Challenging clinical situation

A young patient with prosthetic aortic valve endocarditis

Gilbert Habib
La Timone Hospital
Marseille - France

October 25th 2014

Case report

History of the disease

- 34 year-old woman,
- 2006: aortic bioprosthesis (IE)
- december 2013: unexplained fever
- treatment: oral Ofloxacin
- persistent fever

Clinical examination

- no sign of CHF
- fever = 38° 5
- aortic systolic murmur 2/6
- arterial pressure: 140/70 mmHg
- normal neurological examination

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Case report

Laboratory data

- haemoglobin: 11 g / dl
- white blood cell: 13,000 / mm^3
- CRP = 280 mg/l
- creatinin = 85 mg

TTE

- apparently normal bioprosthesis
- mean gradient = 18 mmHg
- prosthetic area = 1.2 cm^2
- LVEF = 60%
- no vegetation, no abscess

Blood cultures:

Pseudomonas Aeruginosa (x 6)

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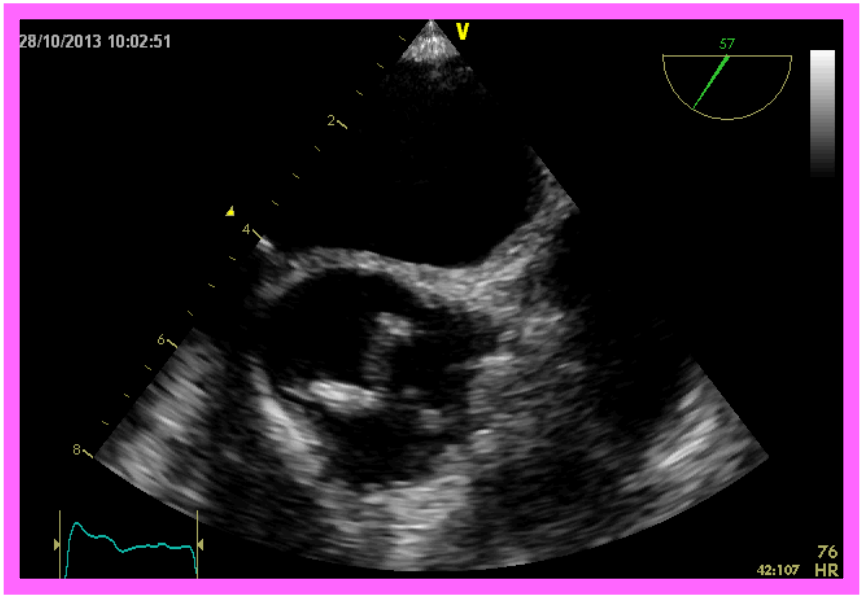
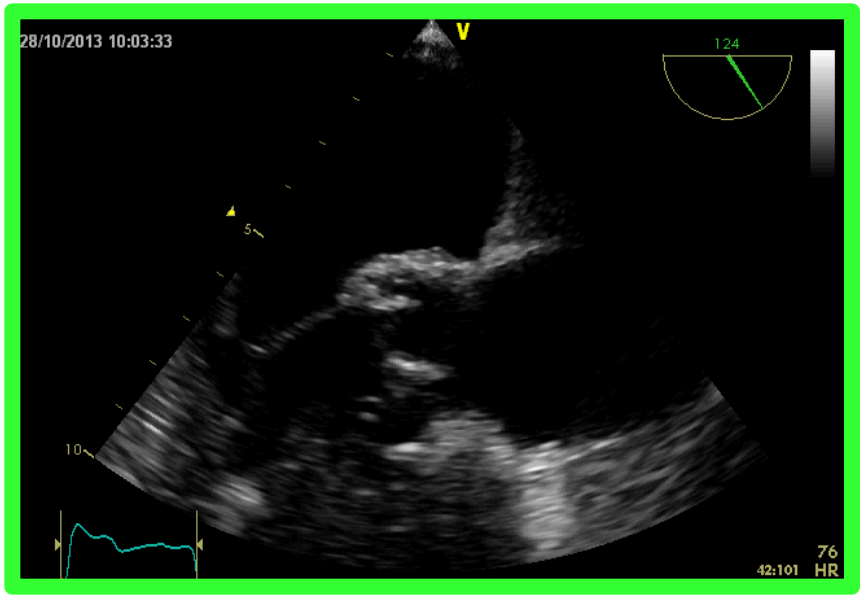
TEE October 28th, 2013





Q 1: is the diagnosis of PVE?

1. **Definite ?**

2. **Possible ?**

3. **Rejected ?**

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Modified Duke criteria for the diagnosis of IE

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, Abscess, 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.

European Heart Journal (2009) 30:2369–2413

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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

Adapted from LI Js et al., *Clin Infect Dis.* 200;30:633-638

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Q 2: which management?

1. **No treatment – close follow-up – repeat TEE ?**

2. **Perform other diagnostic techniques ?**

3. **Initiate antibiotic therapy ?**

4. **Perform surgery?**

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Decision and follow-up

1. **Possible IE**

2. **Initiation of antibiotic therapy**
   - Vancomycin
   - Gentamycin

3. **follow-up**
   - repeat TTE and TEE
   - ^{18}FDG-PET-CT
   - CT scan

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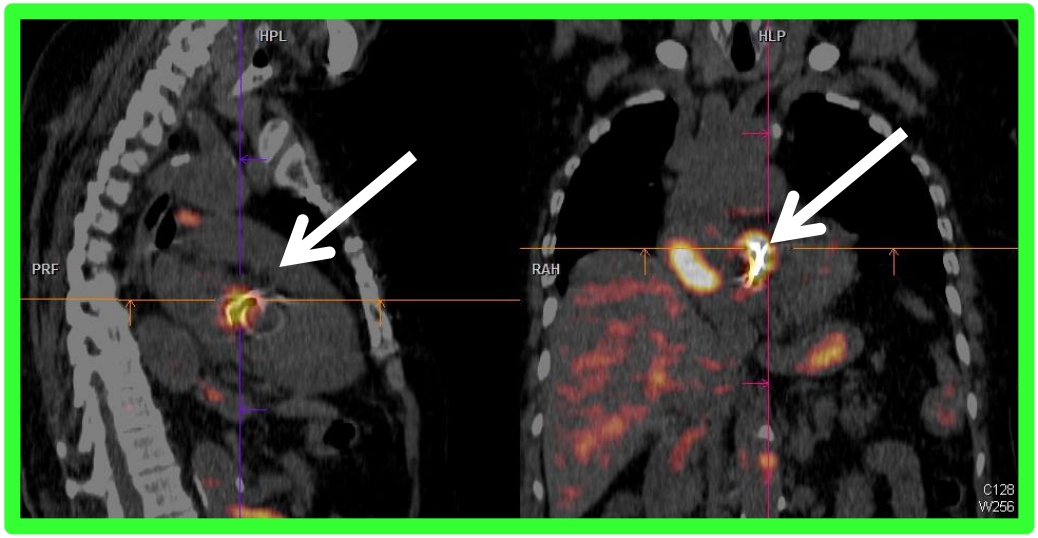
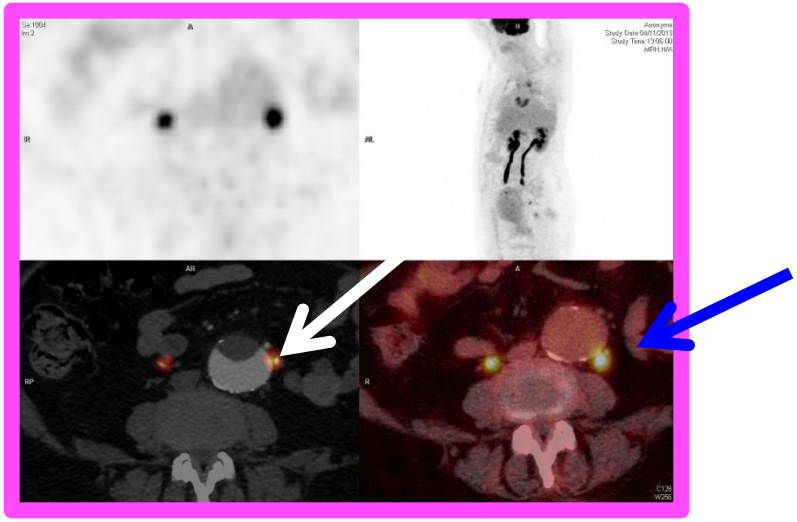
^{18}FDG-PET-CT November 4th

