

# Infective Endocarditis Guidelines

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# 2015 Guidelines for the Management of Infective Endocarditis

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# Classes of recommendations

Classes of recommendations	Definition	Suggested wording to use
<b>Class I</b>	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended/ is indicated.
<b>Class II</b>	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
<b>Class IIa</b>	<i>Weight of evidence/opinion is in favour of usefulness/efficacy.</i>	<i>Should be considered.</i>
<b>Class IIb</b>	<i>Usefulness/efficacy is less well established by evidence/opinion.</i>	May be considered.
<b>Class III</b>	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended.

# Levels of evidence

<b>Level of Evidence A</b>	<b>Data derived from multiple randomized clinical trials or meta-analyses.</b>
<b>Level of Evidence B</b>	<b>Data derived from a single randomized clinical trial or large non-randomized studies.</b>
<b>Level of Evidence C</b>	<b>Consensus of opinion of the experts and/or small studies, retrospective studies, registries.</b>

# Infective Endocarditis

## New guidelines ESC 2015

1. prevention
2. the “Endocarditis Team”
3. diagnosis
4. treatment
5. specific situations

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# Main principles of prevention in IE

1. Le principe d'antibioprophylaxie est maintenu
2. L'antibioprophylaxie est limitée aux **patients à haut risque** d'EI avant un **geste dentaire à risque élevé**.
3. **Hygiène bucco-dentaire** et suivi par un dentiste +++
4. Asepsie durant procédures « invasives »

# Cardiac conditions at highest risk of IE

Recommendations	Class	Level
<p>Antibiotic prophylaxis <b>should only be considered</b> for patients <b>at highest risk</b> of IE:</p> <ol style="list-style-type: none"><li>1. Patients with a <b>prosthetic valve</b>, including transcatheter valve, or a prosthetic material used for cardiac valve repair.</li><li>2. Patients with <b>previous IE</b>.</li><li>3. Patients with <b>congenital heart disease</b>.<ol style="list-style-type: none"><li>a. any <b>cyanotic</b> congenital heart disease</li><li>b. congenital heart disease repaired with prosthetic material whether placed surgically or by percutaneous techniques, up to 6 months after the procedure or lifelong if there remains residual shunt or valvular regurgitation.</li></ol></li></ol>	<b>IIa</b>	<b>C</b>
<p><b>Antibiotic prophylaxis is not recommended in other forms of valvular or congenital heart disease.</b></p>	<b>III</b>	<b>C</b>



# Procedures at highest risk of IE

Recommendations	Class	Level
<p><b>A. Dental procedures</b></p> <ul style="list-style-type: none"> <li>• <b>Antibiotic prophylaxis</b> should only be considered for <b>dental procedures</b> requiring <b>manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa.</b></li> </ul>	<b>IIa</b>	<b>C</b>
<ul style="list-style-type: none"> <li>• Antibiotic prophylaxis is not recommended for local anaesthetic injections in non-infected tissues, treatment of superficial caries, removal of sutures, dental X-rays, placement or adjustment of removable prosthodontic or orthodontic appliances or braces, or following the shedding of deciduous teeth or trauma to the lips and oral mucosa.</li> </ul>	<b>III</b>	<b>C</b>
<p><b>B. Respiratory tract procedures</b></p> <ul style="list-style-type: none"> <li>• Antibiotic prophylaxis is not recommended for respiratory tract procedures, including bronchoscopy or laryngoscopy, transnasal or endotracheal intubation.</li> </ul>	<b>III</b>	<b>C</b>
<p><b>C. Gastrointestinal or urogenital procedures or TOE</b></p> <ul style="list-style-type: none"> <li>• Antibiotic prophylaxis is not recommended for gastroscopy, colonoscopy, cystoscopy, vaginal or caesarean delivery or TOE.</li> </ul>	<b>III</b>	<b>C</b>
<p><b>D. Skin and soft tissues procedures</b></p> <ul style="list-style-type: none"> <li>• Antibiotic prophylaxis is not recommended for any procedure.</li> </ul>	<b>III</b>	<b>C</b>

# Prophylaxis for dental procedures at risk

Situation	Antibiotic	Single-dose 30-60 minutes before procedure	
		Adults	Children
No allergy to penicillin or ampicillin	Amoxicillin or Ampicillin <sup>a</sup>	2 g orally or i.v.	50 mg/kg orally or i.v.
Allergy to penicillin or ampicillin	Clindamycin	600 mg orally or i.v.	20 mg/kg orally or i.v.

