

Fever in TAVI patients:

When should infective Endocarditis be suspected?



The poster is a 2x3 grid of colored squares. The top-left square is green and contains the text 'EUROVALVE' in large white letters and 'CROWNE PLAZA LINATE' in smaller pink letters below it. It also features a white silhouette of a cathedral. The top-middle square is light blue and contains a green caduceus symbol. The top-right square is light green and contains a red heart icon. The bottom-left square is orange and contains the text 'MILAN' in yellow, 'SEPTEMBER' in white, and '21 & 22, 2023' in white. The bottom-middle square is yellow and contains a white bowtie icon. The bottom-right square is purple and contains the text 'COURSE DIRECTORS' in white, followed by a list of names and locations: Patrizio Lancellotti, Belgium; Khalil Fattouch, Italy; Gilbert Habib, France; José Luis Zamorano, Spain; Philippe Pibarot, Canada; Mani Vannan, USA; Jeroen Bax, The Netherlands. Below this is the text 'LOCAL HOST' in white, followed by 'Eustachio Agricola, Italy'.

Gilbert Habib
La Timone Hospital
Marseille - France



Fever in TAVI patients:

How should infective Endocarditis be diagnosed?



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EUROVALVE

CROWNE PLAZA Linate
MILAN



SEPTEMBER
21 & 22, 2023



FACULTY DISCLOSURE

I have no financial relationships to disclose

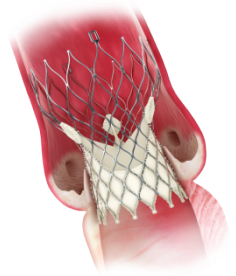


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FACULTÉ DE MÉDECINE
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JAMA | Original Investigation

Association Between Transcatheter Aortic Valve Replacement and Subsequent Infective Endocarditis and In-Hospital Death

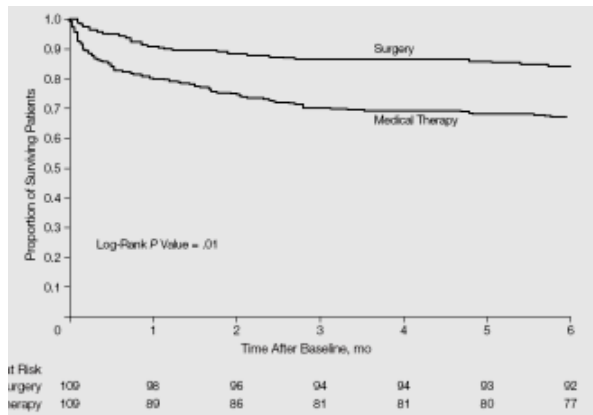
- 20006 patients between 2005-2015
- 250 IE
- incidence, 1.1%per person-year
- median age, 80 years; 64%men
- Enterococci species and Staphylococcus aureus the most frequent microorganisms (24.6% and 23.3%)



Infective Endocarditis After Transcatheter Aortic Valve Replacement: The Worst That Can Happen

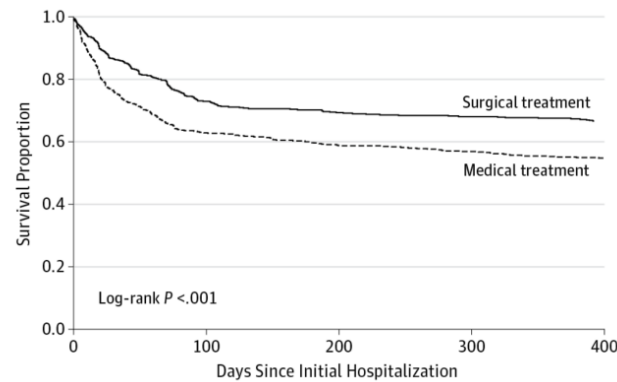
JAHA 2018

Gilbert Habib, MD, PhD



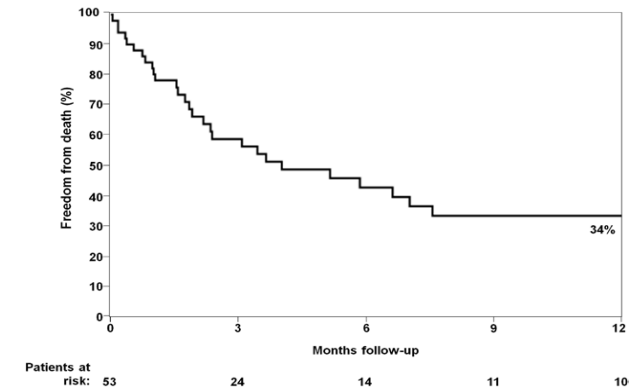
513 patients
Native Valve IE

Vikram- JAMA 2003



1025 patients
Prosthetic Valve IE

Lalani T- JAMA 2013



53 patients
TAVI IE

Amat-Santos IJ et al.
Circulation 2015

Multimodality Imaging in Infective Endocarditis

An Imaging Team Within the Endocarditis Team

Echocardiography

Nuclear Imaging

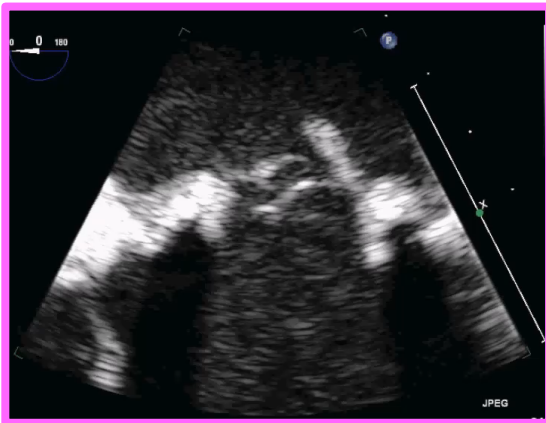
*Cardiovascular
MRI*

Cardiovascular CT



The Duke echographic criteria

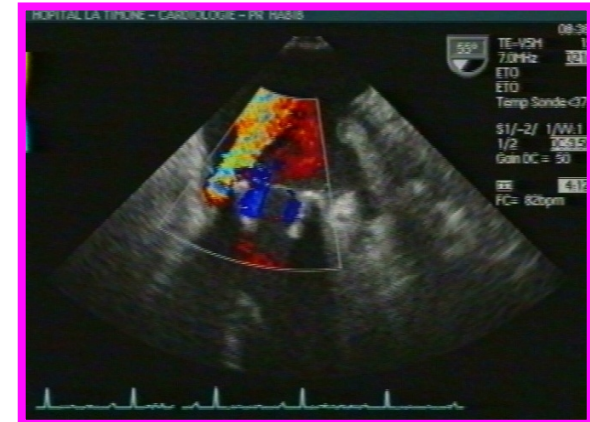
Durack DT Am J Med 1994 ; 96 : 200-9



vegetation



abscess



*new dehiscence
of prosthetic valve*



European Heart Journal (2015) 36, 3075–3123
doi:10.1093/eurheartj/ehv319

ESC GUIDELINES

2015 ESC Guidelines for the management of infective endocarditis

The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC)

Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM)

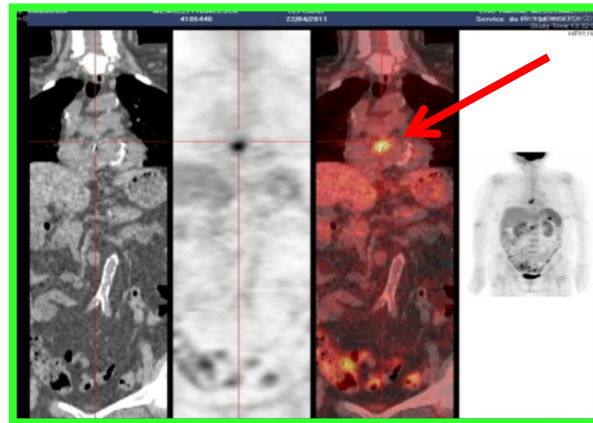


The ESC 2015 imaging criteria

Habib G, Lancellotti P, et al - ESC guidelines Europ Heart J 2015



TOE
Morphology



PET CT
Inflammation /
infection



Cardiac CT
Perivalvular lesions

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:
- b. Microorganisms consistent with IE from persistently positive blood cultures:
- c. Single positive blood culture for *Coxiella burnetii* or phase I IgG antibody titre >1:800

