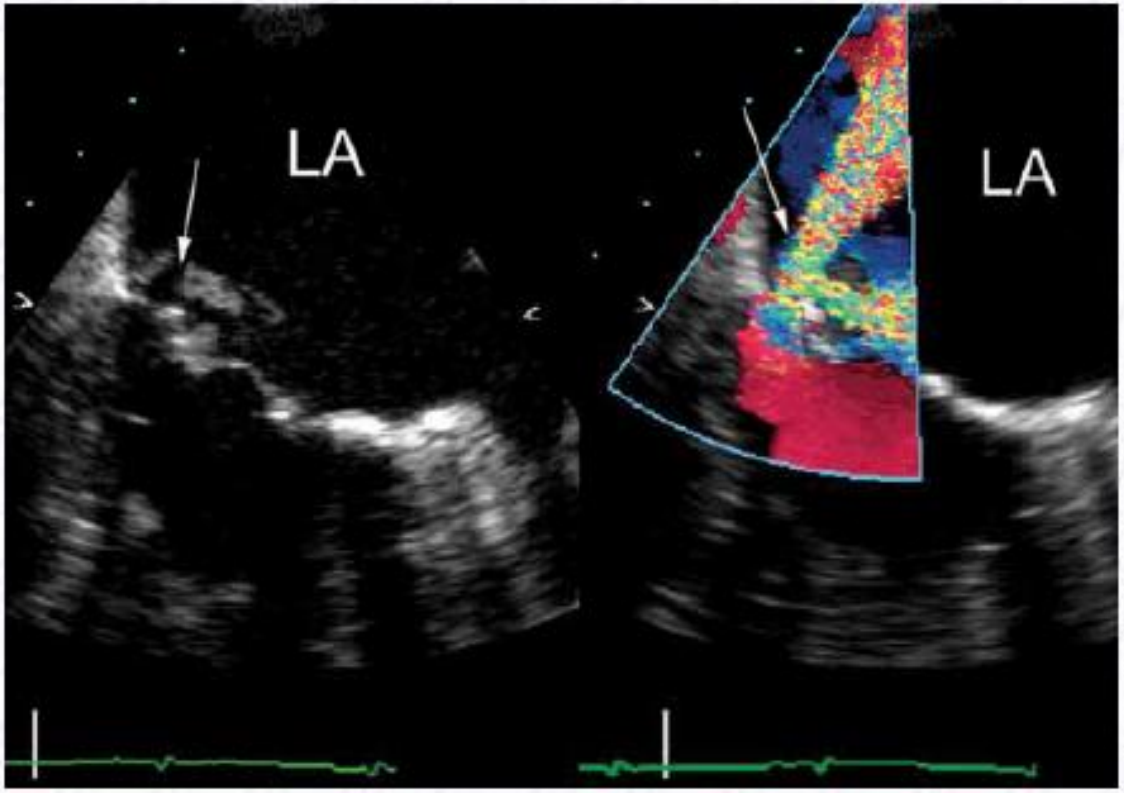
	Sensitivity	Spesificity
TTE	50-90%	91-98%
TEE	82-100%	86-100%



Complications of IE

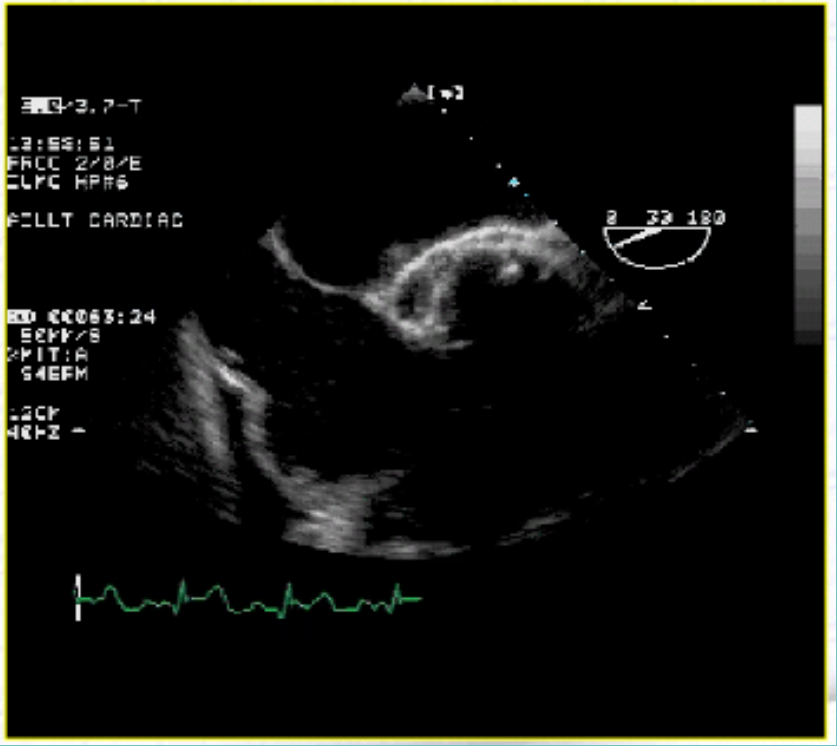
Congestive heart failure	50-60%
AR>MR>TR	
Embolization	20-25%
Mitral>aortic	
CVA	15%
Other emboli	
Limb	2-3%
Mesenteric	2%
Splenic	2-3%
Glomerulonephritis	15-25%
Annular abscess	10-15%
Mycotic aneurysm	10-15%
Conduction system involvement	5-10%
CNS abscess	3-4%
Other less common complications	1-2%
Pericarditis	
Myocarditis	
Myocardial infarction	
Intracardiac fistula	
Metastatic abscess	