<sup>a</sup>Alternatively, cephalexin 2 g i.v. for adults or 50 mg/kg i.v. for children, cefazolin or ceftriaxone 1 g i.v. for adults or 50 mg/kg i.v. for children.

“Cephalosporins should not be used in patients with anaphylaxis, angio-oedema, or urticaria after intake of penicillin or ampicillin due to cross-sensitivity”.

# Non-specific prevention measures

These measures should ideally be applied to the general population and particularly reinforced in high-risk patients.

- **Strict dental and cutaneous hygiene. Dental follow-up** should be performed twice a year in high-risk patients and yearly in the others.
- Disinfection of wounds.
- Eradication or decrease of chronic bacterial carriage: skin, urine.
- Curative antibiotics for any focus of bacterial infection.
- No self-medication with antibiotics.
- Strict asepsis control measures for any at-risk procedure.
- **Discourage piercing and tattooing.**
- Limit the use of infusion catheters and invasive procedure when possible. Favour peripheral over central catheters, and systematic replacement of the peripheral catheter every 3–4 days. Strict adherence to care bundles for central and peripheral cannulae should be performed.

# Prophylactic measures **before** **cardiac or vascular** interventions

Recommendations	Class	Level
Pre-operative <b>screening of nasal carriage of <i>Staphylococcus aureus</i></b> is recommended before elective cardiac surgery in order to treat carriers.	I	A
<b>Peri-operative prophylaxis</b> is recommended before pacemaker or implantable cardioverter defibrillator implantation.	I	B
Elimination of <b>potential sources of dental sepsis</b> is recommended >2 weeks before implantation of a prosthetic valve or other intracardiac or intravascular foreign material, except in urgent procedures.	I	C
<b>Peri-operative antibiotic prophylaxis</b> should be considered in patients undergoing surgical or transcatheter implantation of a prosthetic valve, intravascular prosthetic, or other foreign material.	IIa	C
Systematic local treatment without screening of <i>Staphylococcus aureus</i> is not recommended.	III	C

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# « Team-endocardite »

- **Maladie grave** associée à une importante morbi-mortalité
- **Présentations cliniques multiples**, atteinte de plusieurs organes.
- **Adapter l'attitude au cas / cas**
  - la présentation clinique
  - du terrain
  - du germe
  - des lésions cardiaques.
  - des localisations secondaires et / ou des complications systémiques
  - du risque opératoire
  - de la faisabilité d'une réparation valvulaire.....
- >> **Nécessité d'une prise en charge multi-disciplinaire en particulier pour les formes compliquées (prothèses, ...)**

# The « Endocarditis team »

- **Characteristics of the reference center**

1. **Imagerie** (échocardiographie, scanner, IRM, médecine nucléaire.

2. **Chirurgie cardiaque**

3. **Plusieurs spécialistes**

- Cardiologue

- Chirurgien cardiaque

- Anesthésiste / médecin réanimateur

- Infectiologue / microbiologiste

- spécialistes en imagerie

- autres spécialistes: cardiopathie congénitale, rythmologie, neurologues, neurochirurgiens, neuroradiologie interventionnelle...

# The « Endocarditis team »

Recommendations	Class	Level
Patients with <b>complicated IE</b> should be <b>evaluated and managed at an early stage</b> in a <b>reference centre</b> , with immediate <b>surgical facilities</b> and the presence of a <b>multidisciplinary “Endocarditis Team”</b> , including an ID specialist, a microbiologist, a cardiologist, imaging specialists, a cardiac surgeon, and if needed a specialist in CHD.	<b>IIa</b>	<b>B</b>
For patients with <b>non-complicated IE</b> managed in a non-reference centre, <b>early and regular communication with the reference centre</b> and, when needed, with visit to the reference centre, should be made.	<b>IIa</b>	<b>B</b>