2. Imaging positive for IE

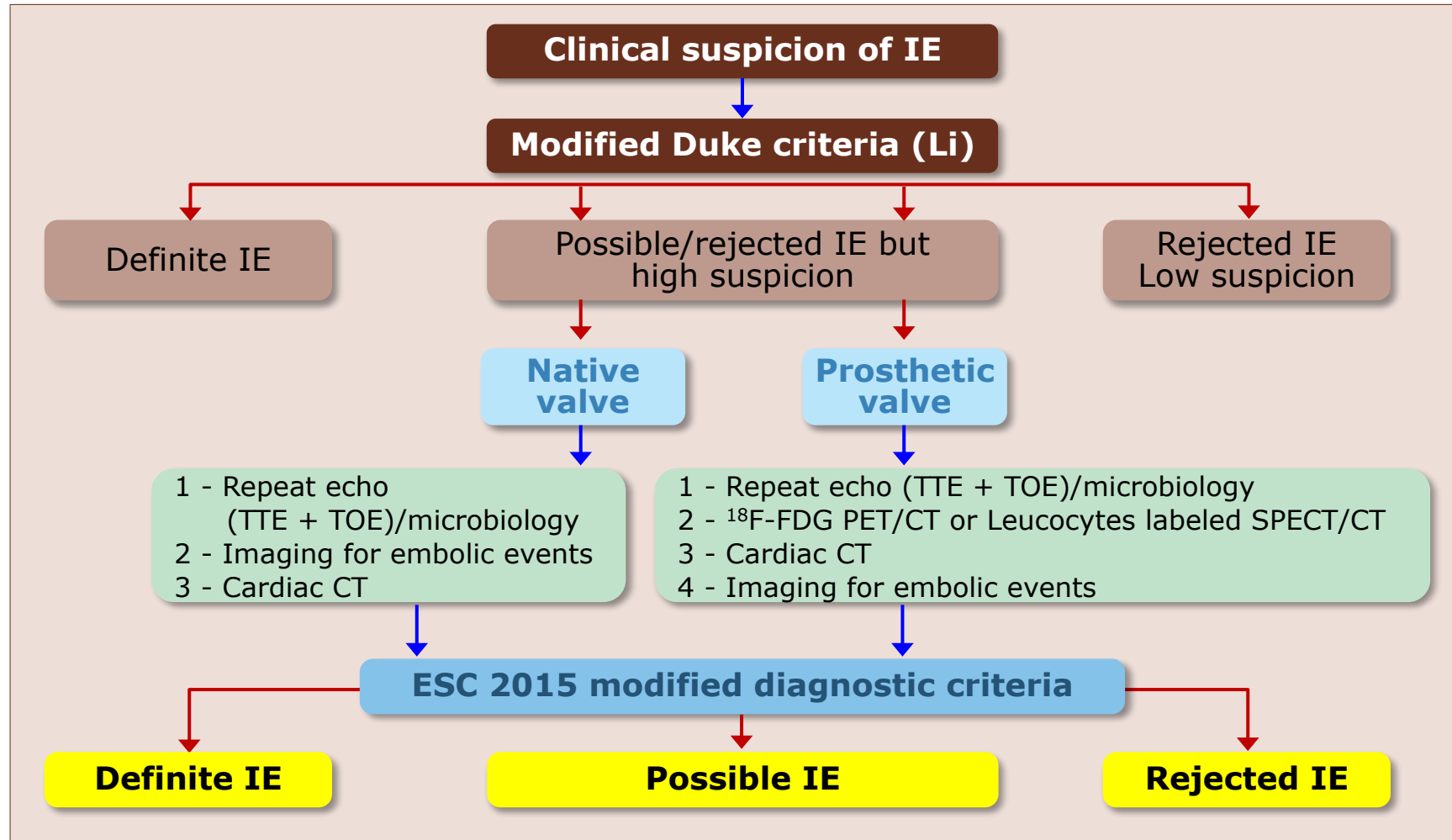
a. Echocardiogram positive for IE:

- Vegetation
- Abscess, pseudoaneurysm, intracardiac fistula
- Valvular perforation or aneurysm
- New partial dehiscence of prosthetic valve

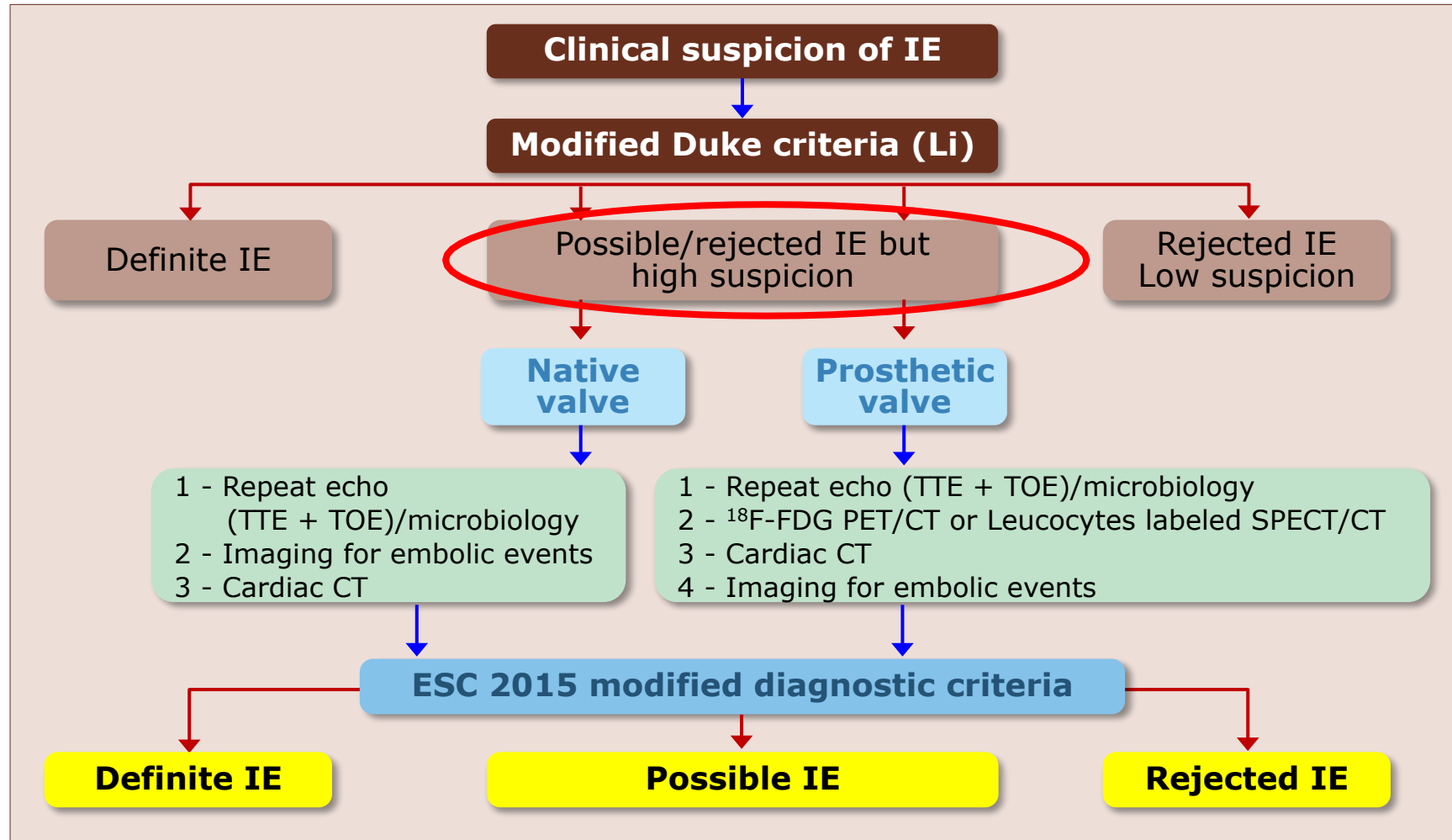
b. Abnormal activity around the site of prosthetic valve implantation detected by ^{18}F -FDG PET/CT (only if the prosthesis was implanted for >3 months) or radiolabelled leukocytes SPECT/CT.

c. Definite paravalvular lesions by cardiac CT.