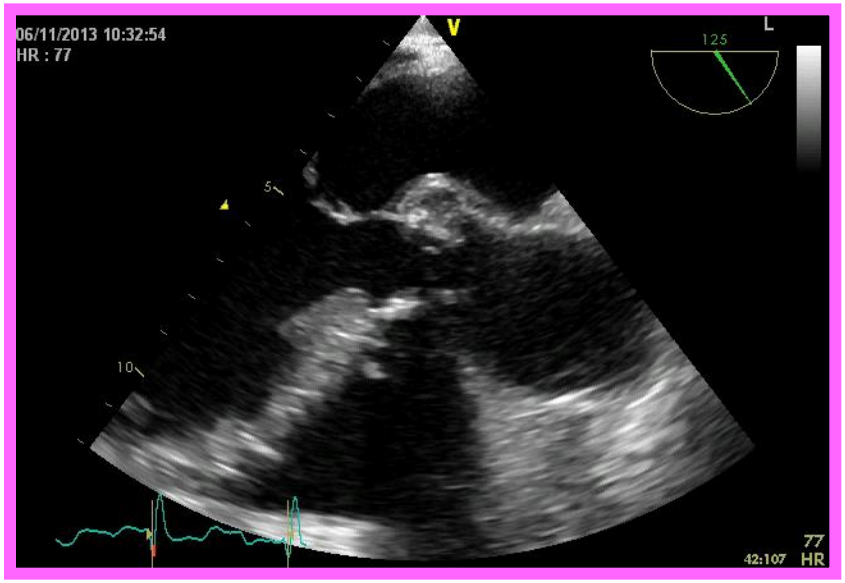


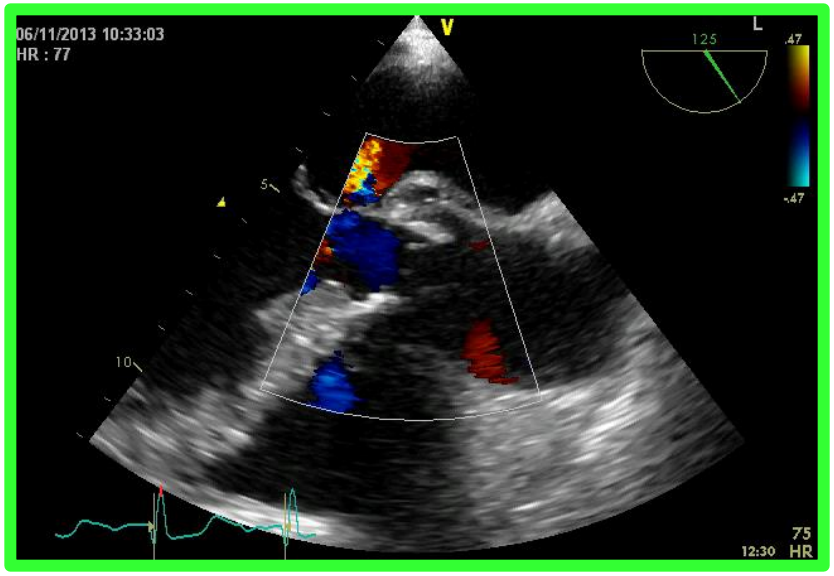
Uptake on the prosthesis



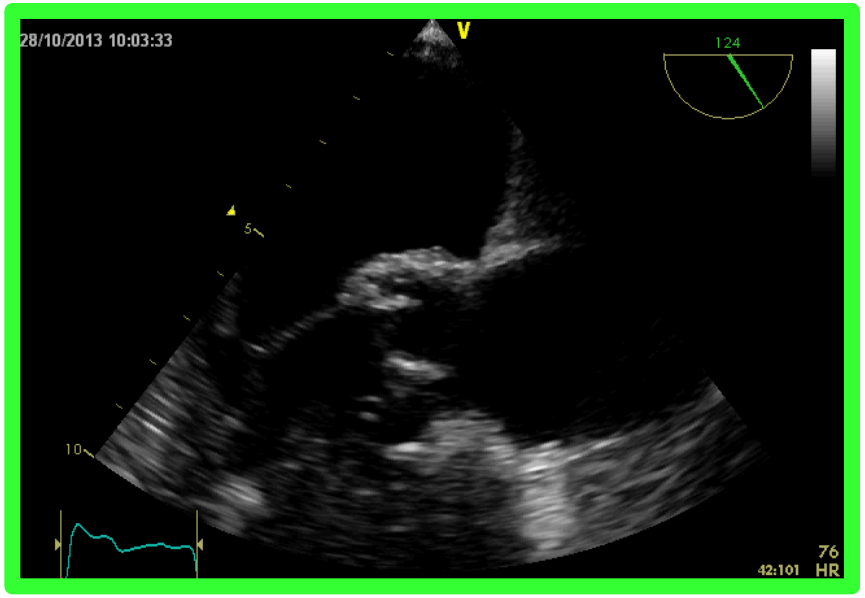
Aortic aneurysm
Uptake on the superior mesenteric artery

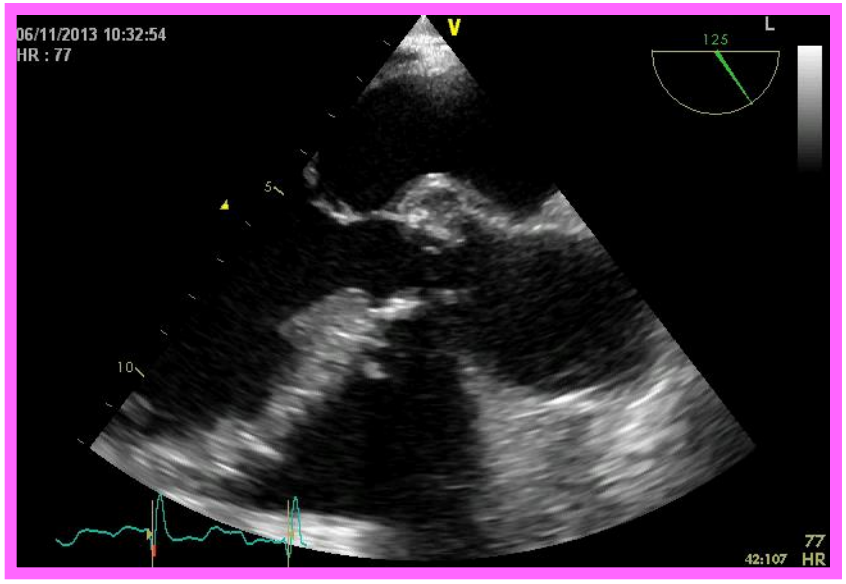
TEE November 6th 2013





TEE follow-up

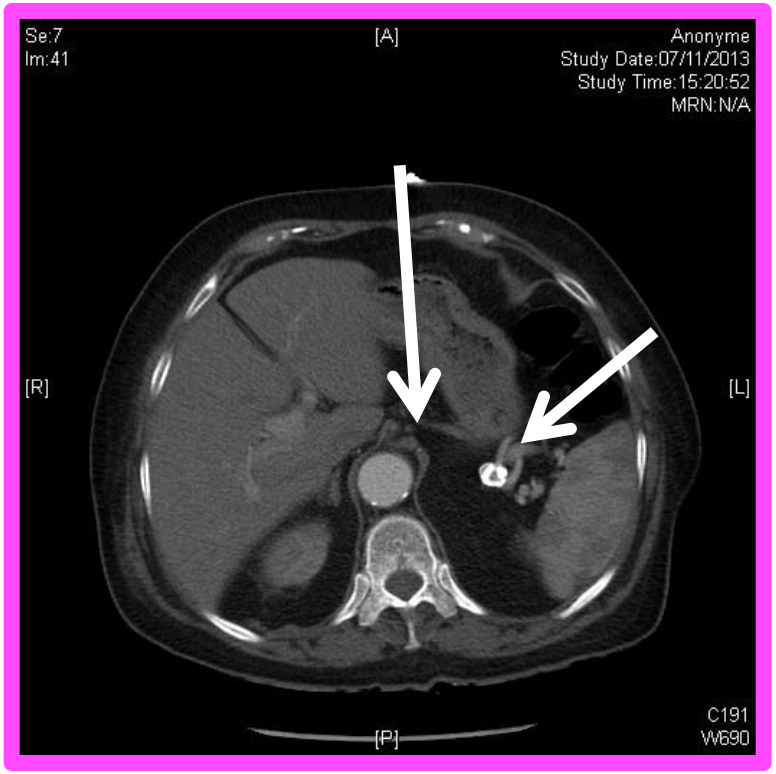




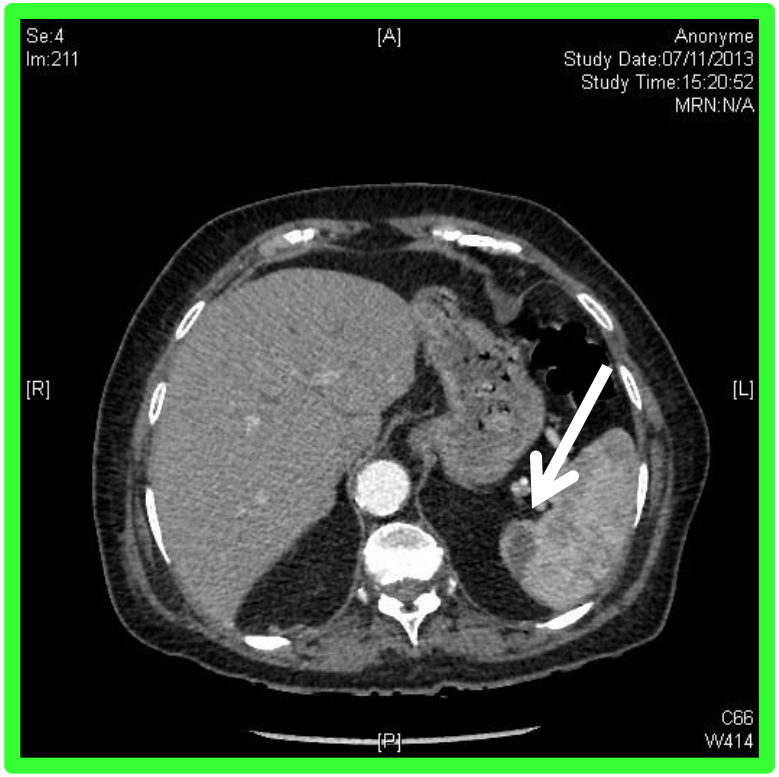
October 28, 2013

November 6, 2013

Abdominal CT scan



Occlusion of the SMA
Aneurysm of the splenic artery



Splenic embolism

Outcome on ATB therapy

- **Clinical and biological improvement**
- **TEE: unchanged**
- **Negative BC**
- **No abdominal symptom**

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Q 3: How will you manage?

1. **Urgent surgery because an abscess is present?**

2. **Go on with ATB, since the patient is doing well?**

3. **Interventional treatment of the mesenteric FA?**

4. **No surgery, lifelong ATB therapy?**

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Prosthetic valve IE

1. Diagnosis

2. Management

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Prosthetic valve IE

1. ***Diagnosis***

2. **Management**

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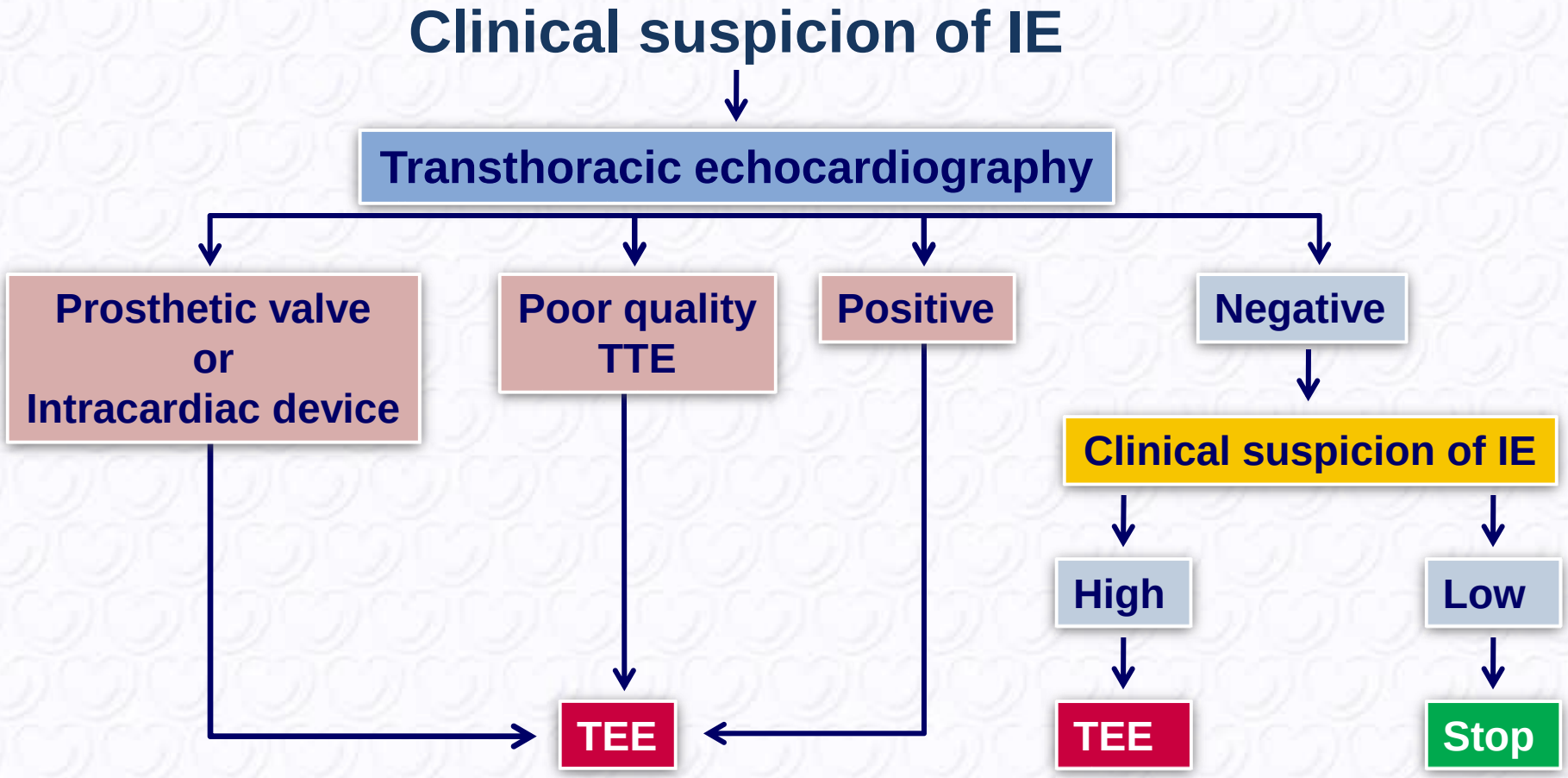
Indications for echocardiography