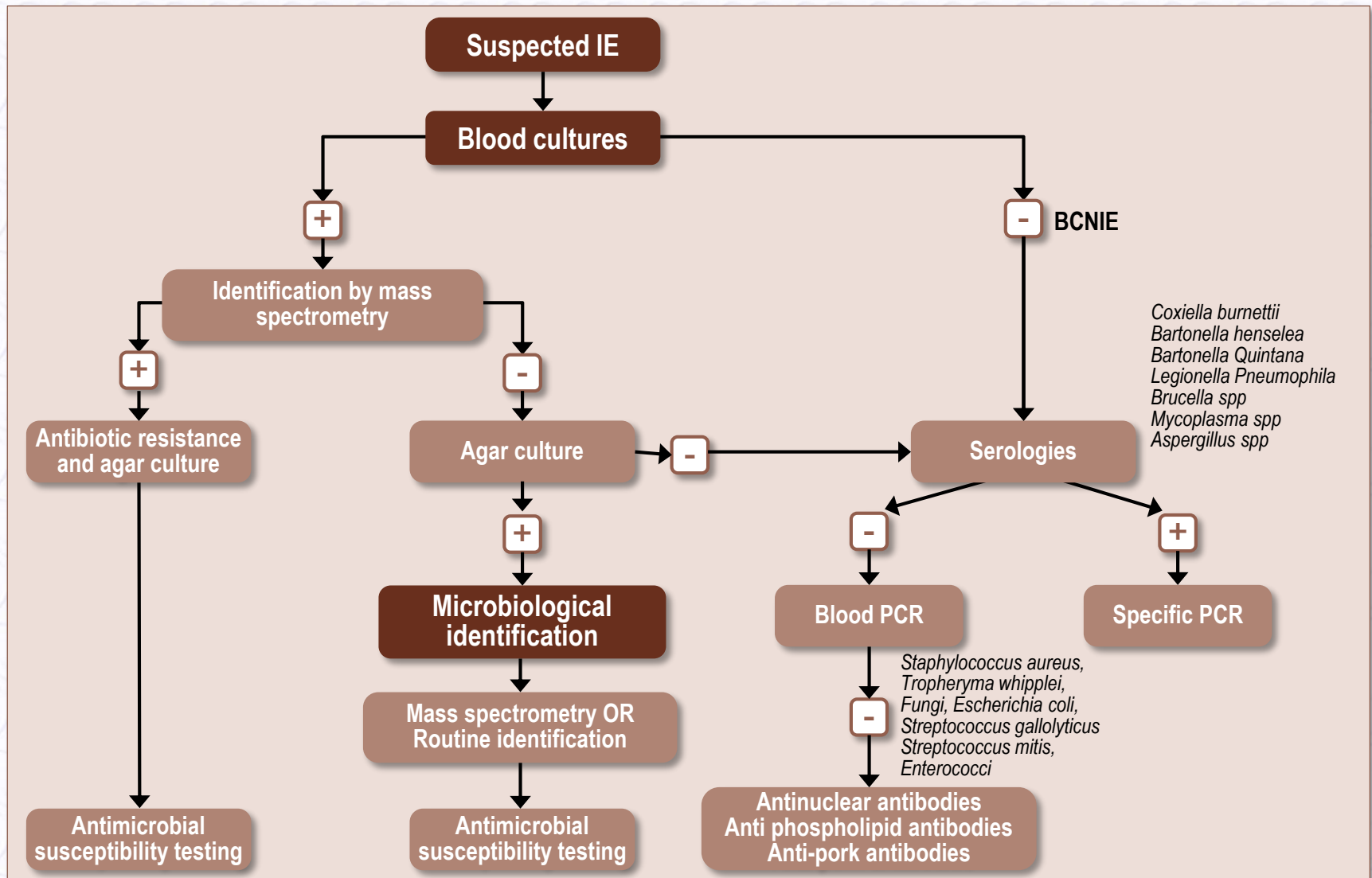


# Infective Endocarditis

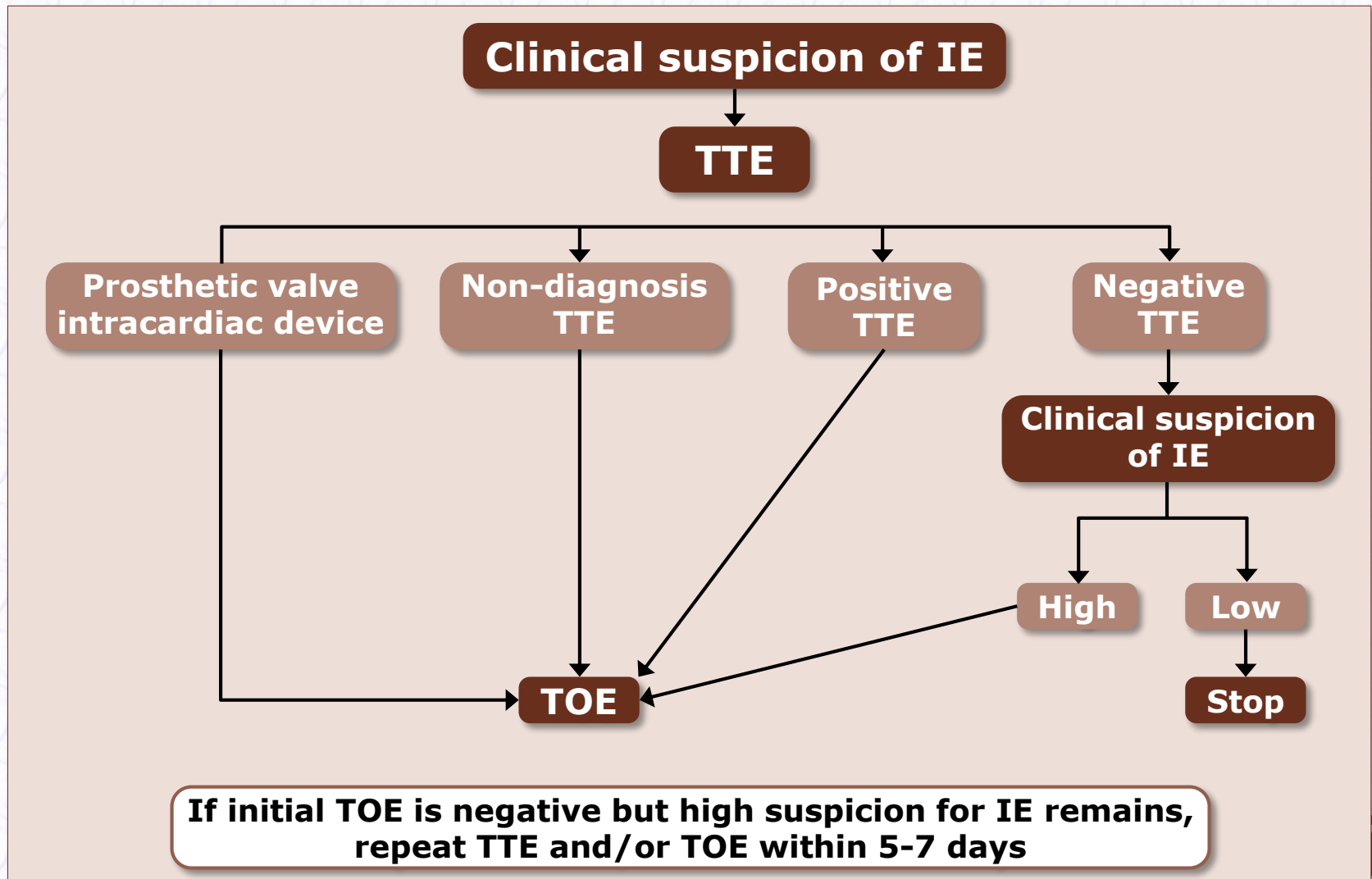
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# Microbiology



# Indications for echocardiography



# Anatomic and echographic definitions

	<b>Surgery/necropsy</b>	<b>Echocardiography</b>
Vegetation	Infected mass attached to an endocardial structure or on implanted intracardiac material.	Oscillating or non-oscillating intracardiac mass on valve or other endocardial structures, or on implanted intracardiac material.
Abscess	Perivalvular cavity with necrosis and purulent material not communicating with the cardiovascular lumen.	Thickened, non-homogeneous 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 two neighbouring cavities through a perforation.	Colour-doppler communication between two 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/TOE, with or without rocking motion of the prosthesis.