Perforation



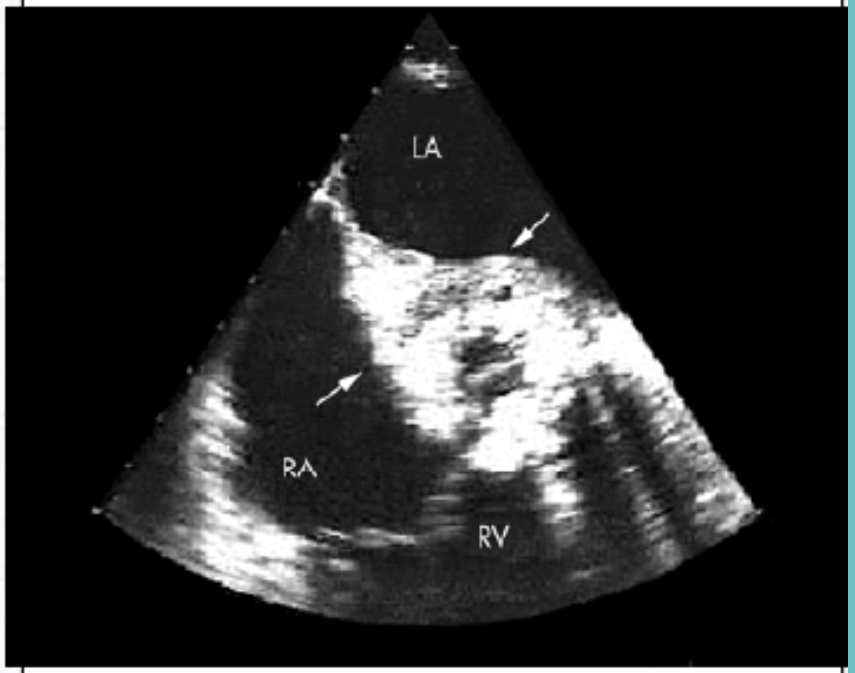
Vegetation and perforation on the mitral valve

Abscess



Periannular Complications

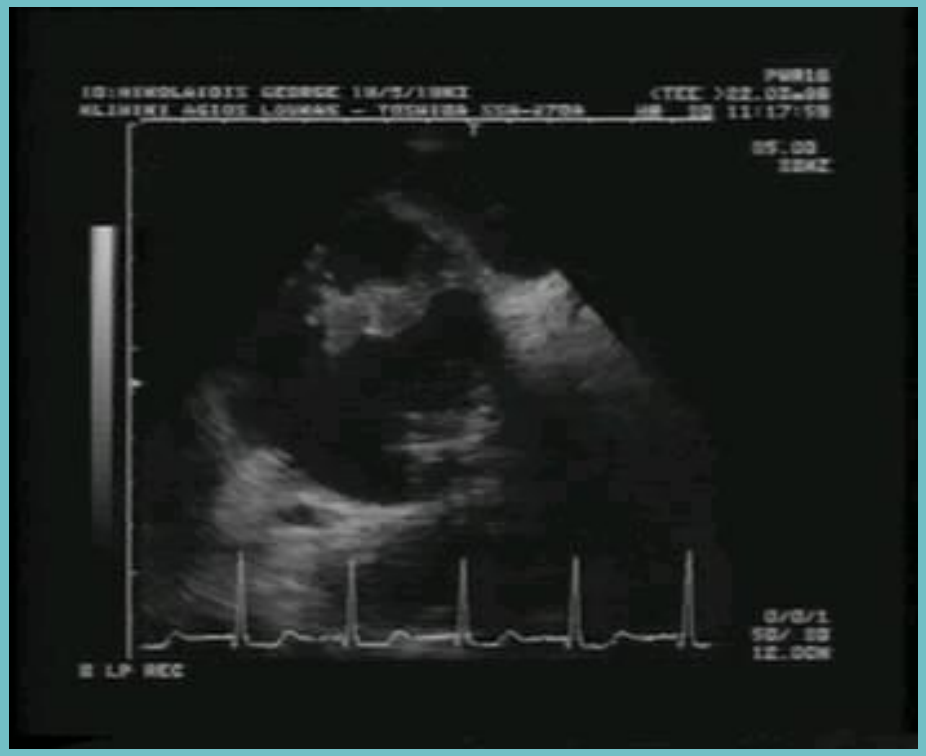
- Periannular complications are more commonly encountered in prosthetic (56–100%) than native (10–40%) valve endocarditis, because in the latter the annulus, rather than the leaflet, is generally the primary site of the infection