If initial TEE is negative but persistent suspicion of IE: repeat TEE within 7-10 days

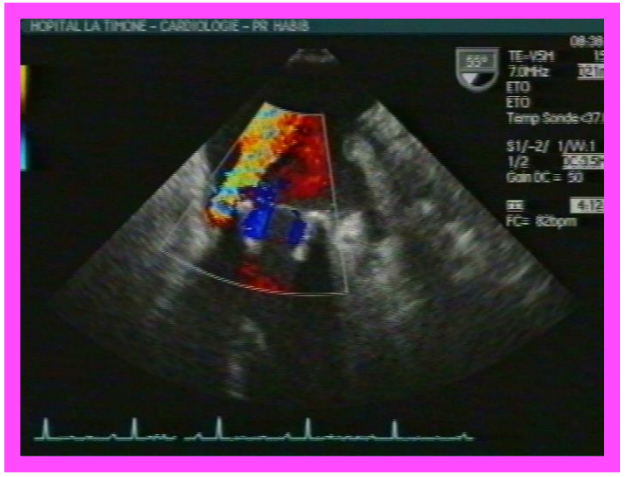
European Heart Journal (2009) 30:2369–2413

The Duke echographic criteria

Durack DT Am J Med 1994 ; 96 : 200-9

vegetation

abscess



new dehiscence of prosthetic valve

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Echo is not 100% sensitive

1. very small (< 2 mm) vegetation
2. non vegetant endocarditis
3. prosthetic and pacemaker endocarditis
4. mitral valve prolapse with thickened valves
5. vegetation not yet present or already embolized

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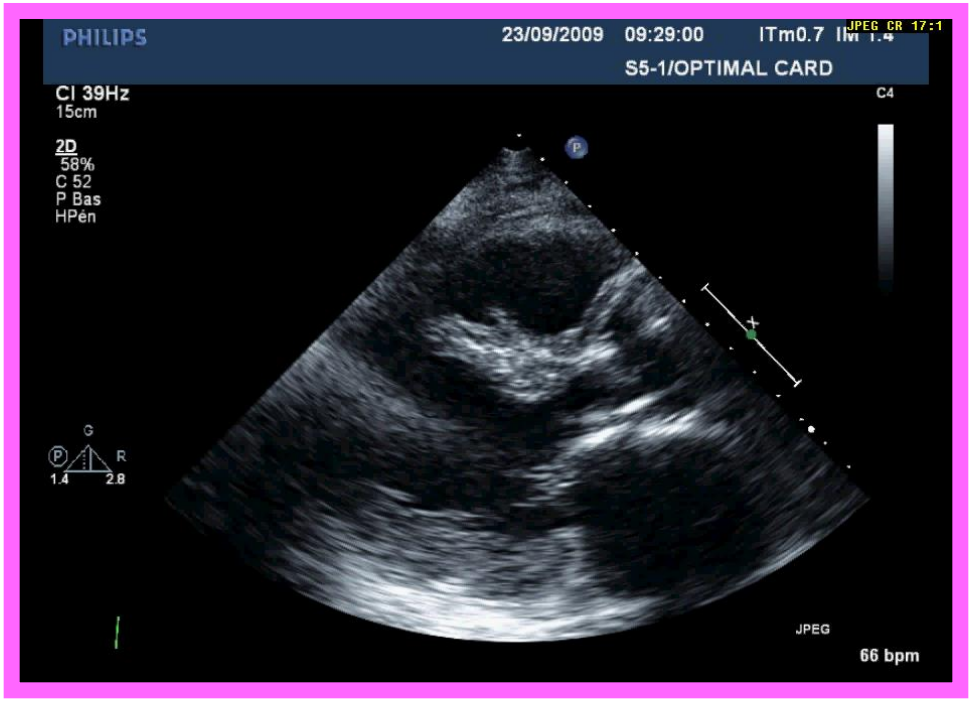
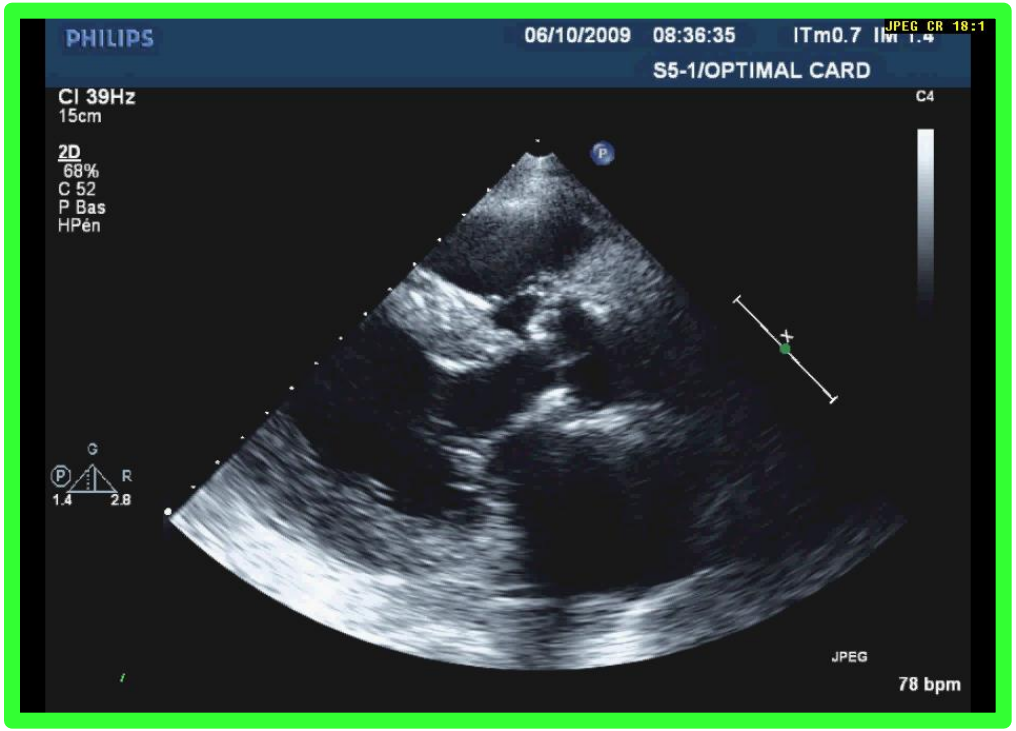
Aortic bioprosthetic abscess





September 23, 2009

October 6, 2009

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Role of echocardiography in IE (1)

A. Diagnosis

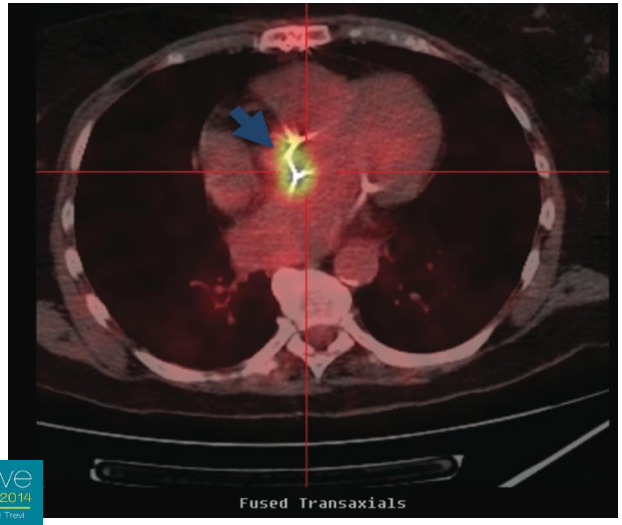
Recommendations	Class	Level
1. TTE is recommended as the first-line imaging in suspected IE.	I	B
2. TEE is recommended in patients with high clinical suspicion of IE and normal TTE.	I	B
3. Repeat TTE/TEE within 7-10 days in case of negative initial examination and if clinical suspicion of IE persists.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

European Heart Journal (2009) 30:2369–2413

Advantages of PET – CT over echo

- **Echo provides morphological imaging without accurate information on the activity of IE = insensitive for very early diagnosis**

- **PET/CT provides a functional imaging of inflammation and has the potential to bring an earlier diagnosis of IE**



Bensimhon L, et al. Clin Microbiol Infect 2011;17:836-44
Ploux S, et al. Heart Rhythm 2011;8:1478-81
Sarrazin JF, et al. J Am Coll Cardiol 2012;59:1616-25
Saby L, et al. Circulation 2013;126:e217-220

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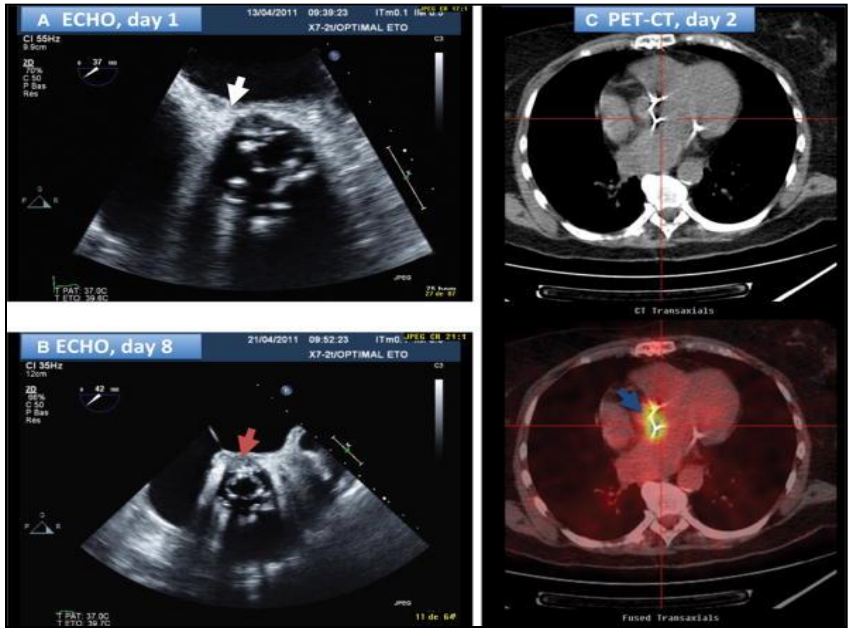
Images in Cardiovascular Medicine

Early Diagnosis of Abscess in Aortic Bioprosthetic Valve by 18F-Fluorodeoxyglucose Positron Emission Tomography-Computed Tomography

Ludivine Saby, MD; Yvan Le Dolley, MD; Olivia Laas, MD; Laetitia Tessonnier, MD; Serge Cammilleri, MD; Jean-Paul Casalta, MD; Didier Raoult, MD, PhD; Gilbert Habib, MD; Franck Thuny, MD, PhD



Results of echocardiographic studies and 18F-FDG PET-CT

The first transesophageal echocardiography (A) showed a small thickening around the aortic bioprosthetic annulus (white arrow).