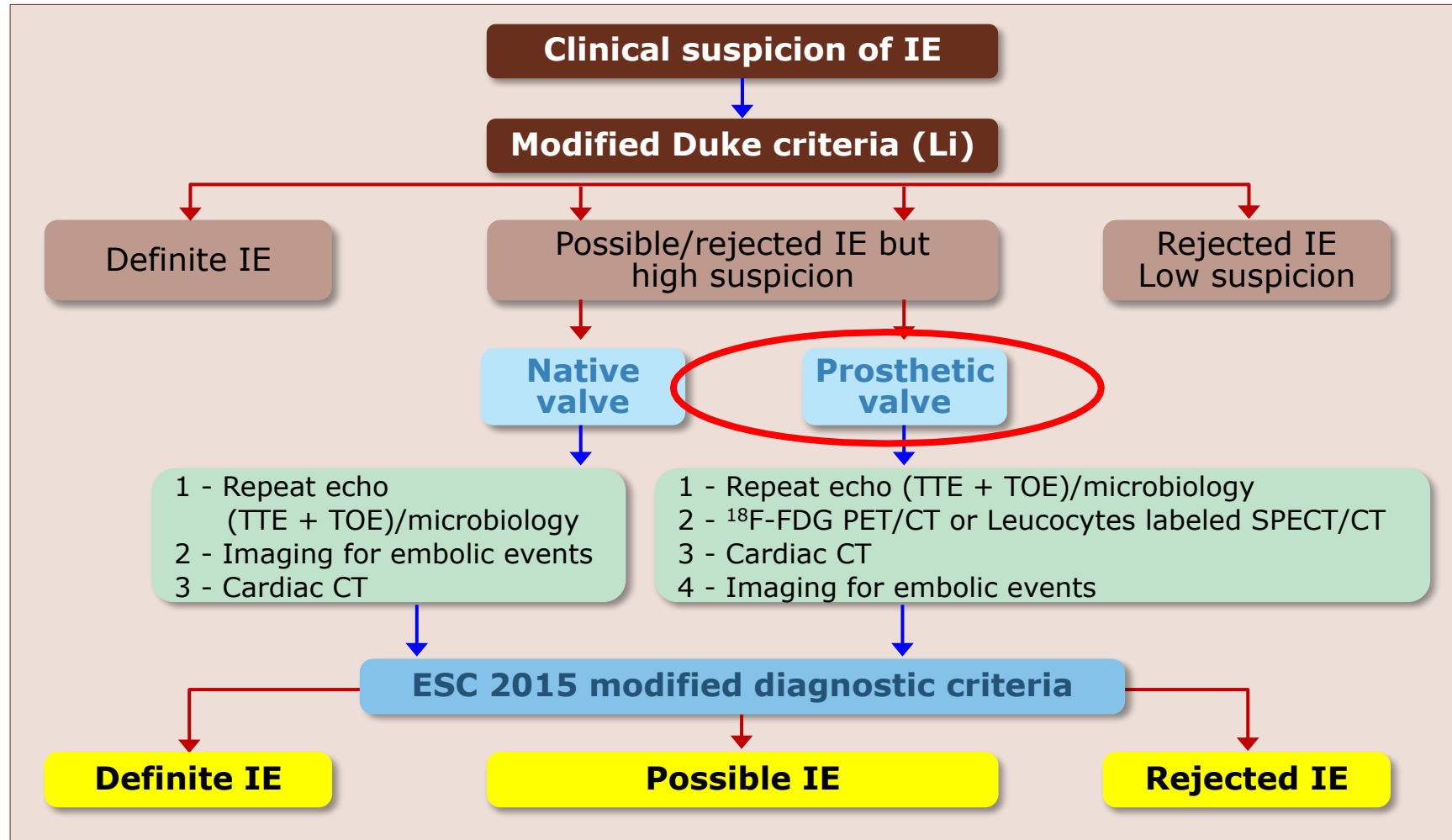
ESC 2015 algorithm for diagnosis of IE



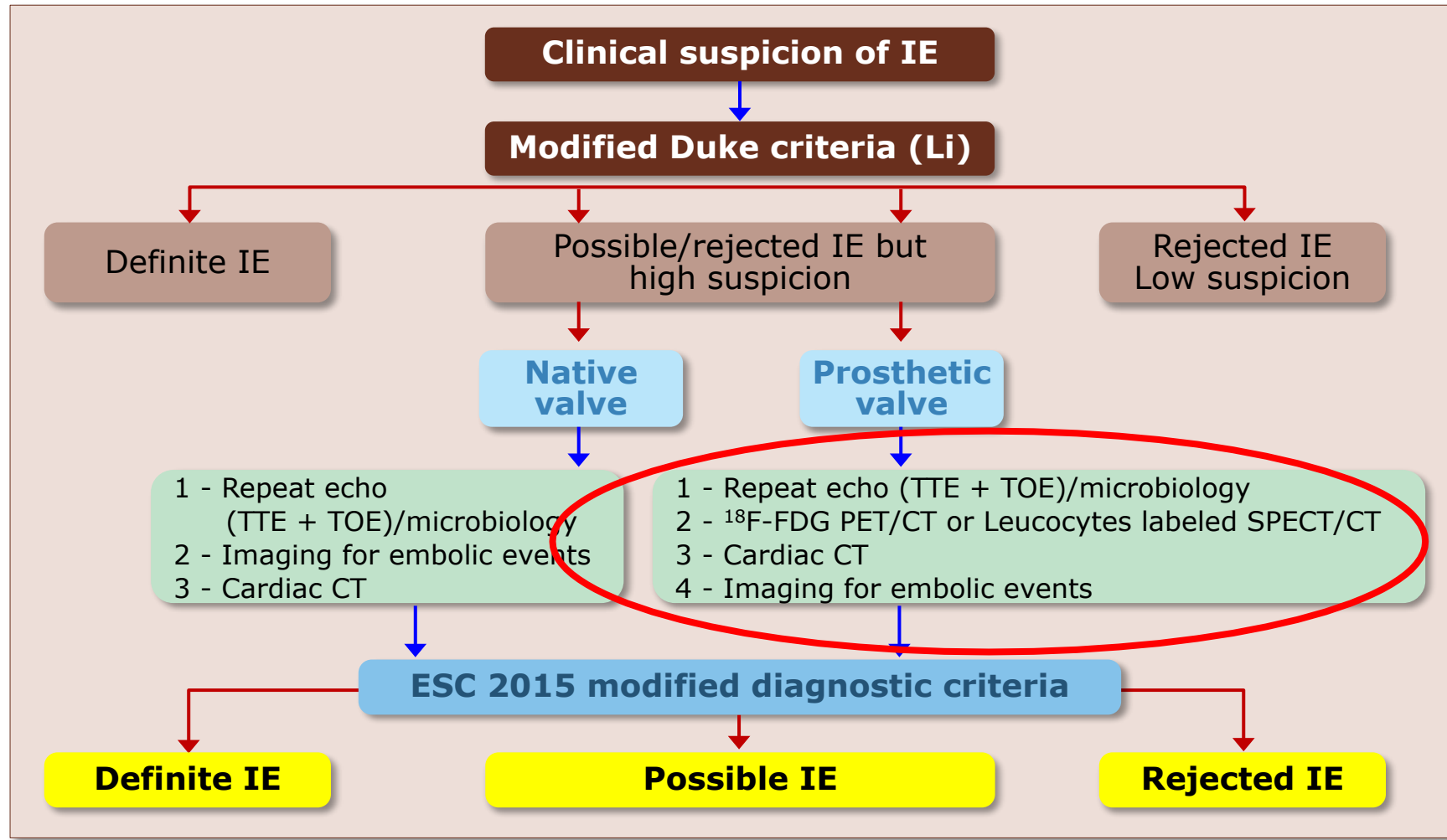
ESC 2015 algorithm for diagnosis of IE



ESC 2015 algorithm for diagnosis of IE



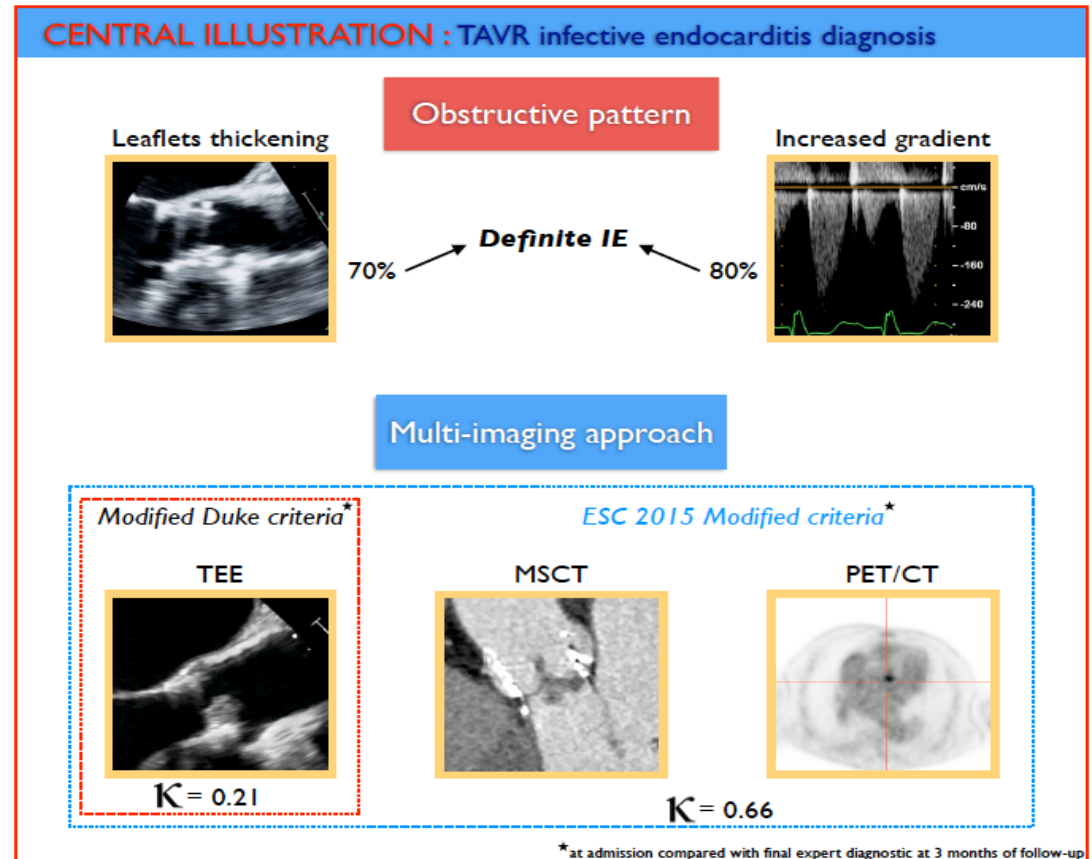
ESC 2015 algorithm for diagnosis of IE



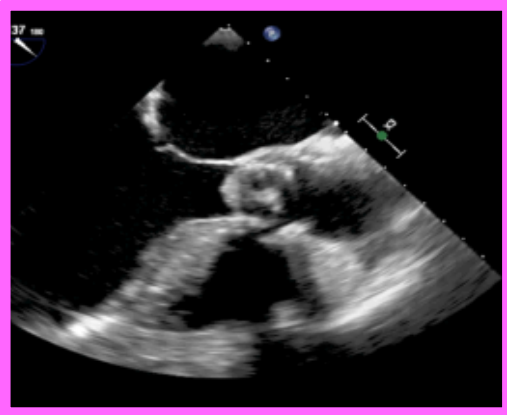
TAVI endocarditis

Salaun E – JACC Imaging 2017

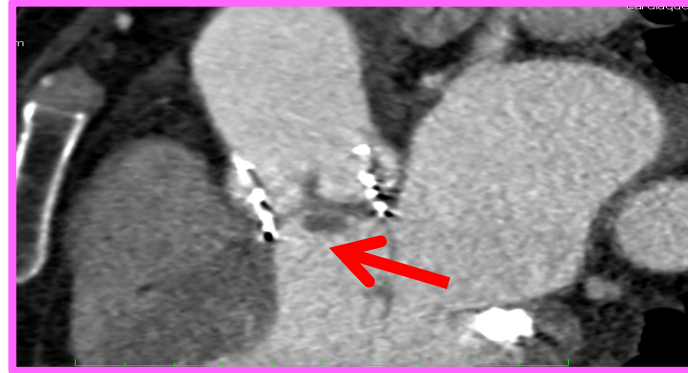
- 16 suspected TAVI IE, 10 definite cases
- Leaflet thickening and increased mean gradient in 70% and 80% of definite TAVI IE
- Major additional diagnostic value of PET CT and cardiac CT over echocardiography