# Echocardiography in IE

Recommendations	Class	Level
<b>A. Diagnosis</b>		
TTE is recommended as the <b>first-line imaging modality</b> in suspected IE.	<b>I</b>	<b>B</b>
TOE is recommended in all patients with clinical suspicion of IE and a negative or non diagnostic TTE.	<b>I</b>	<b>B</b>
TOE is recommended in patients with clinical suspicion of IE, in case of prosthetic valve or intracardiac device.	<b>I</b>	<b>B</b>
<b>Repeat TTE/TOE within 5–7 days</b> is recommended in case of initially negative examination when clinical suspicion of IE remains high.	<b>I</b>	<b>C</b>
Echocardiography should be considered in <i>Staphylococcus aureus</i> bacteraemia.	<b>IIa</b>	<b>B</b>
TOE should be considered in the majority of adult patients with suspected IE, even in cases with positive TTE.	<b>IIa</b>	<b>C</b>

# Echocardiography in IE

Recommendations	Class	Level
<b>B. Follow-up under medical therapy</b>		
Repeat <b>TTE and TOE</b> are recommended as soon as a <b>new complication</b> of IE is suspected (new murmur, embolism, persisting fever, HF, abscess, atrioventricular block).	<b>I</b>	<b>B</b>
Repeat TTE and TOE should be considered during follow-up of uncomplicated IE, in order to detect new silent complications and monitor vegetation size. The timing and mode (TTE or TOE) of repeat examination depend on the initial findings, type of microorganism, and initial response to therapy.	<b>IIa</b>	<b>B</b>
<b>C. Intra-operative echocardiography</b>		
Intra-operative echocardiography is recommended in all cases of IE requiring surgery.	<b>I</b>	<b>B</b>
<b>D. Following completion of therapy</b>		
TTE is recommended at completion of antibiotic therapy for evaluation of cardiac and valve morphology and function.	<b>I</b>	<b>C</b>

# 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:
  - *Viridans streptococci*, *Streptococcus gallolyticus* (*Streptococcus bovis*), *HACEK* group, *Staphylococcus aureus*; or
  - Community-acquired enterococci, in the absence of a primary focus; or
- b. Microorganisms consistent with IE from persistently positive blood cultures:
  - $\geq 2$  positive blood cultures of blood samples drawn  $>12$  h apart; or
  - All of 3 or a majority of  $\geq 4$  separate cultures of blood (with first and last samples drawn  $\geq 1$  h apart); or
- 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  $^{18}\text{F}$ -FDG PET/CT or radiolabelled leukocytes SPECT/CT.** (only if the prosthesis was implanted for  $>3$  months)