The second transesophageal echocardiography (B), performed 8 days after, showed a periprosthetic abscess (red arrow).

The 18F-FDG PET-CT performed the day after the first echocardiography showed a hyperfixation around the aortic prosthesis (C, blue arrow).

Circulation. 126(14):e217-e220, October 2, 2012.
DOI: 10.1161/CIRCULATIONAHA.112.102301

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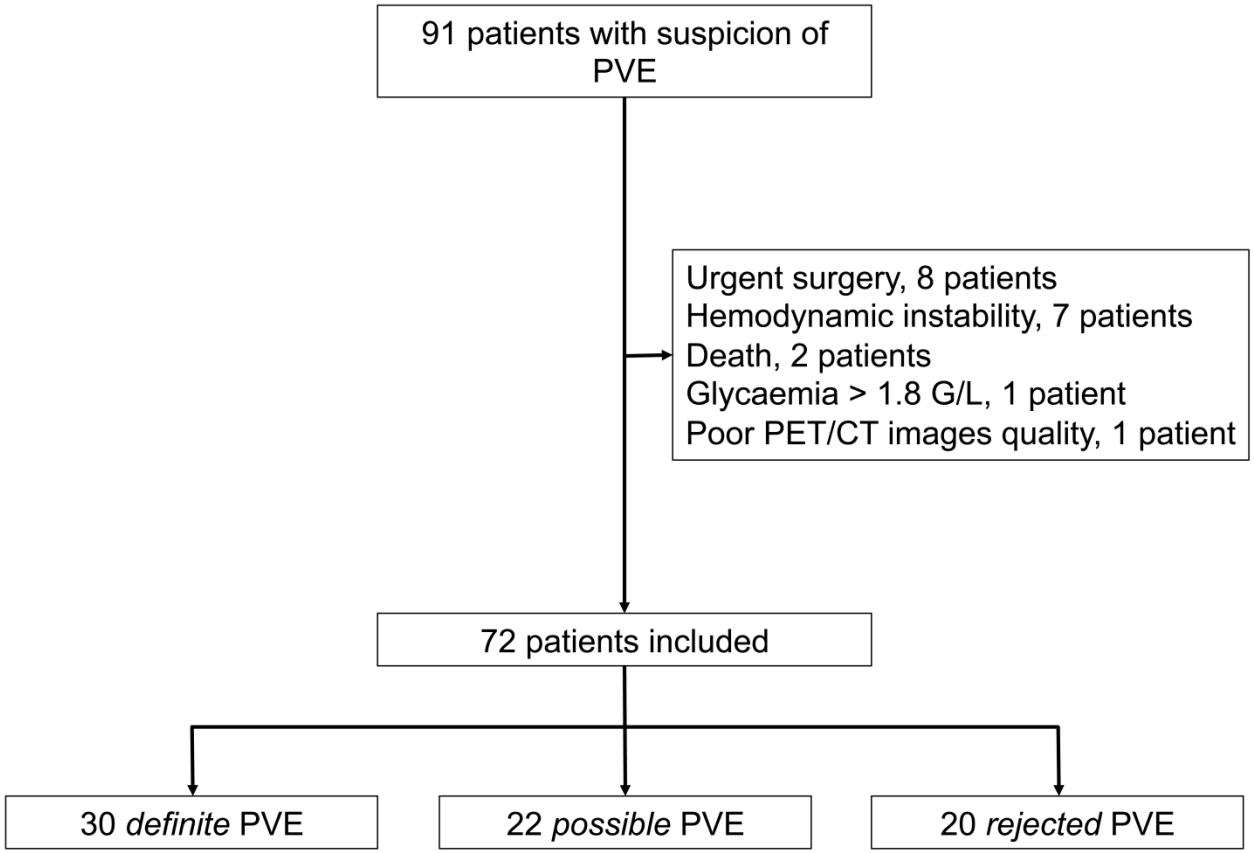
^{18}FDG-PET-CT in endocarditis

Saby L, Thuny F, Habib G - J Am Coll Cardiol. 2013; 11;61:2374-82



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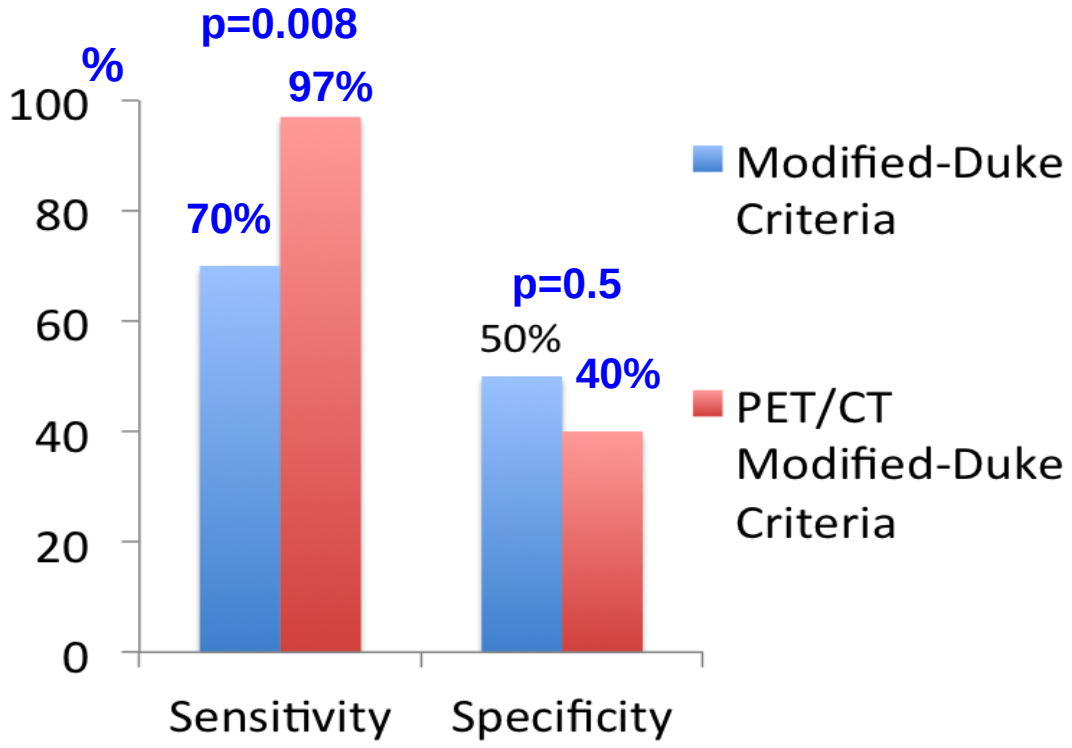
PET/CT as a novel major criterion



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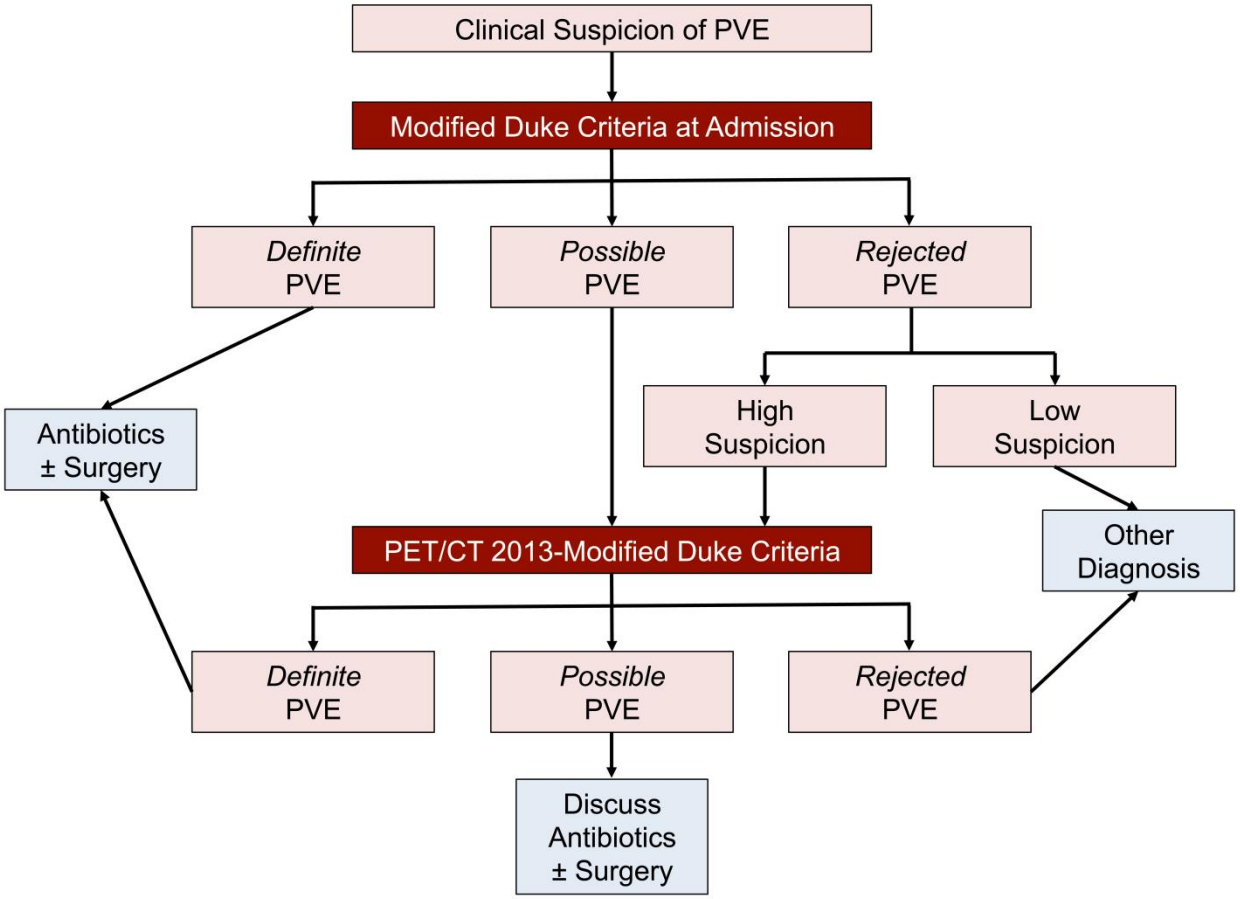