- Low diagnostic value of Duke criteria (sensitivity = 50%)
- High sensitivity (100%) of ESC 2015 modified criteria, including a multimodality approach



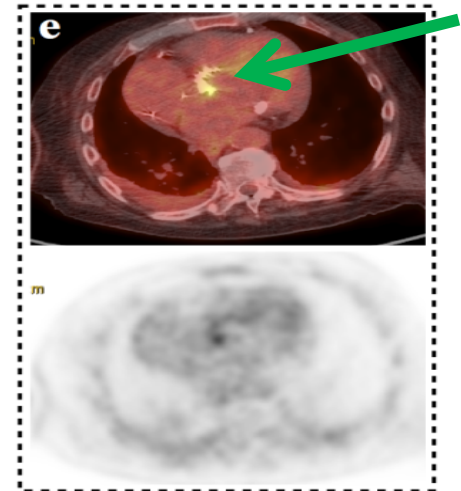
Patient 1: TAVI endocarditis



May, 27th 2016



May, 28th 2016



- ✦ 83 year-old man
- ✦ streptococcus salivarius IE
- ✦ 6 months after Edwards Sapien 3 implantation
- ✦ TEE: thickening of THV leaflets
- ✦ MSCT: leaflets thickening and vegetation
- ✦ PET/CT showed the THV ¹⁸F-FDG uptake

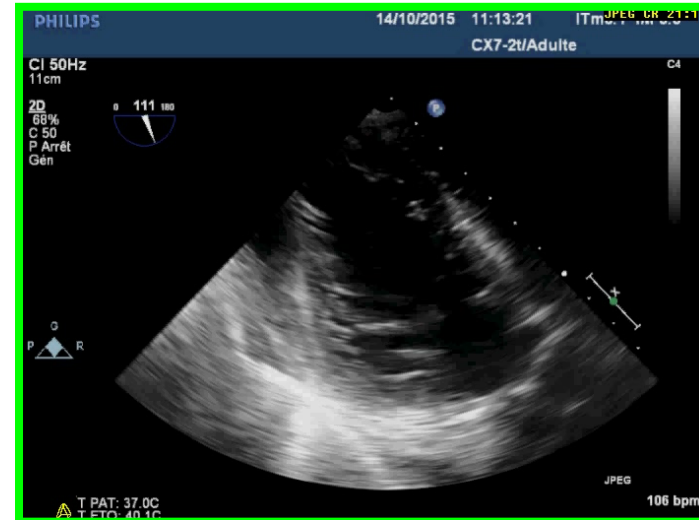
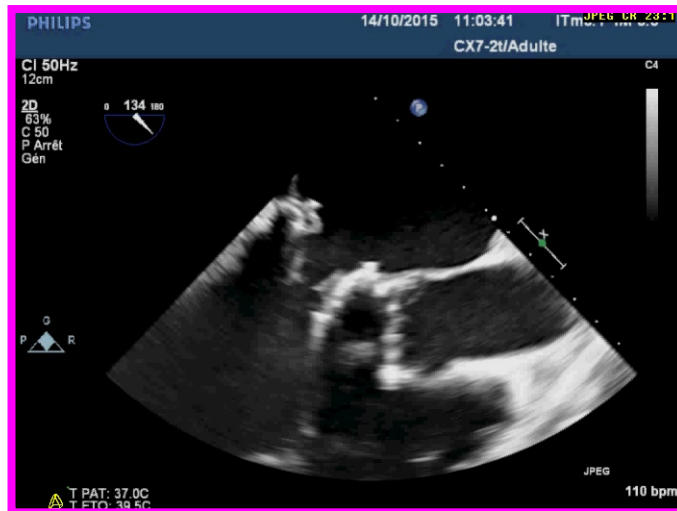
1 – Multimodality imaging is of major value in TAVI IE