Fistulas

- Connection between two distinct cardiac blood spaces through nonanatomical channel
- Narrow communication with flow from the aorta or left ventricular outflow tract to a cardiac chamber

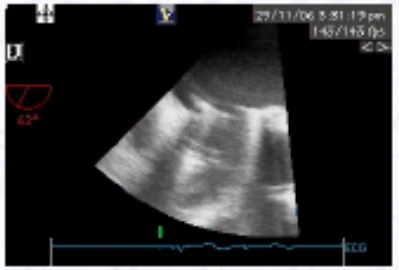
COMPLICATIONS - PVE

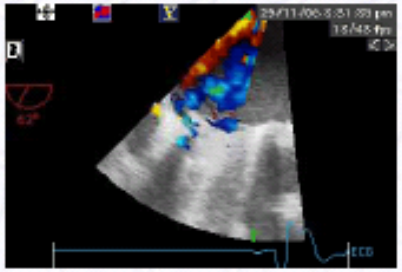


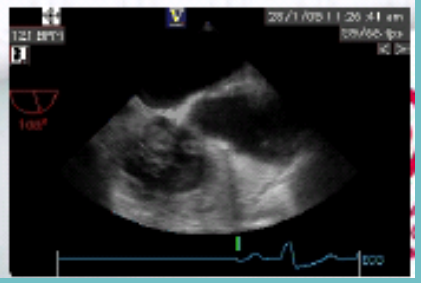
Mechanical PVE

Infection in periprosthetic tissues

- **Abscess**
- **Valve dehiscence**
- **Regurgitation**
- **Fistulization**







Periannular complications in prosthetic valves

- **More frequent in**
  - Aortic position
  - Early PVE
  - Staphylococci infections

- **Heart failure**
- **Heart block**
- **Ventricular septal defect**
- **Mortality**

More in periannular complications

Diagnosis

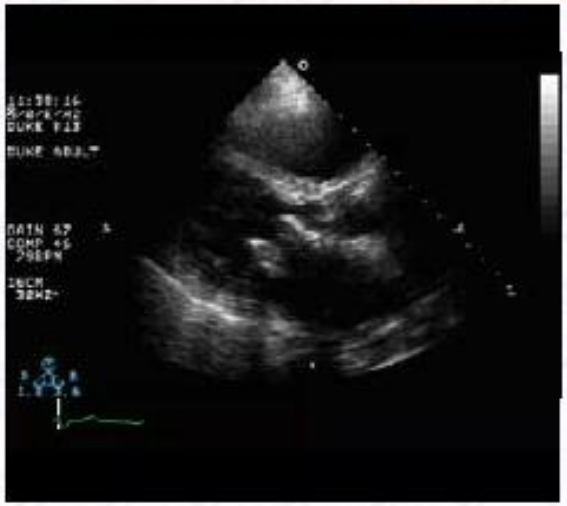
- **TEE is the modality of choice in the evaluation for potential periannular extension**
  - Sensitivity: 76% to 100%,
  - Specificity: 95%,
  - positive predictive value: 87%
  - negative predictive value: 89%

The role of TEE in the diagnosis of periannular camplications in PVE

	Anatomic diagnosis	TEE diagnosis	TEE sensitivity	TEE specificity
Abscess	30	27	90%	100%
Pseudoaneurysm	18	19	100%	98%
Fistula	8	8	100%	100%

Bioprosthetic PVE

- Restricted to leaflets
- Increased chance of late failure due to degeneration of the cusps
- Sewing ring infection is less
- Less susceptible to early infection
- Cure with antibiotics more likely