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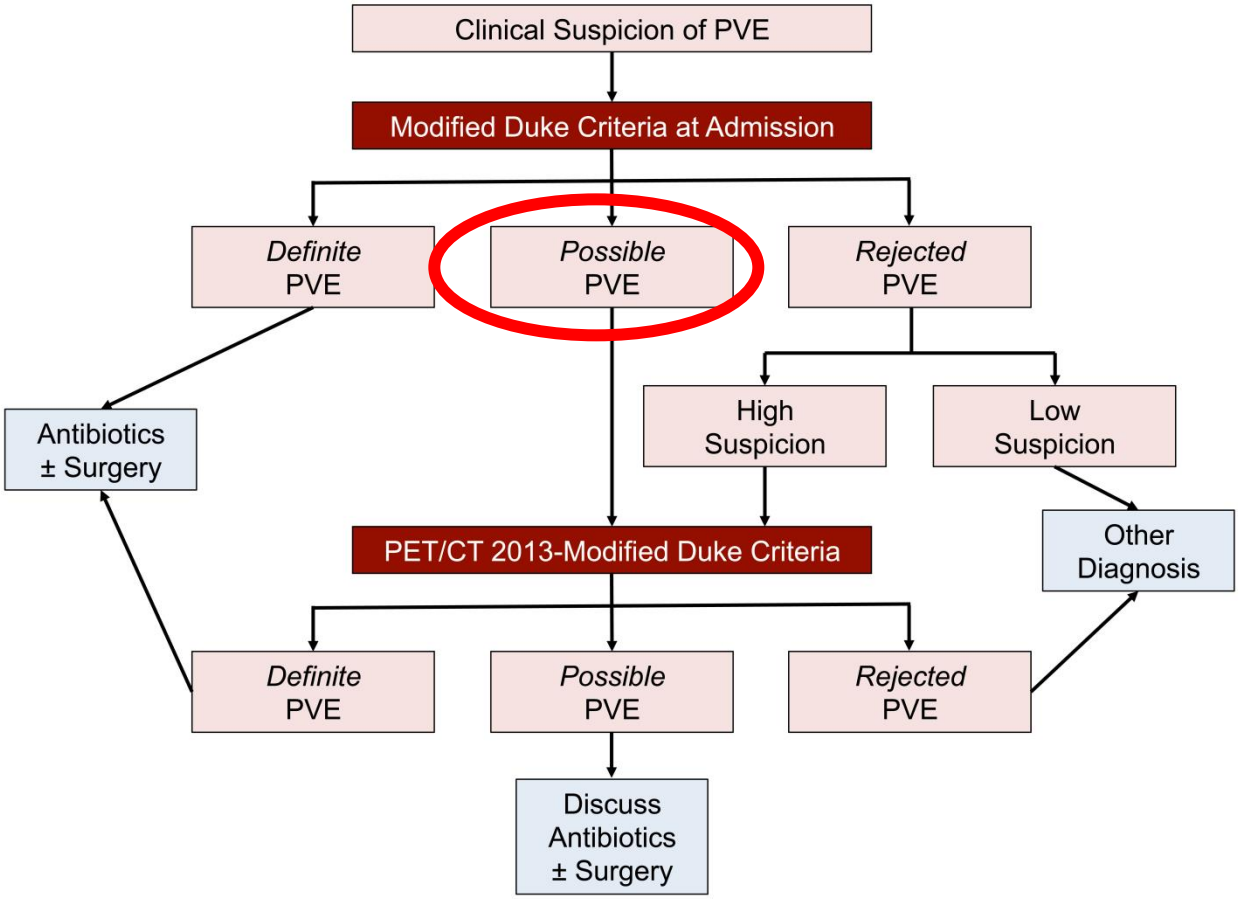

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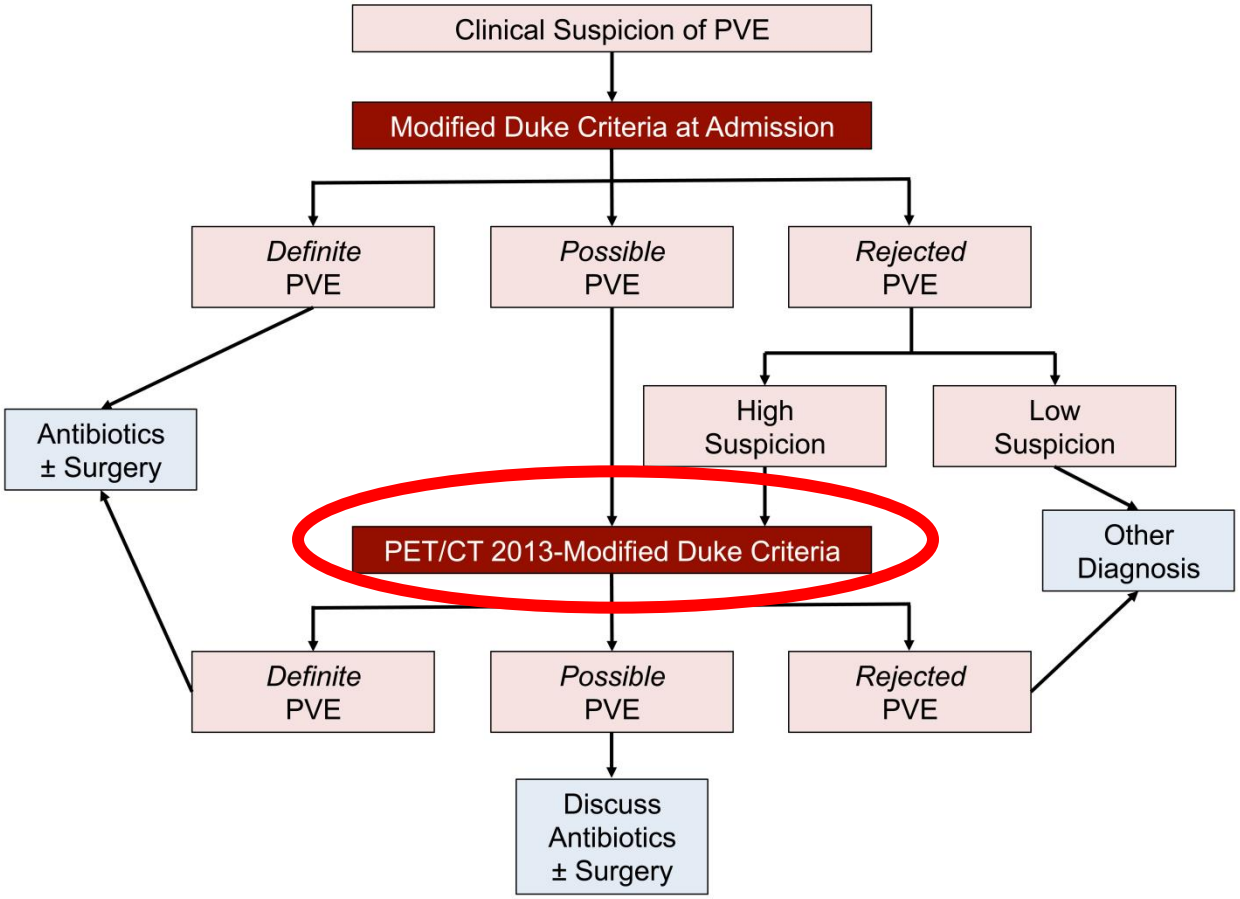

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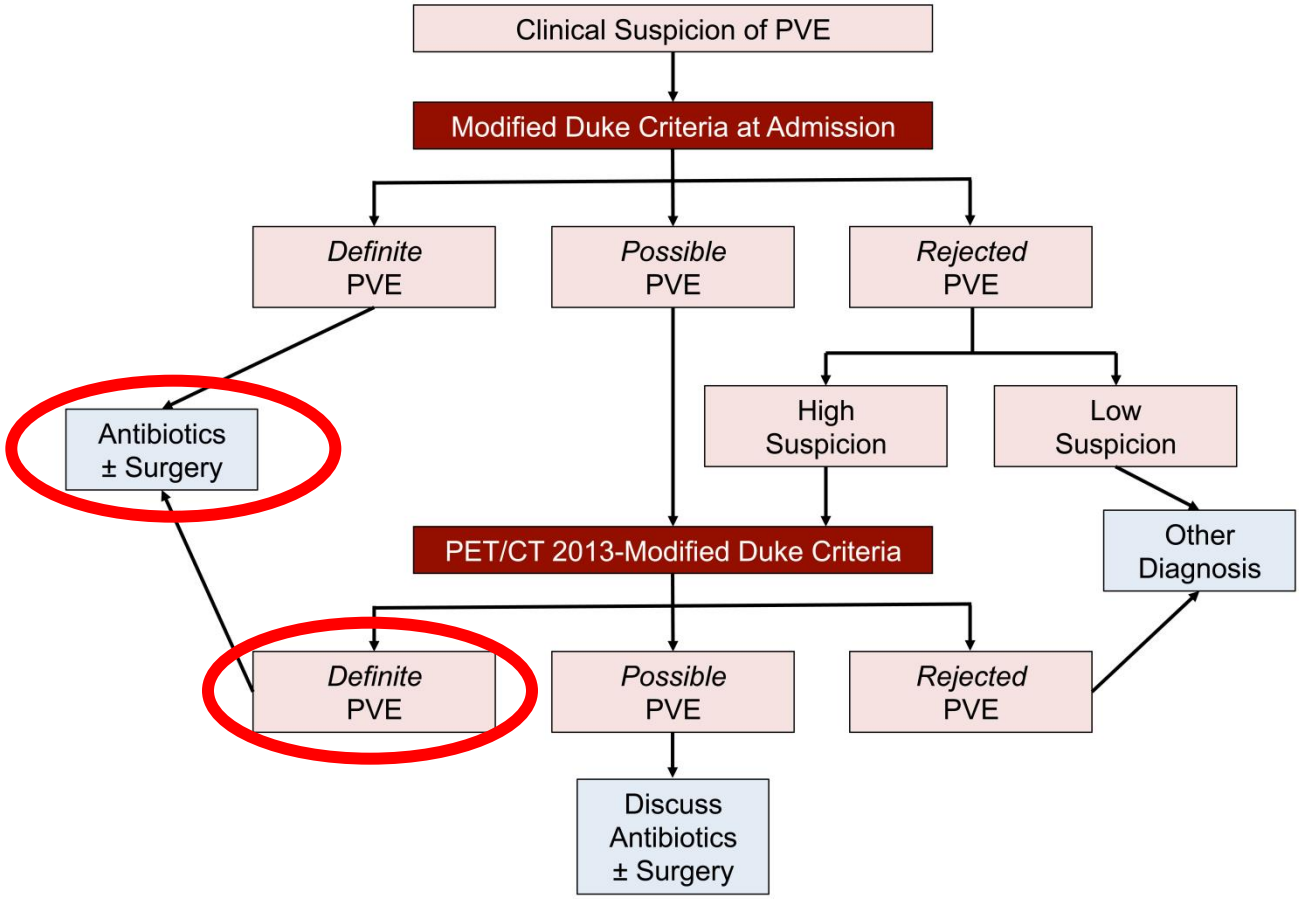