2 - Atypical lesions of leaflets thickening and high transvalvular gradient (obstructive pattern) are frequent in TAVI IE

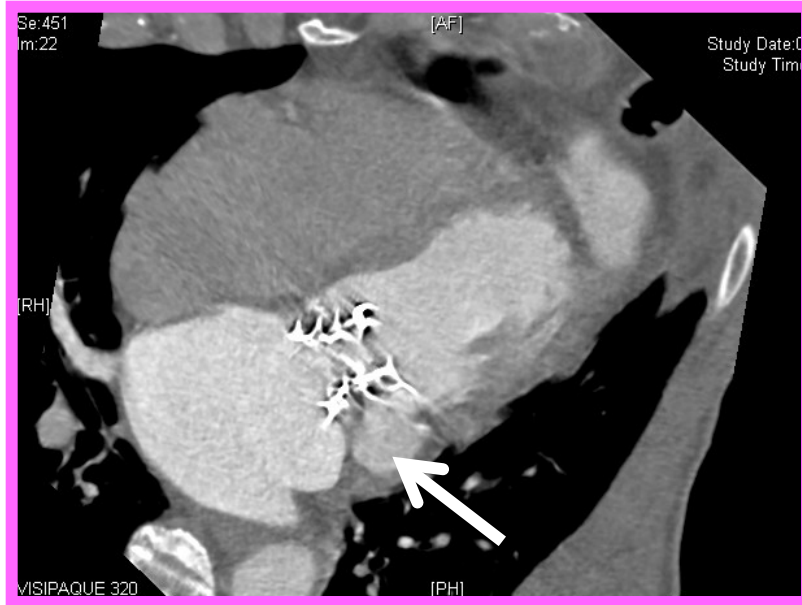
Patient 2: Valve-in-valve PVE

History of the disease

- 71 year-old man, mitral bioprosthesis 2000
- severe Parkinson disease
- valve-in-valve MV replacement (transapical) June 2015
- october 2015: fever / suspected endocarditis