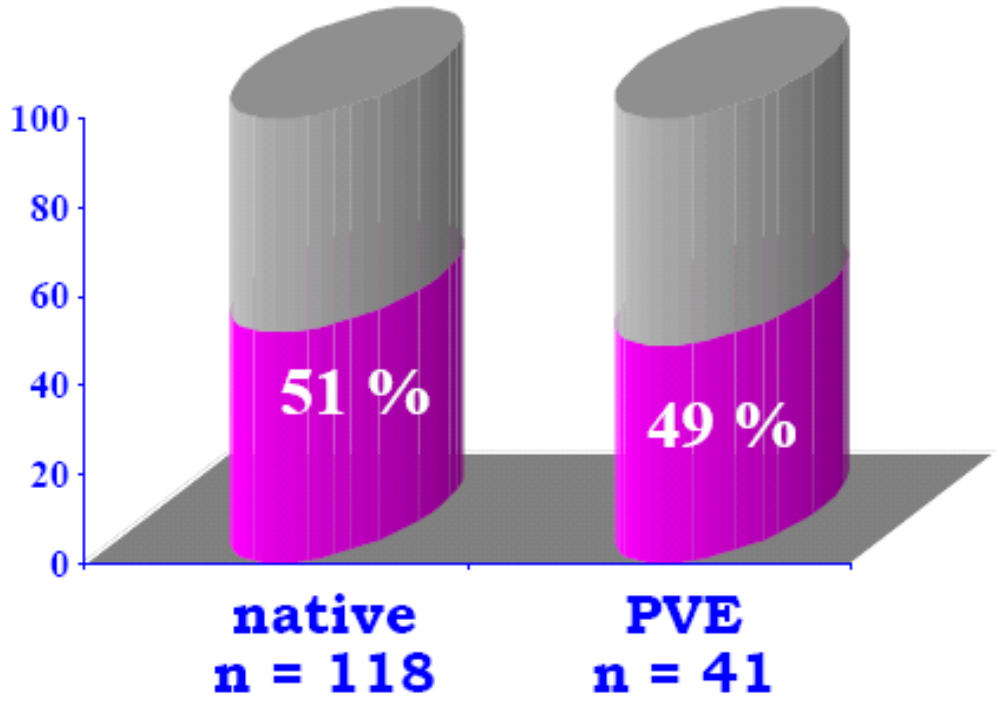


IE: new guidelines ESC 2009

1. prevention
2. diagnosis
3. **treatment**
4. specific situations

Surgery in IE : Euro Heart Survey

Tornos P – Heart 2005 ; 91 : 571-5



Surgery performed

Medical therapy only

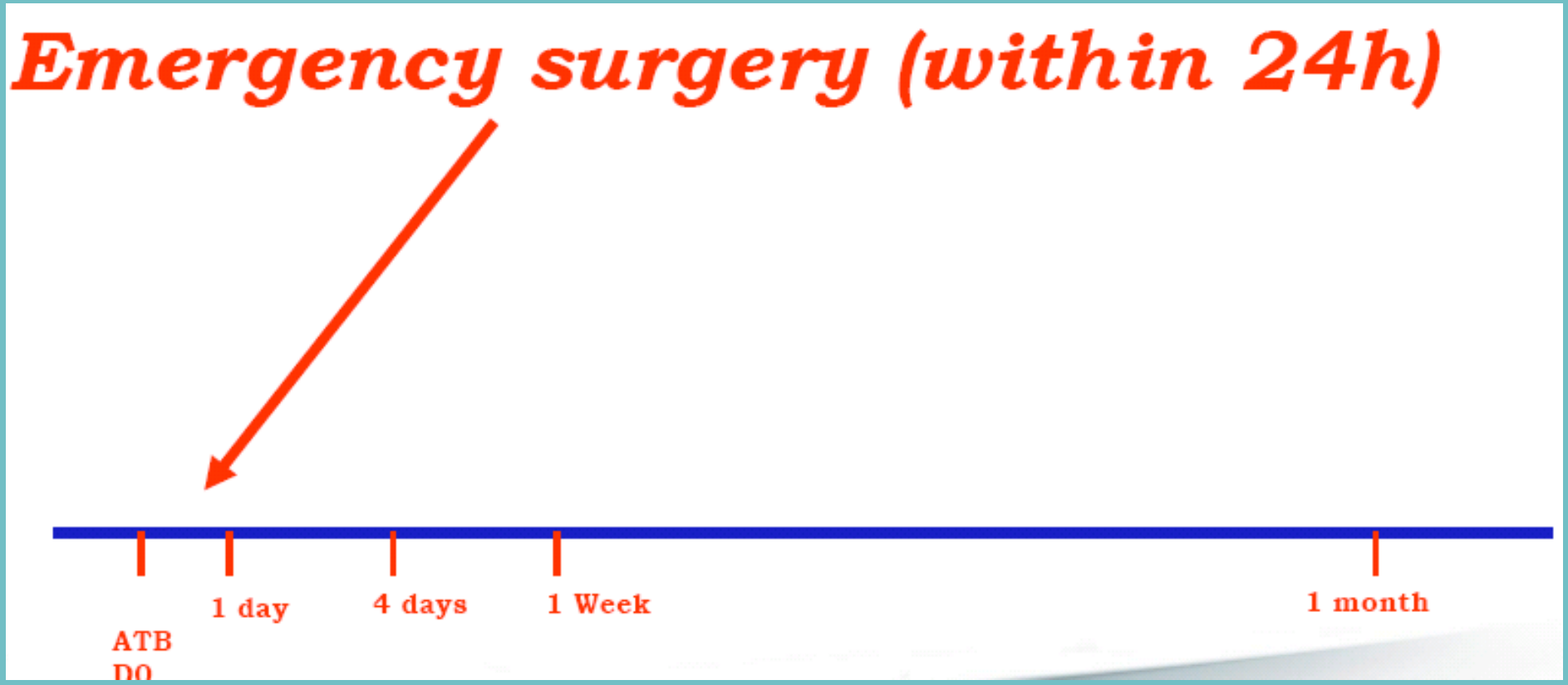
Reasons for surgery

- *CHF: 65%*
- *persistent sepsis: 45%*
- *embolism: 20%*
- *vegetation size: 25%*
- *other: 40%*

New guidelines 2009: native IE

Recommendations: Indications for surgery	Timing*	Class[a]	Level[b]
A - HEART FAILURE			
Aortic or mitral IE with severe acute regurgitation or valve obstruction causing refractory pulmonary oedema or cardiogenic shock	Emergency	I	B
Aortic or mitral IE with fistula into a cardiac chamber or pericardium causing refractory pulmonary oedema or shock	Emergency	I	B
Aortic or mitral IE with severe acute regurgitation or valve obstruction and persisting heart failure or echocardiographic signs of poor haemodynamic tolerance (early mitral closure or pulmonary hypertension)	Urgent	I	B
Aortic or mitral IE with severe regurgitation and no HF	Elective	IIa	B
B - UNCONTROLLED INFECTION			
Locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation)	Urgent	I	B