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^{18}FDG-PET-CT in endocarditis

1. **advantages**
   - non invasive
   - early detection of infection/ abscess
   - in prosthetic valves / pacemakers
   - detection of secondary localizations

2. **limitations**
   - few data
   - false positive in the year after PV replacement
   - availability

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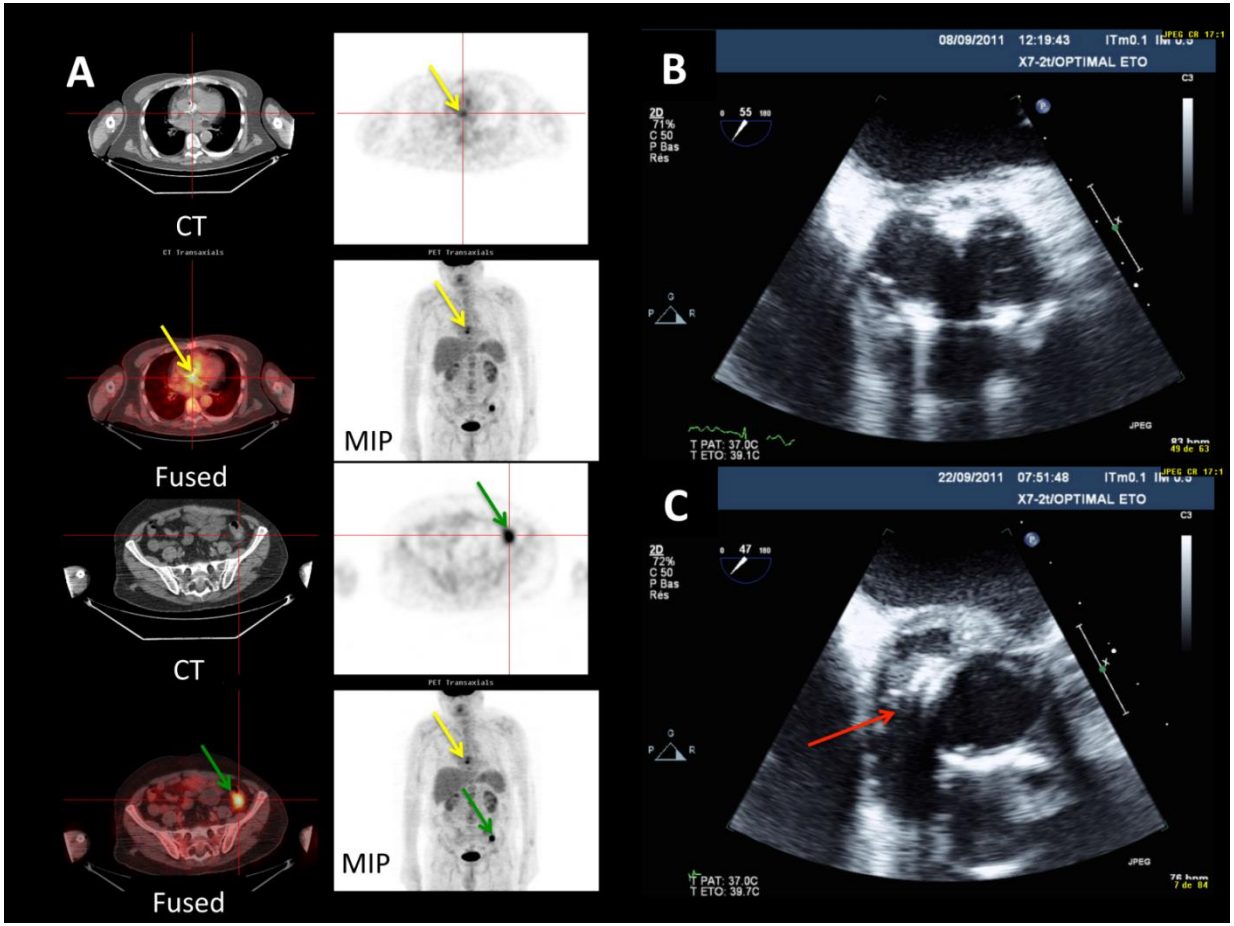
^{18}FDG-PET-CT in endocarditis

1. **Early diagnosis of perivalvular lesions**

2. **Detection of secondary lesions**



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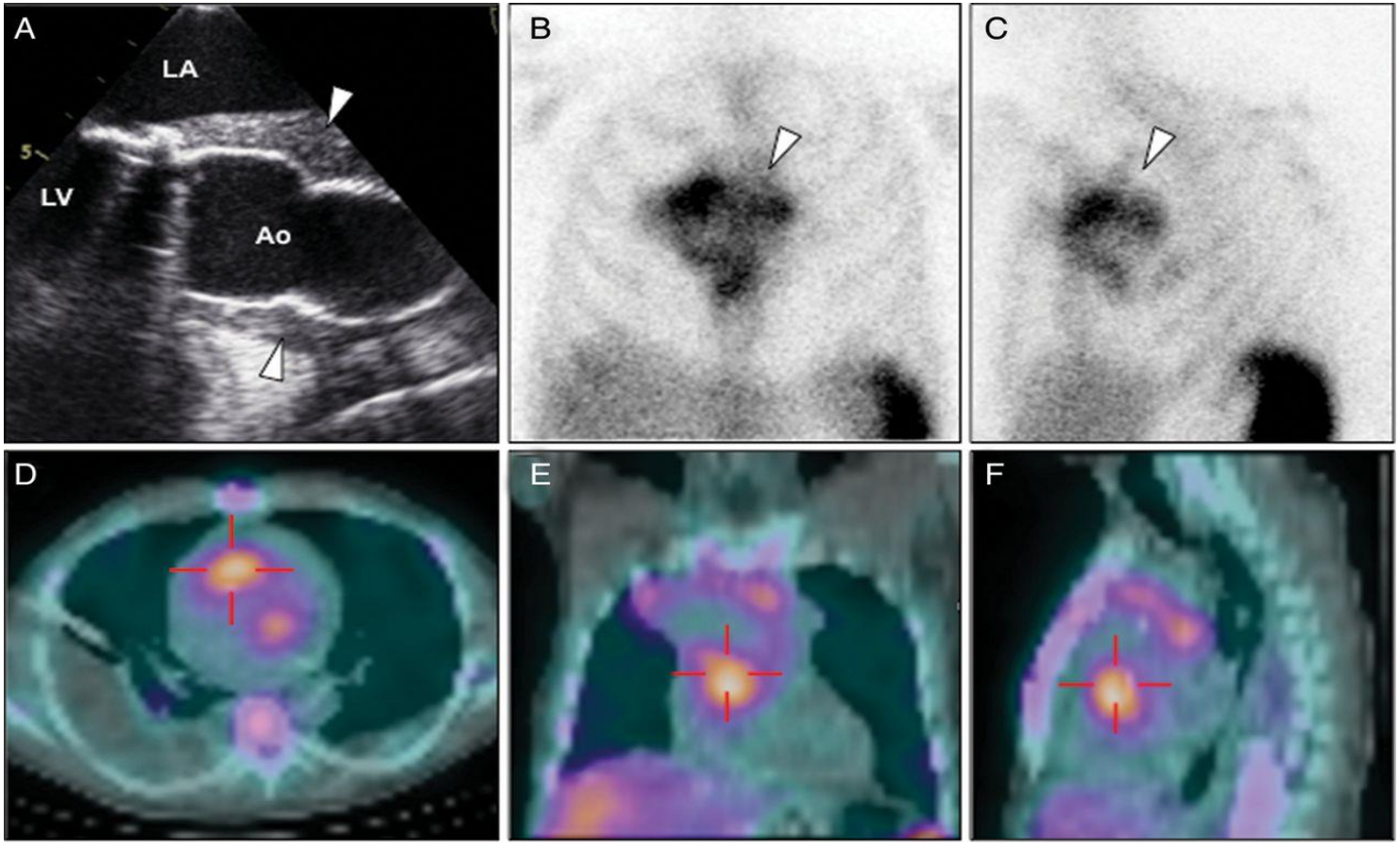
Leucocyte scintigraphy in IE

Hyafil F et al. Eur Heart J Cardiovasc Imaging 2013;14:586-594



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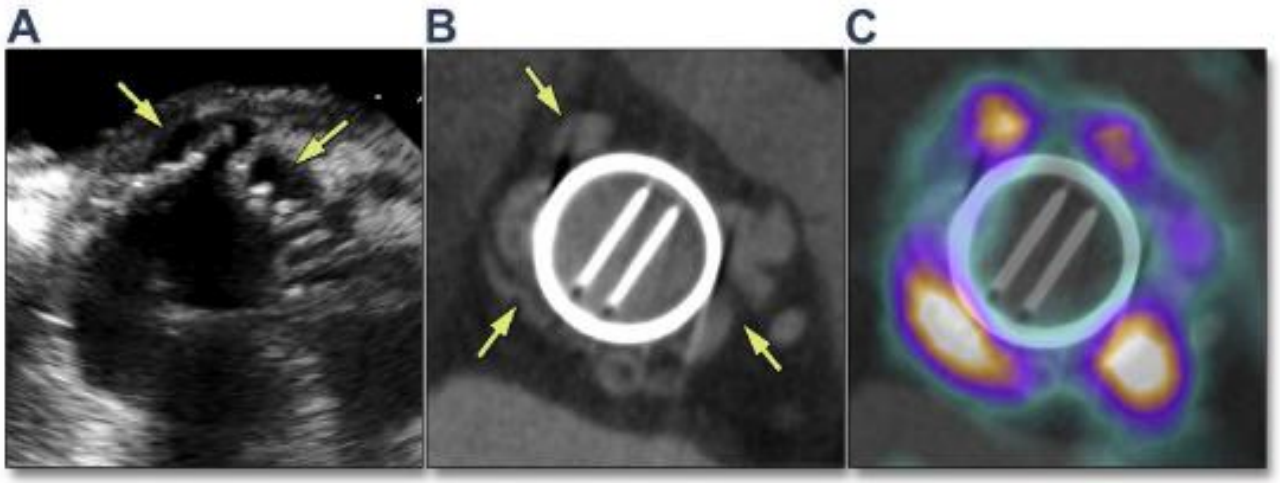
European Heart Journal Cardiovascular Imaging