cardiac CT scan

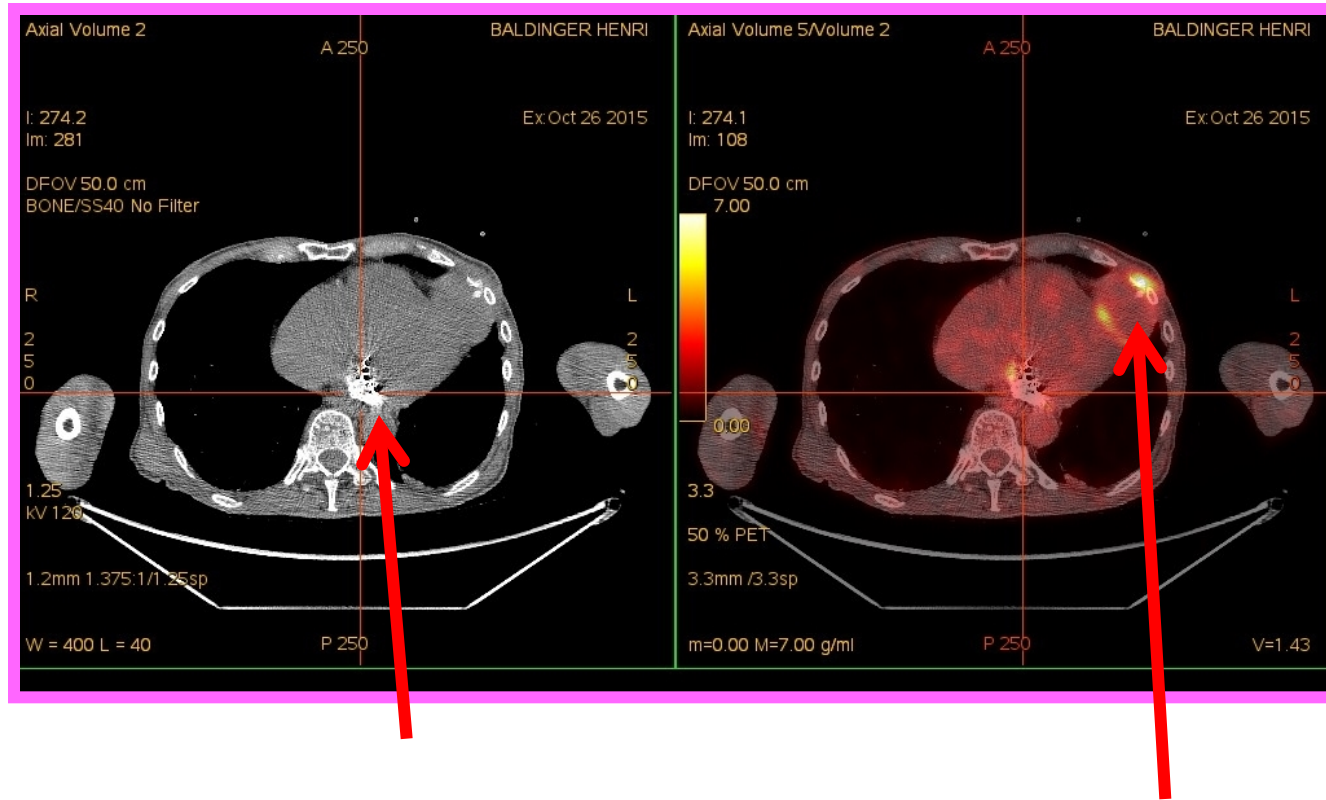


**Mitral annulus
pseudo-aneurysm**



Apical false aneurysm

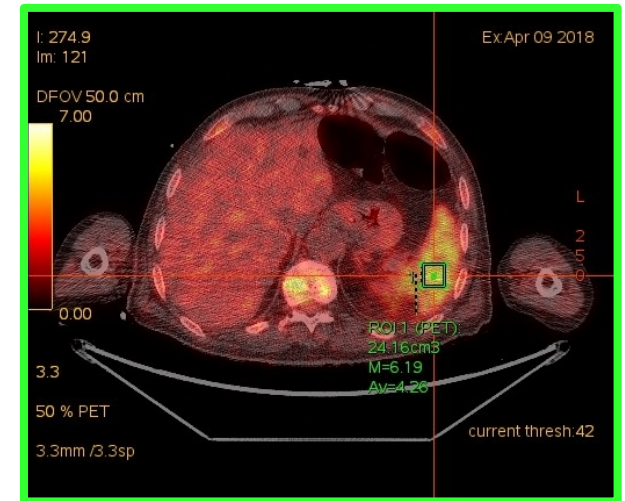
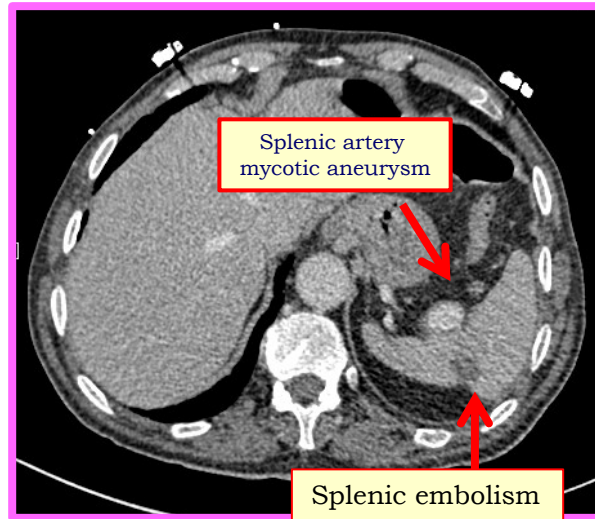
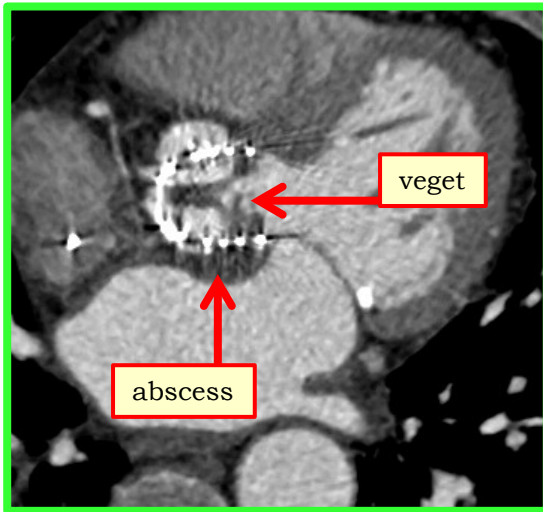
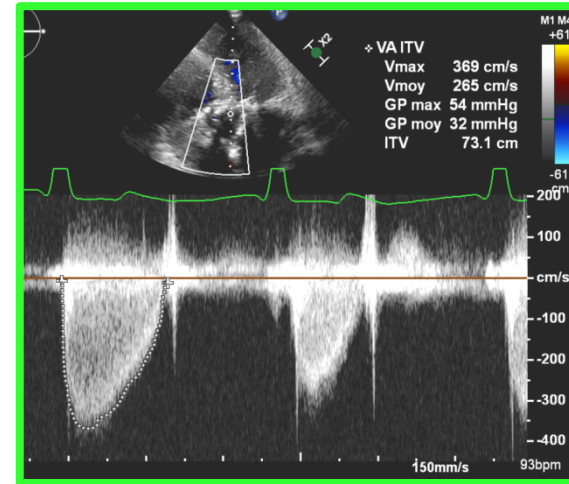
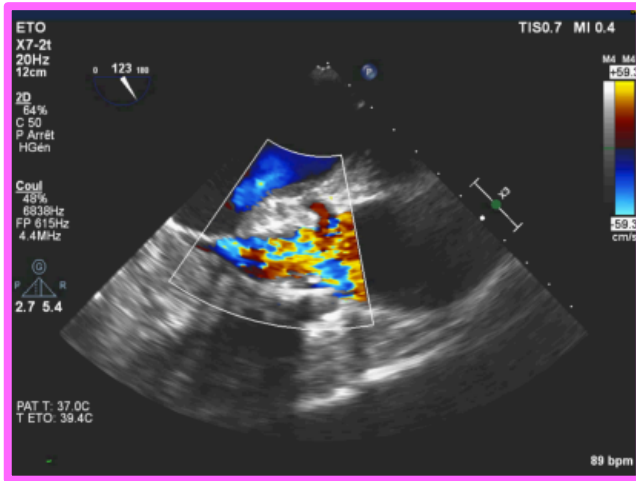
^{18}F FDG-PET-CT November 4th



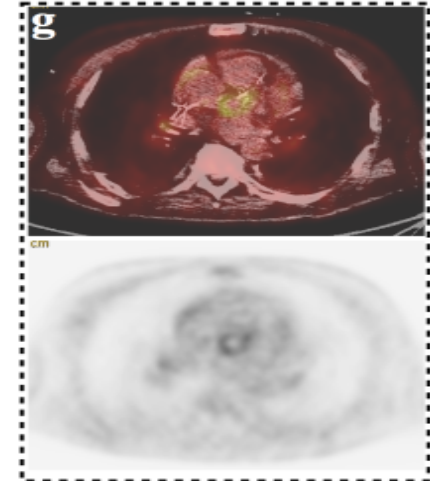
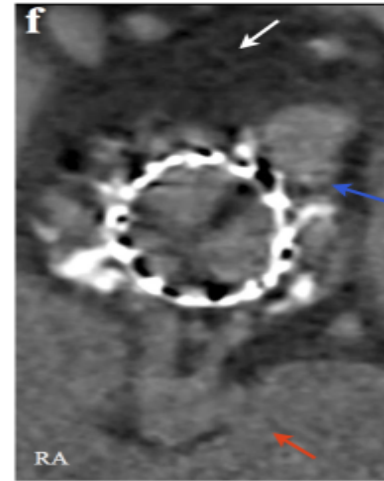
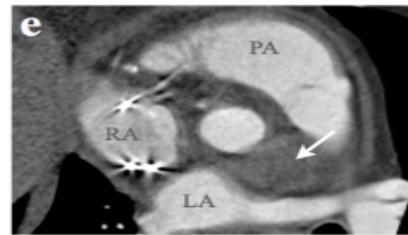
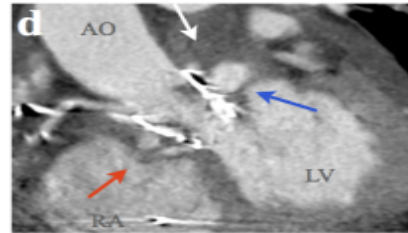
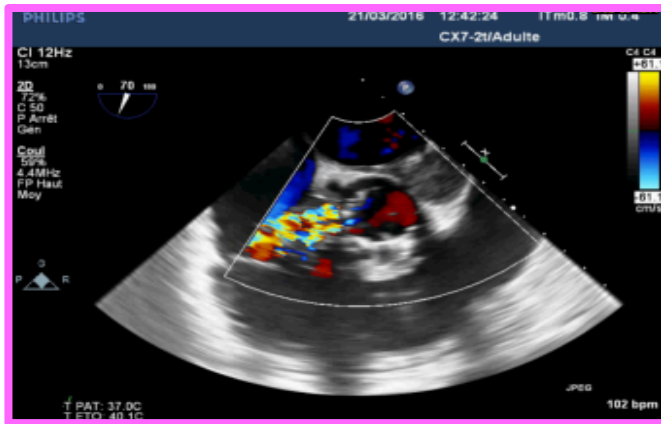
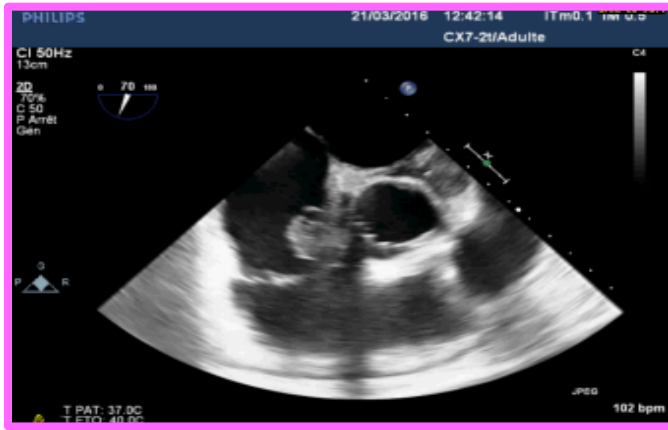
**Uptake on the
prosthesis**