Persisting fever and positive blood cultures > 7-10 days	Urgent	I	B
Infection caused by fungi or multiresistant organisms	Urgent/elective	I	B
C - PREVENTION OF EMBOLISM			
Aortic or mitral IE with large vegetations (> 10 mm) following 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 (heart failure, persistent infection, abscess)	Urgent	I	C
Isolated very large vegetations (> 15 mm)#	Urgent	IIb	C

Emergency surgery

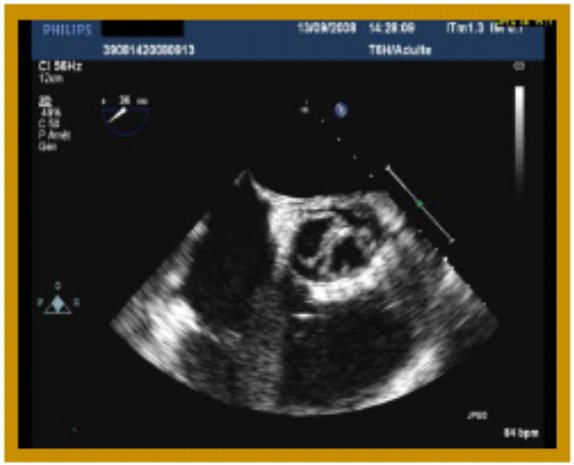


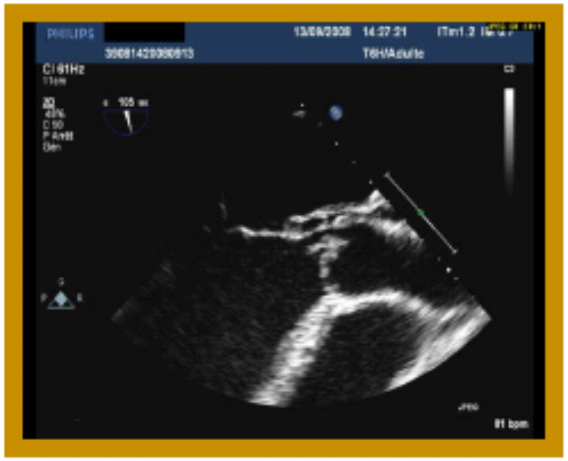
New guidelines: timing of surgery

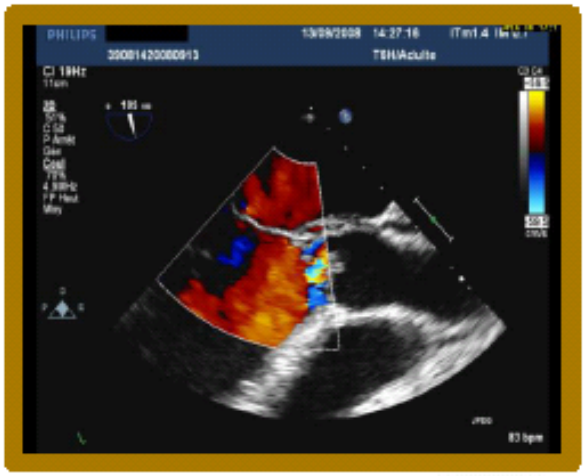
Recommendations: Indications for surgery	Timing*	Class[a]	Level[b]
A - HEART FAILURE			
Aortic or mitral IE with severe acute regurgitation or valve obstruction causing refractory pulmonary oedema or cardiogenic shock	Emergency	I	B
Aortic or mitral IE with fistula into a cardiac chamber or pericardium causing refractory pulmonary oedema or shock	Emergency	I	B
Aortic or mitral IE with severe acute regurgitation or valve obstruction and persisting heart failure or echocardiographic signs of poor haemodynamic tolerance (early mitral closure or pulmonary hypertension)	Urgent	I	B
Aortic or mitral IE with severe regurgitation and no HF	Elective	IIa	B