^{18}FDG-PET + CT angiography fusion imaging

Tanis W – JACC CVI 2013

IMAGING VIGNETTE

CT Angiography and ^{18}F-FDG-PET Fusion Imaging for Prosthetic Heart Valve Endocarditis



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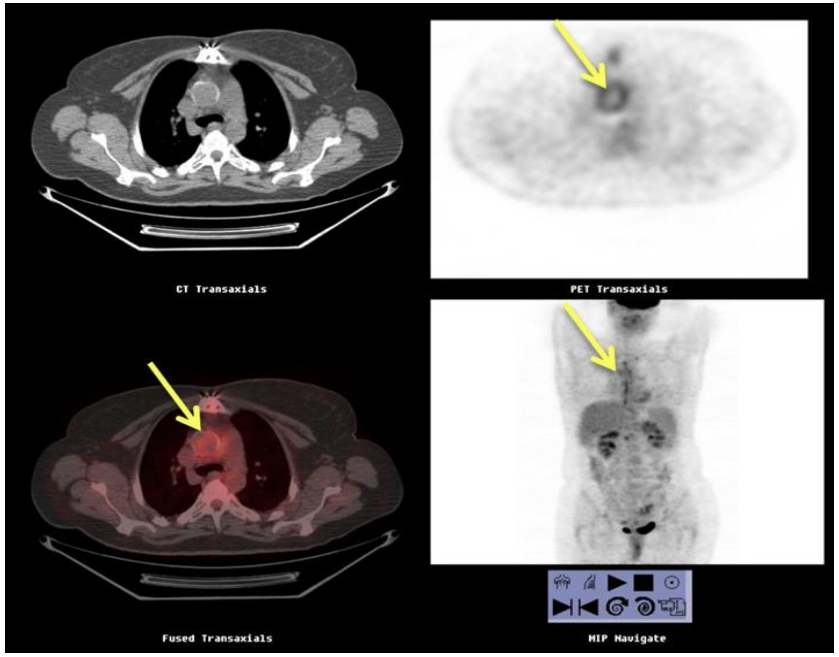
Limitations of PET - CT

1. **False positive: 15% (4/26)**
2. **Slight abnormal uptake on AA graft (bio-Glue)**
3. **Prosthetic thrombosis**
4. **Early after surgery (which timing?)**



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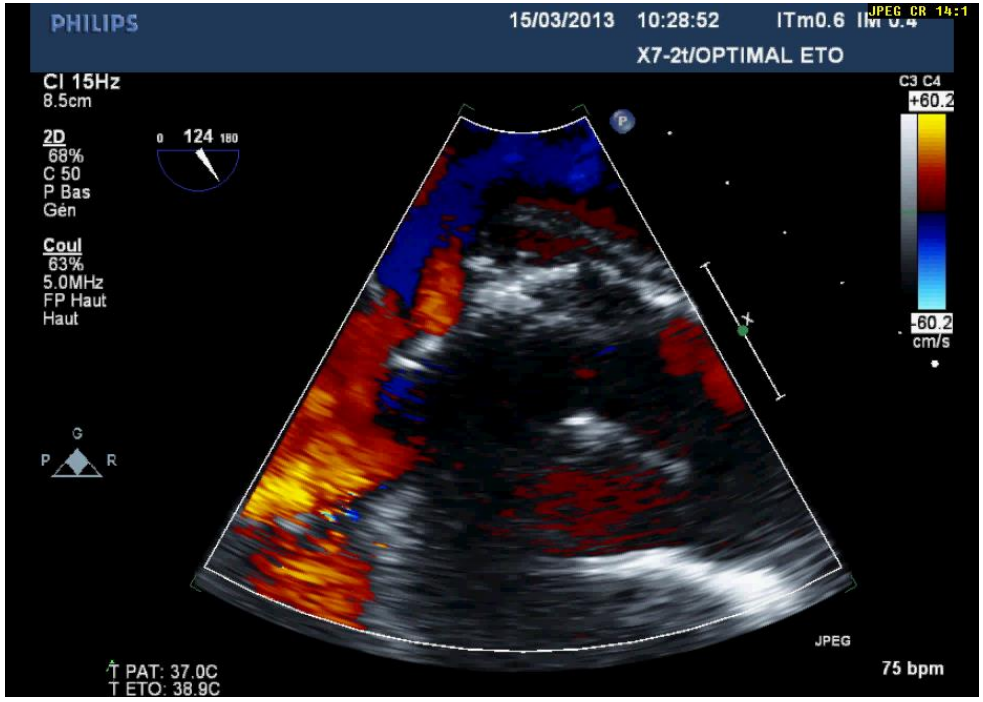
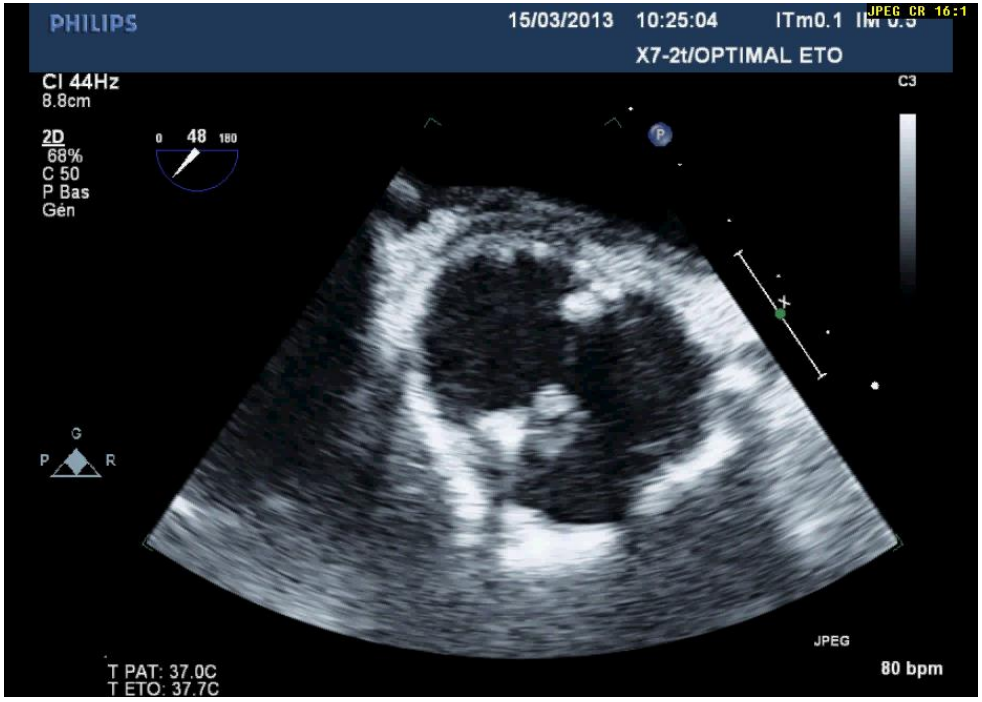
Multimodality imaging in IE





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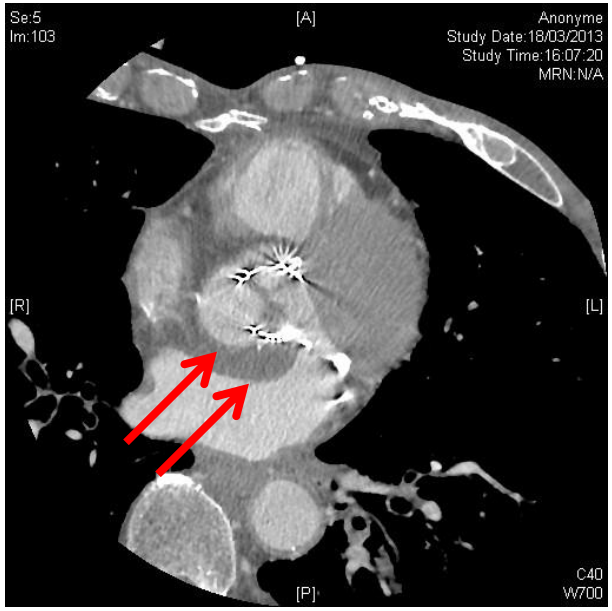
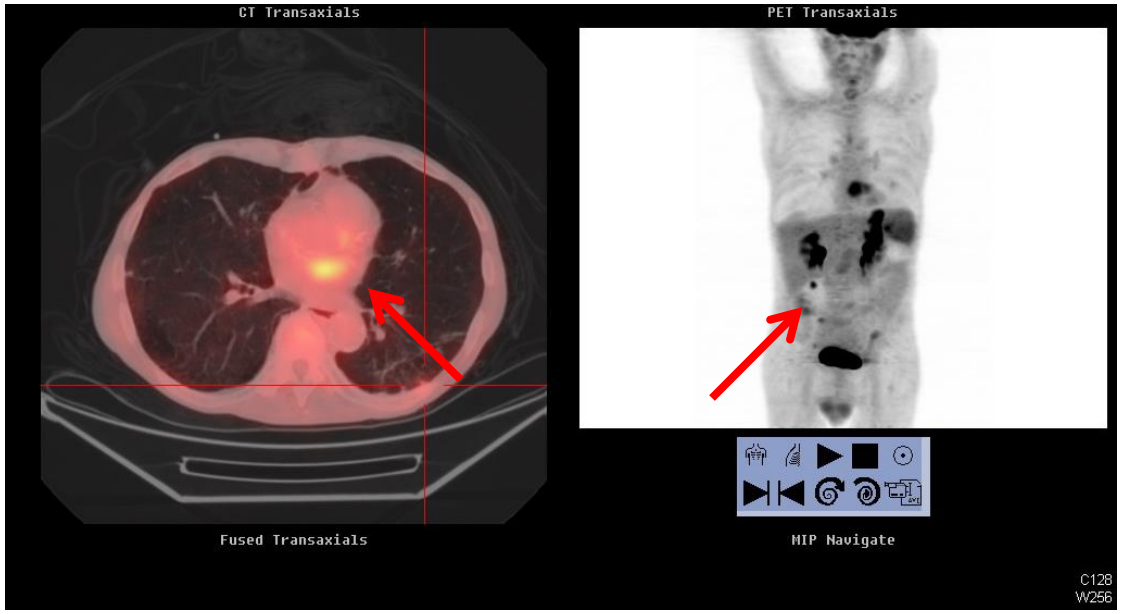
Multimodality imaging in IE