**Uptake on the apical
LV false aneurysm**

Case 3: MMI in TAVI IE



Patient 4: abscess and fistula

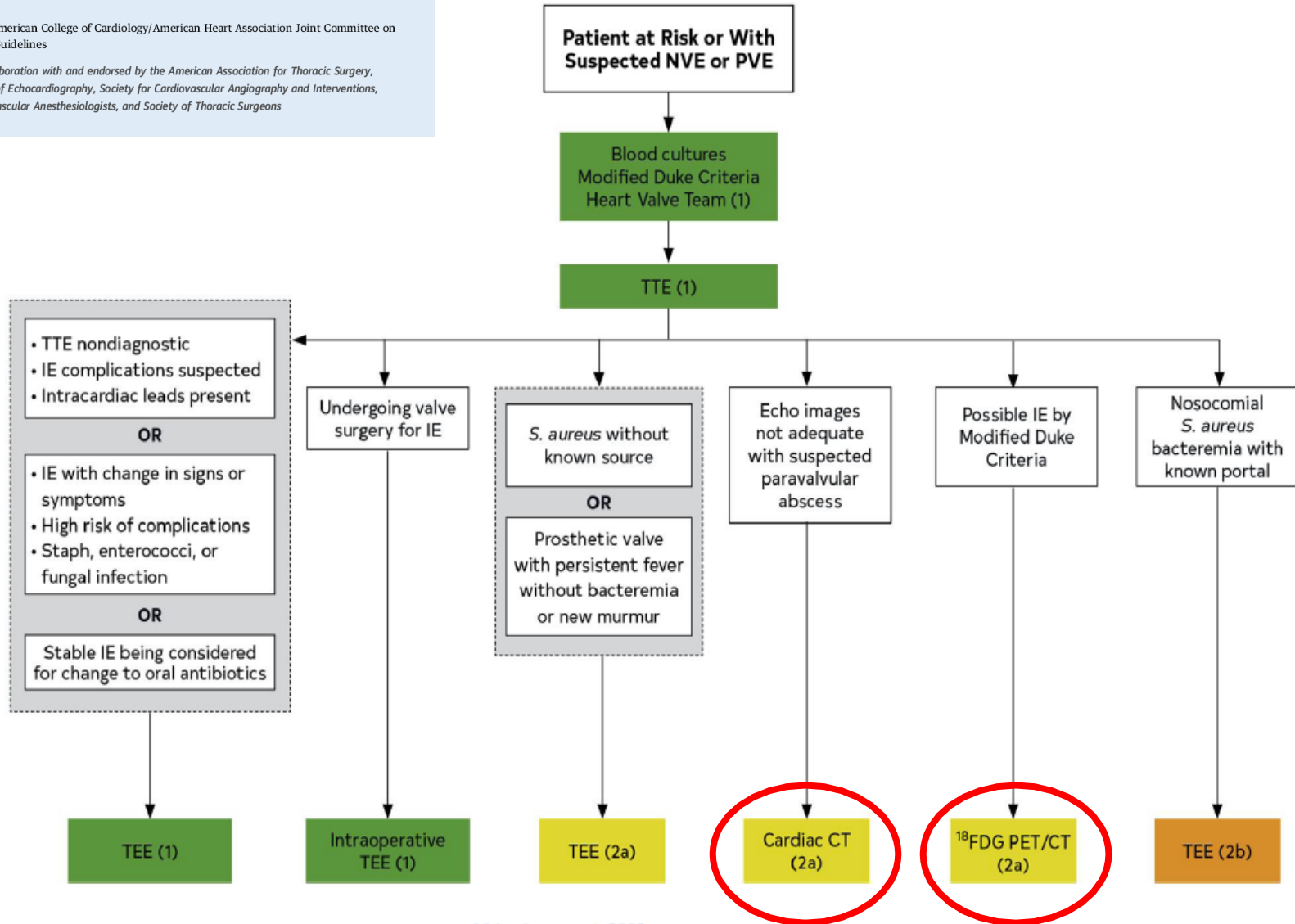


Panel D. A 84 year-old man with a *enterococcus faecalis* definite IE 8 months after a 26-mm Edwards Sapien 3 implantation. TEE showed an abscess on the external aortic root (white arrow, a, b and c) with a pseudoaneurysm near the THV stent (blue arrow, c) and a critical internal aortic periannular lesion with an aorto-right atrial fistulae (red arrows, a and b). MSCT confirmed all the lesions in d, e and f. PET/CT showed the THV ¹⁸F-FDG uptake (g).

2020 ACC/AHA Guideline for the Management of Patients With Valvular Heart Disease

A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

Developed in collaboration with and endorsed by the American Association for Thoracic Surgery, American Society of Echocardiography, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Anesthesiologists, and Society of Thoracic Surgeons



The 2023 Duke-ISCVID Criteria for Infective Endocarditis: Updating the Modified Duke Criteria

Table 2. Definitions of Terms Used in the 2023 Duke-International Society for Cardiovascular Infectious Diseases Infective Endocarditis (IE) Criteria for the Diagnosis of IE, With Proposed Changes in Bold Type

B. Imaging Major Criteria

(1) Echocardiography and **cardiac computed tomography (CT) imaging**

i. Echocardiography and/or **cardiac CT** showing vegetation,^e valvular/leaflet perforation,^f valvular/leaflet aneurysm,^g abscess,^h pseudoaneurysm,ⁱ or intracardiac fistula^j

or

ii. Significant new valvular regurgitation on echocardiography as compared with previous imaging. Worsening or changing of preexisting regurgitation is not sufficient.

or

iii. New partial dehiscence of prosthetic valve as compared with previous imaging [52]

(2) **positron emission computed tomography with 18F-fluorodeoxyglucose ([18F]FDG PET/CT imaging)**

Abnormal metabolic activity^k involving a native or prosthetic valve, ascending aortic graft (with concomitant evidence of valve involvement), intracardiac device leads or other prosthetic material^{l,m}

ESC 2023 diagnostic criteria

Definitions of the 2023 European Society of Cardiology modified diagnostic criteria of infective endocarditis (2)



Major criteria (continued)

(ii) Imaging positive for IE

Valvular, perivalvular/periprosthetic and foreign material anatomic and metabolic lesions characteristic of IE detected by any of the following imaging techniques:

- Echocardiography (TTE and TOE)
- Cardiac CT
- [18F]-FDG-PET/CT(A)
- WBC SPECT/CT

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www.escardio.org/guidelines

2023 ESC Guidelines for the management of endocarditis
(European Heart Journal; 2023 – doi: 10.1093/eurheartj/ehad193)



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Figure 1
Flowchart of the study