New guidelines: timing of surgery

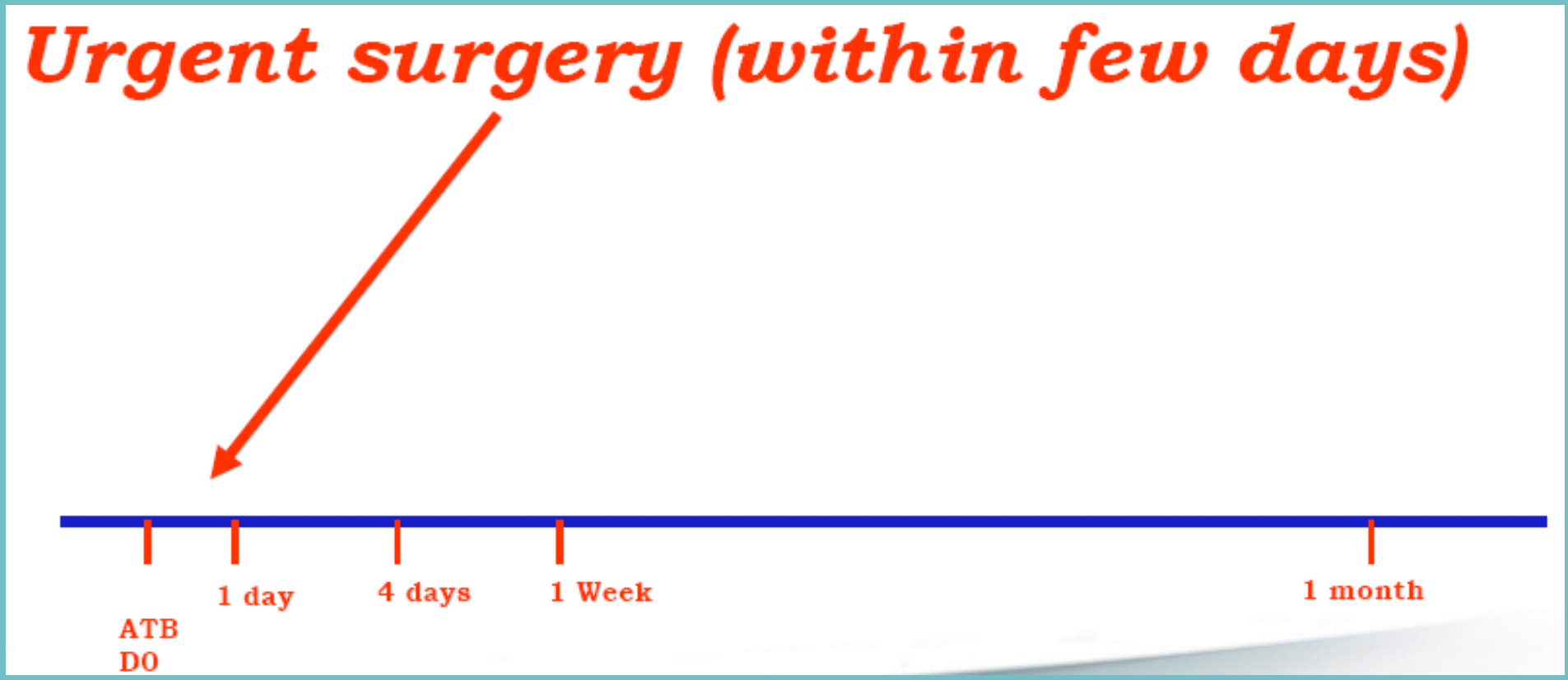
Recommendations: Indications for surgery	Timing*	Class[a]	Level[b]
B - UNCONTROLLED INFECTION			
Locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation)	Urgent	I	B
Persisting fever and positive blood cultures > 7-10 days	Urgent	I	B
Infection caused by fungi or multiresistant organisms	Urgent/elective	I	B