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EACVI EUROPEAN ASSOCIATION OF CARDIOVASCULAR IMAGING

EUROPEAN SOCIETY OF CARDIOLOGY®

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Prosthetic valve IE

1. Diagnosis

2. *Management*

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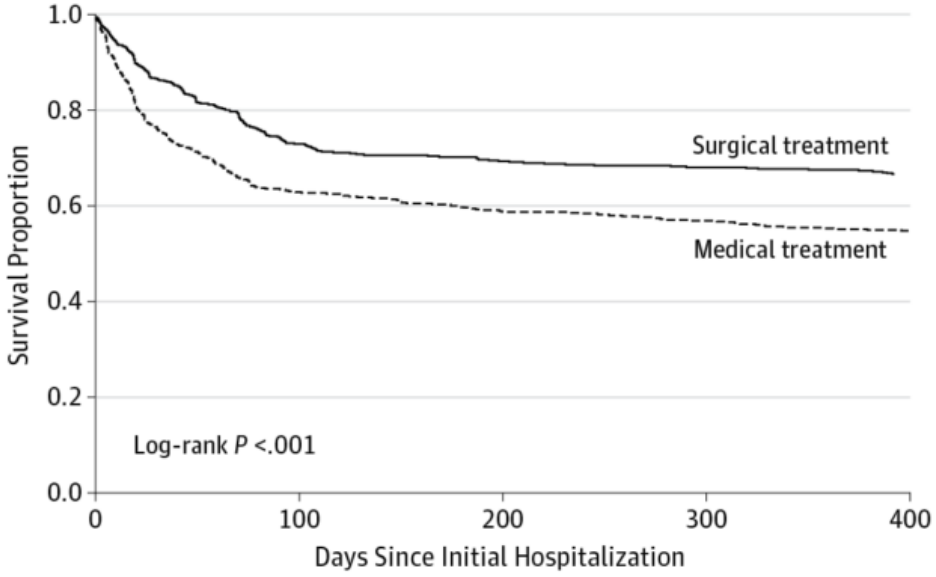
Is surgery always needed in PVE?

- PVE is the most serious complication of valve replacement
- very high (20-50%) mortality
- best therapeutic strategy debated



Lalani T– JAMA 2013

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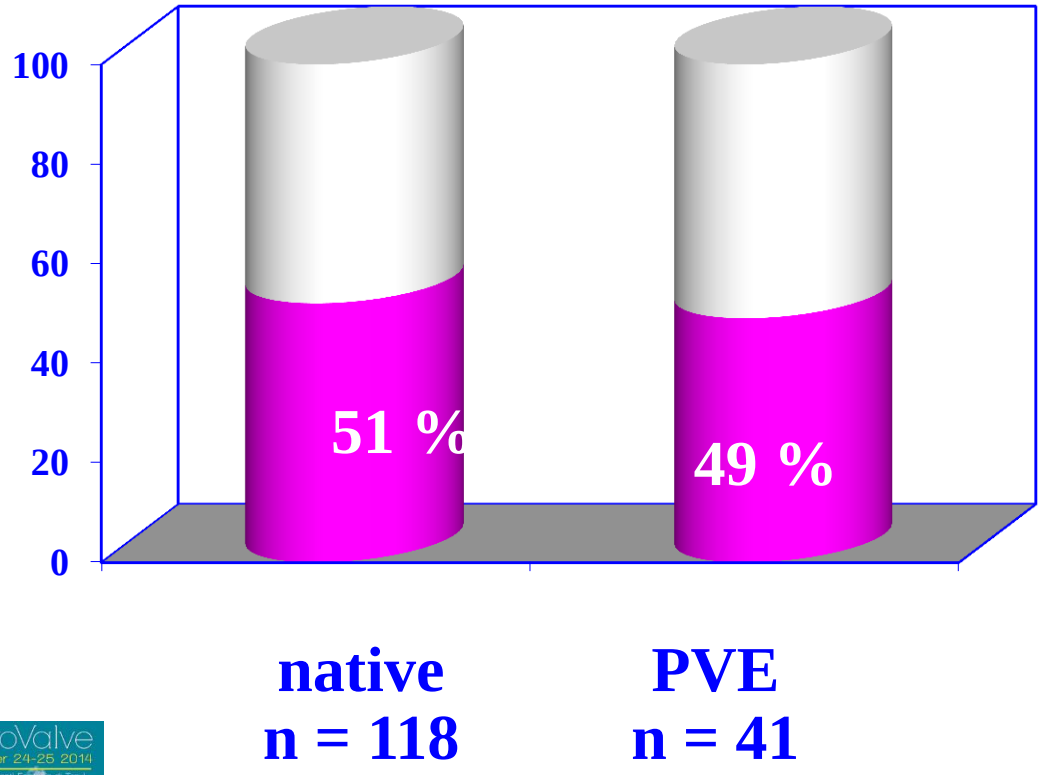
Surgery in IE : Euro Heart Survey

Tornos P – Heart 2005 ; 91 : 571-5



Reasons for surgery

- *CHF: 65%*
- *persistent sepsis: 45%*
- *embolism: 20%*

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Prognostic markers: in-hospital mortality

Habib G, Tribouilloy C- Heart 2005 ; 91 : 954-9

- **104 PVE (bicentre Marseille Amiens) – 49% surgery**
- **Factors associated with in-hospital mortality (21%)**
  - comorbidity (p=0.05)
  - renal failure (p=0.05)
  - severe PV regurgitation (p-0.006)
  - staphylococcal infection (p=0.001)
  - severe CHF (p=0.001)
- **Multivariable analysis**

	p value	adjusted OR	95% CI
Congestive heart failure	0.002	5.5	1.9-16.1
Staphylococcus Aureus	0.002	6.1	1.9-19.2

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Prognostic markers: in-hospital mortality

- 257 episodes of PVE
- 61% surgical therapy, 33% deaths

Lopez J- Rev Esp Cardiol 2013

	p value	adjusted OR	95% CI
Persistent infection	< 0.001	3.6	1.9-6.9
Congestive heart failure	0.001	3	1.5- 6.8
Staphylococcus Aureus	0.022	2.7	1.2-6.5
Perivalvular complications	0.003	2.6	1.4-4.9
Renal failure	0.005	2.5	1.3-4.8
Diabetes mellitus	0.045	2.1	1.0-4.4

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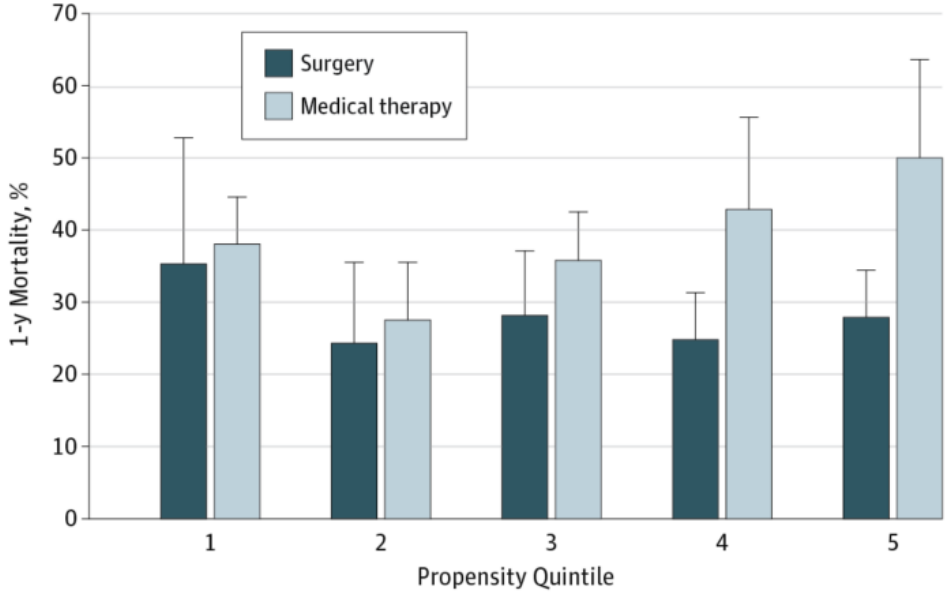
When is surgery beneficial ?

Lalani – JAMA 2013

- 1025 PVE
- 490 (48% early surgery)
- propensity analysis
- highest benefit of surgery in the 4th and 5th quintiles



One-year mortality rates in PVE by propsensity quintile for surgery

Patients with the highest probability of surgical therapy (i.e. complicated PVE) benefit most from surgery

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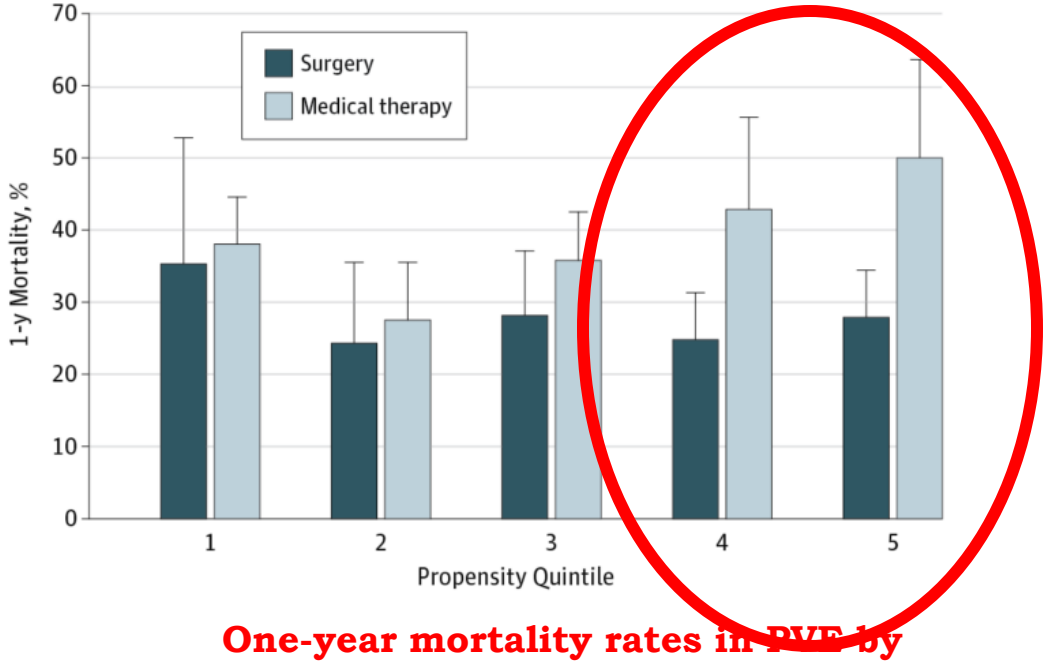

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Prosthetic valve endocarditis (PVE)

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

Adapted from European Heart Journal (2009) 30:2369–2413

Conclusion: PVE

1. **Persistent high mortality**
2. **Major role of multimodality imaging**
3. **Early surgery is recommended in high-risk patients**
4. **Initial medical therapy acceptable:**

- **non complicated PVE**
- **non staphylococcal PVE**
- **late bioprosthetic PVE**
- **severe comorbidity**

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