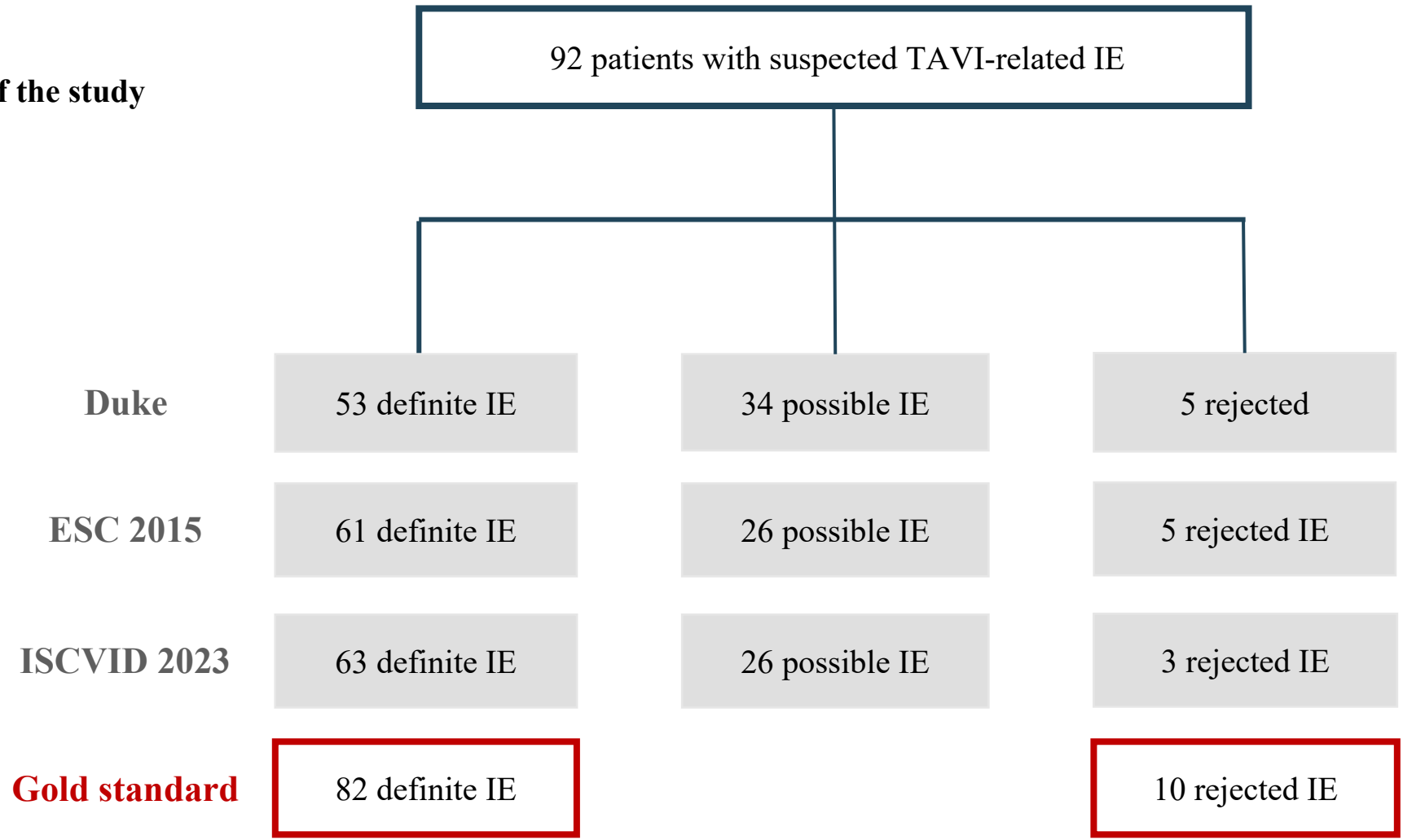
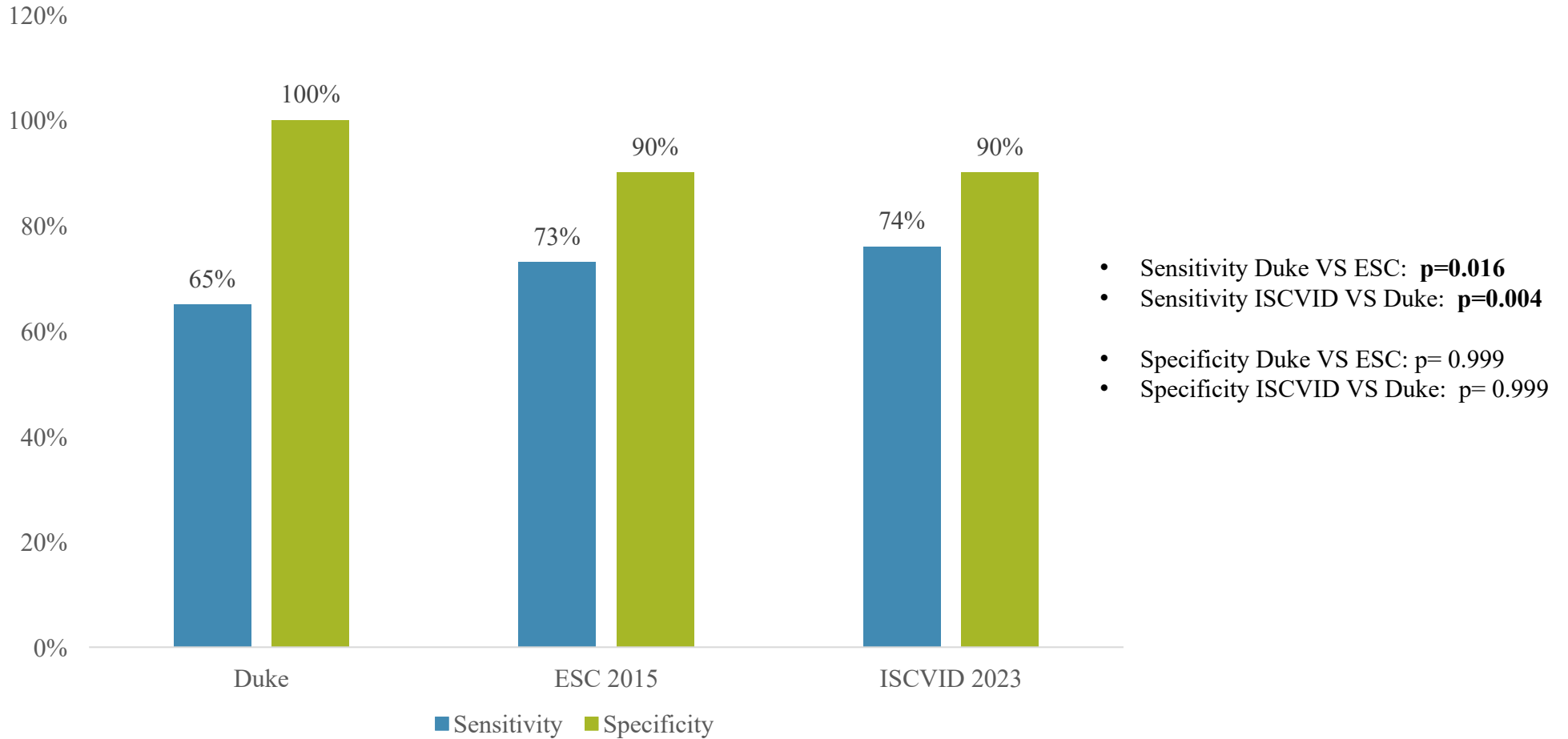
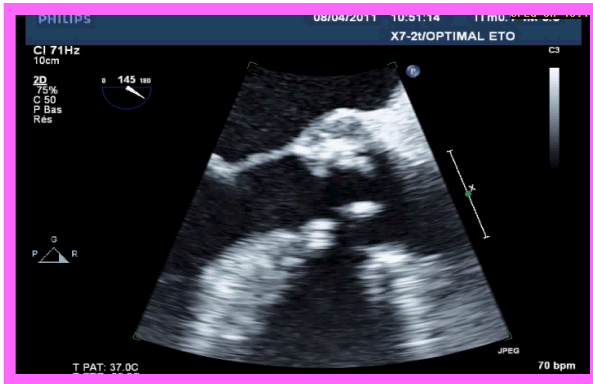


Figure 6a

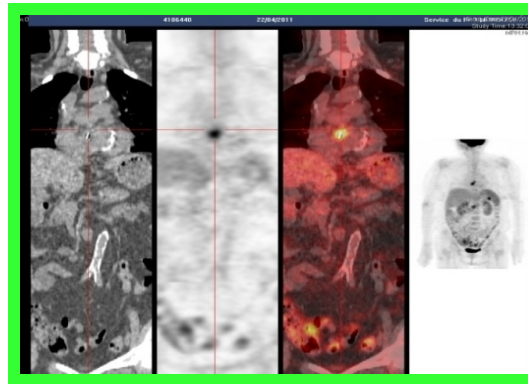
Central illustration : Comparison between Duke, ESC 2015 and ISCVID criteria



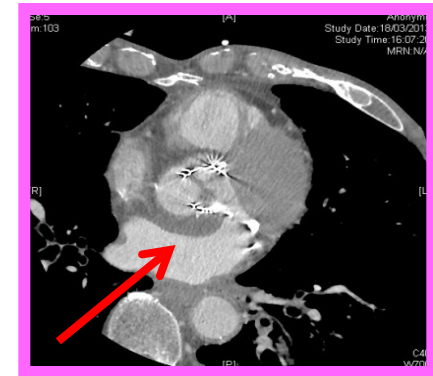
Multimodality imaging in IE



TOE
Morphology



PET CT
Inflammation / infection



Cardiac CT
Perivalvular lesions

Take-home messages: TAVI endocarditis

- 1. Incidence 0.4-2.1%**
- 2. Frail patients, atypical presentation**
- 3. Diagnosis more difficult**
- 4. Role of PET-CT and multimodality imaging**
- 5. Additional value of ESC 2015-2023 criteria**



La Timone Hospital; Marseille, France