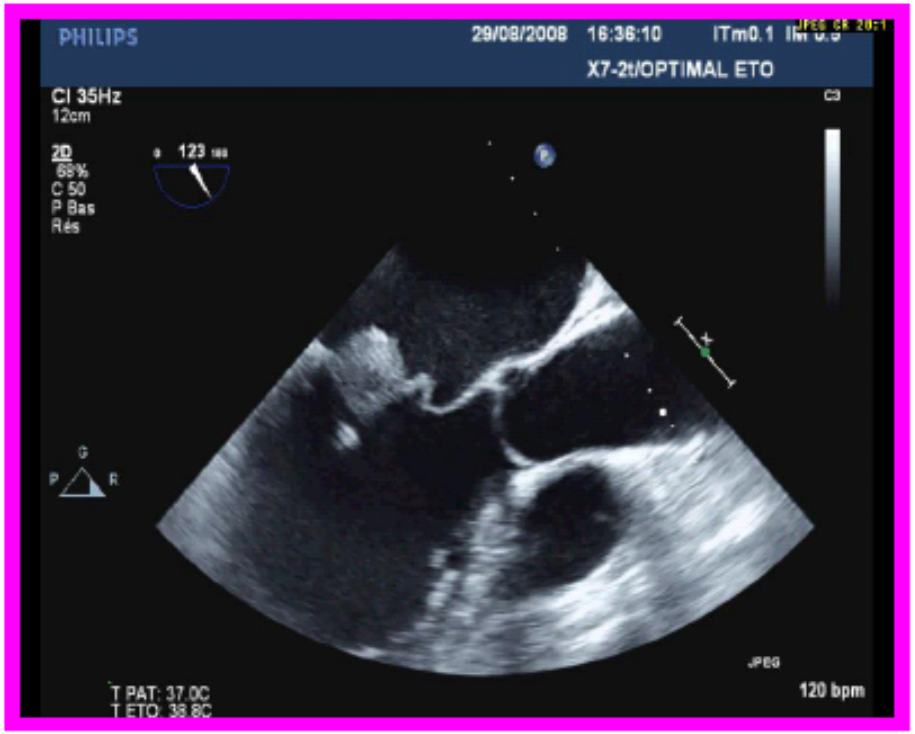


Urgent surgery

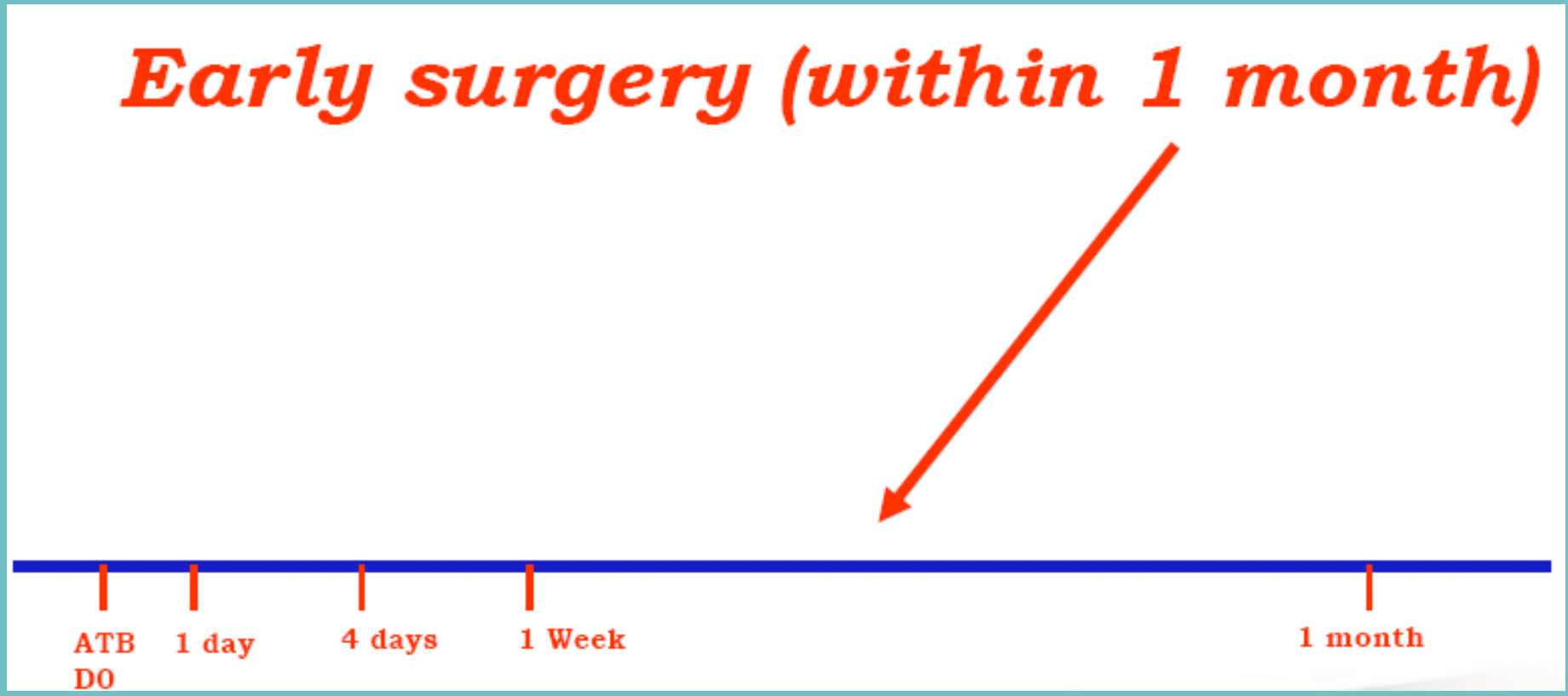


Embolic events in IE

1. are frequent and severe
2. are related to the vegetation size
3. occur early in the course of IE



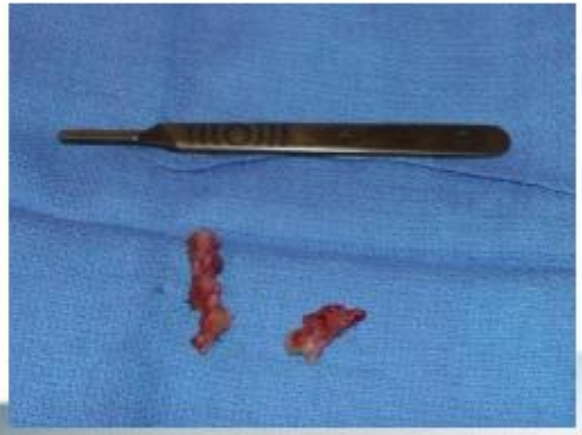
Early surgery



New guidelines: timing of surgery

Recommendations: Indications for surgery	Timing*	Class[a]	Level[b]
C - PREVENTION OF EMBOLISM			
Aortic or mitral IE with large vegetations (> 10 mm) following 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 (heart failure, persistent infection, abscess)	Urgent	I	C
Isolated very large vegetations (> 15 mm)#	Urgent	IIb	C

Surgery may be preferred if procedure preserving the native valve is feasible



Prosthetic Valve Endocarditis (PVE)

Indications for surgery in PVE	Timing
A. HEART FAILURE	
• PVE with severe prosthetic dysfunction (dehiscence or obstruction) causing refractory pulmonary oedema or cardiogenic shock	Emergency
• PVE with fistula into a cardiac chamber or pericardium causing refractory pulmonary oedema or cardiogenic shock	Emergency
• PVE with severe prosthetic dysfunction and persisting heart failure	Urgent
• Severe prosthetic dehiscence without heart failure	Elective
B. UNCONTROLLED INFECTION	
• Locally uncontrolled infection (abscess, false aneurysm, enlarging vegetation)	Urgent
• PVE caused by fungi or multiresistant organisms	Urgent/elective
• PVE with persisting fever and positive blood culture >7-10 days	Urgent
• PVE caused by *staphylocci* or gram *negative bacteria*: (most cases of early PVE)	Urgent/elective
C. PREVENTION of EMBOLISM	
• PVE with recurrent emboli despite appropriate treatment	Urgent
• PVE with large vegetations (10 mm) and other predictors of complicated course (HF, persistent infection, abscess)	Urgent
• PVE with isolated very large vegetations (>15 mm)	Urgent

Crucial role of prognostic assessment

Patient Characteristics

- Elderly
- Prosthetic valve IE
- Insulin dep. diabetes
- Co-morbidity

Microorganisms

- S. Aureus
- Fungi
- Gram-negative bacilli

Complicated IE

- Heart failure
- Renal failure
- Stroke
- Septic shock
- Periannular complications

Echocardiographic findings

- Periannular complications
- Severe left-sided valve regurgit
- Low LVEF
- Pulmonary hypertension
- Large vegetations
- Severe prostetic dysfunction
- Premature valve closure/signs of ↑ diastolic Pr.

Independent Predictors of Mortality

- Co-morbidity
- Abnormal mental status
- Congestive heart failure
- Staphylococcal IE
- Medical treatment
- Large vegetation (>15 mm)

Intravenous Drug User IE

- Incidence: 1-5% per year
  - **With IE ranges 5-25% per year**
- Major entry site: Skin
- Tricuspid valve affected in 70% of pts
- Better prognosis (<5% mortality)
- Short-course therapy first
- Surgery
  - **Difficult to eradicate**
  - **Tricuspid valve veg >2 cm with clinical outcome**

CONCLUSIONS

1) **Despite advances in antibiotic therapy and surgical options, IE remains a challenging and often fatal condition.**
2) **Reduce prophylaxis, increase prevention**
3) **Major role of echocardiography**

   diagnosis
   prognosis
   decision making
   follow-up

4) **Early accurate diagnosis, early proper treatment and early surgery, more valve repair, can be life saving**