**c. Definite paravalvular lesions by cardiac CT.**

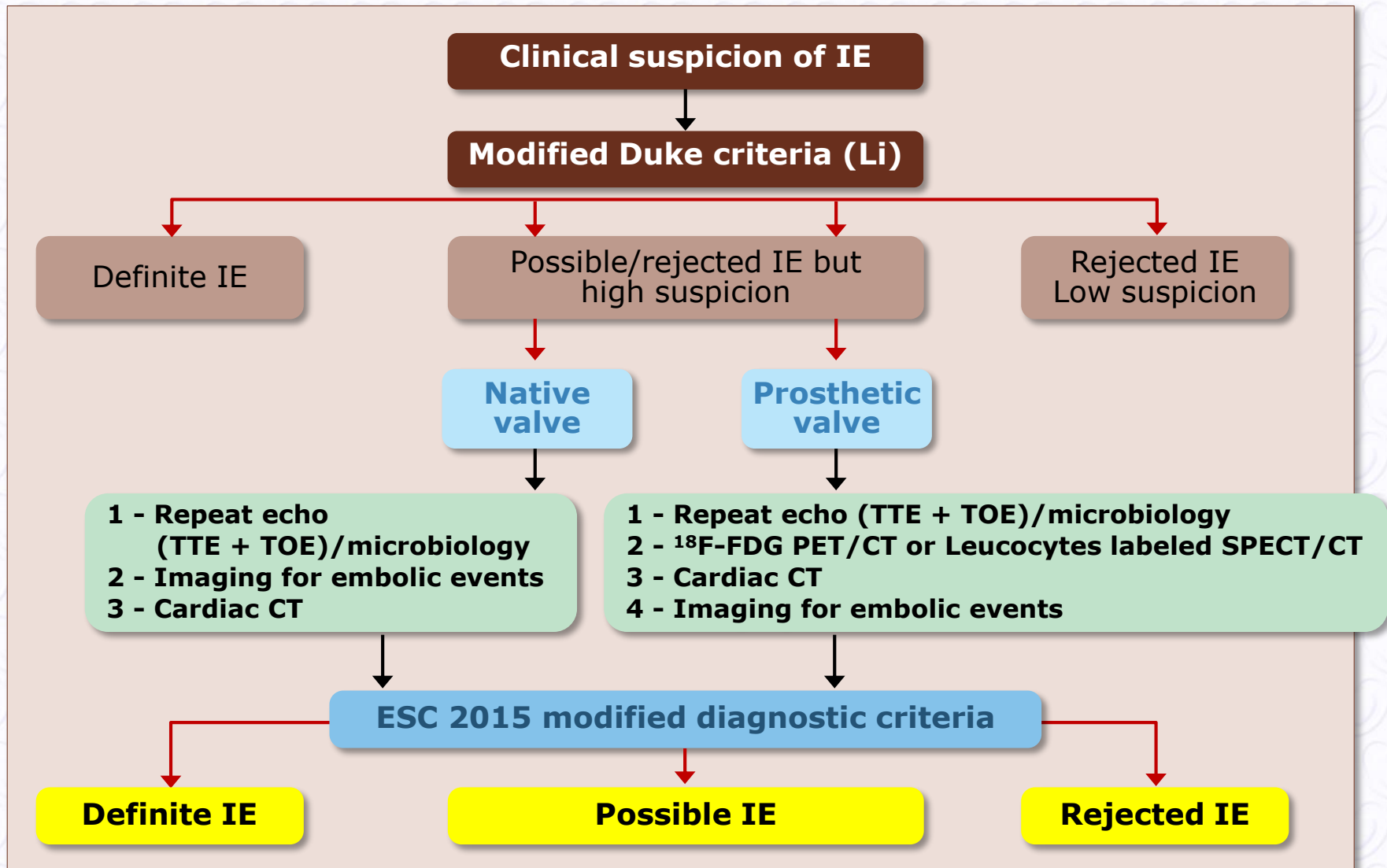
# ESC 2015 modified criteria for diagnosis of IE:

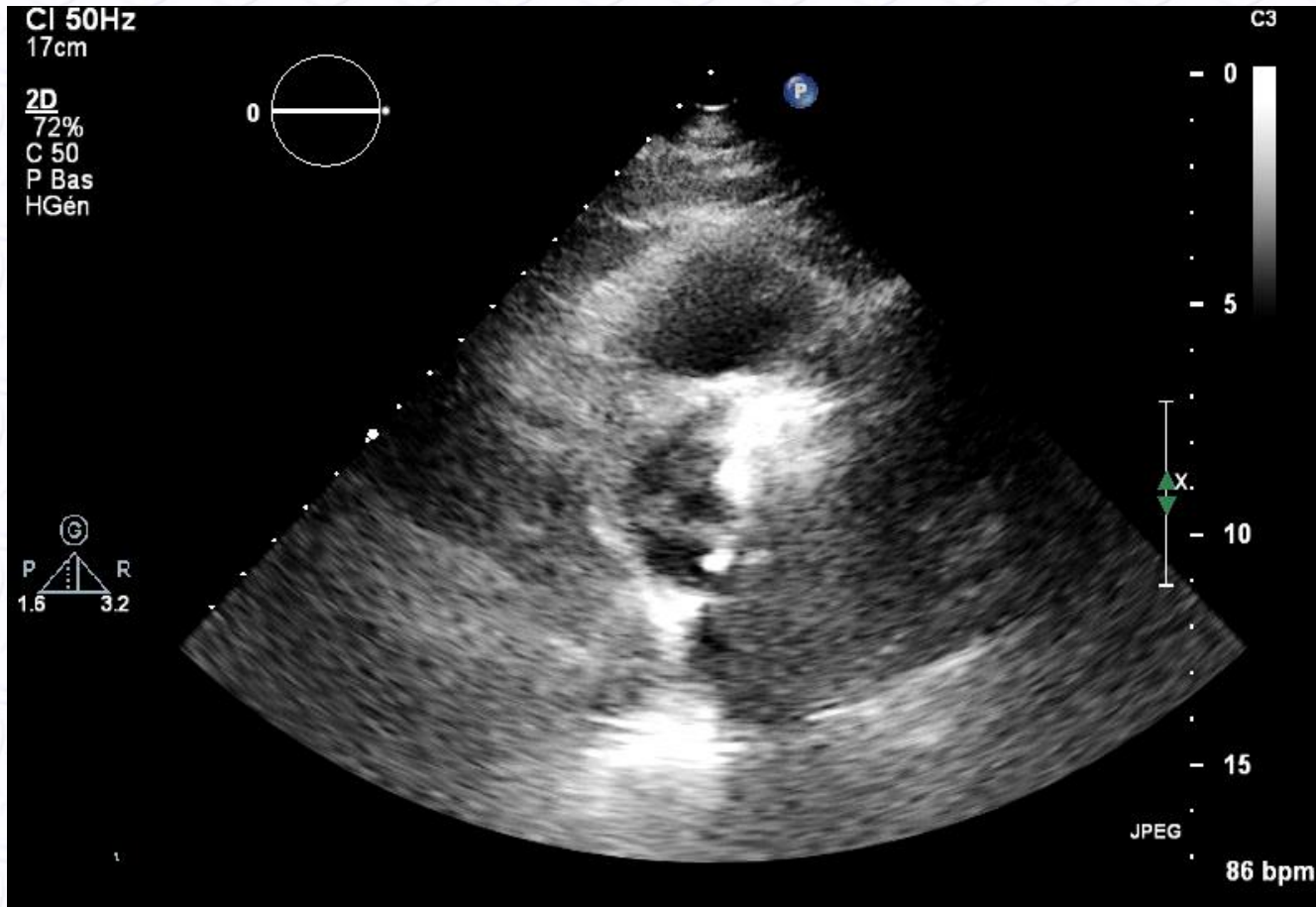
## Minor criteria

1. Predisposition such as predisposing heart condition, or injection drug use.
2. Fever defined as temperature  $>38^{\circ}\text{C}$ .
3. Vascular phenomena (**including those detected only by imaging**): major arterial emboli, septic pulmonary infarcts, infectious (mycotic) aneurysm, intracranial haemorrhage, conjunctival haemorrhages, and Janeway's lesions.
4. Immunological phenomena: glomerulonephritis, Osler's nodes, Roth's spots, and rheumatoid factor.
5. Microbiological evidence: positive blood culture but does not meet a major criterion as noted above or serological evidence of active infection with organism consistent with IE.

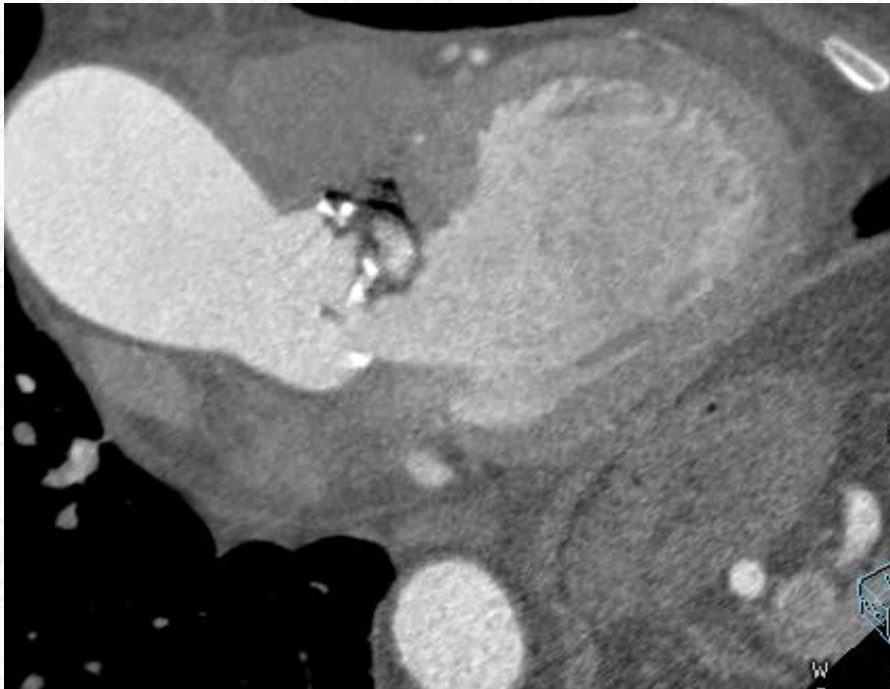


# ESC 2015 algorithm for diagnosis of IE





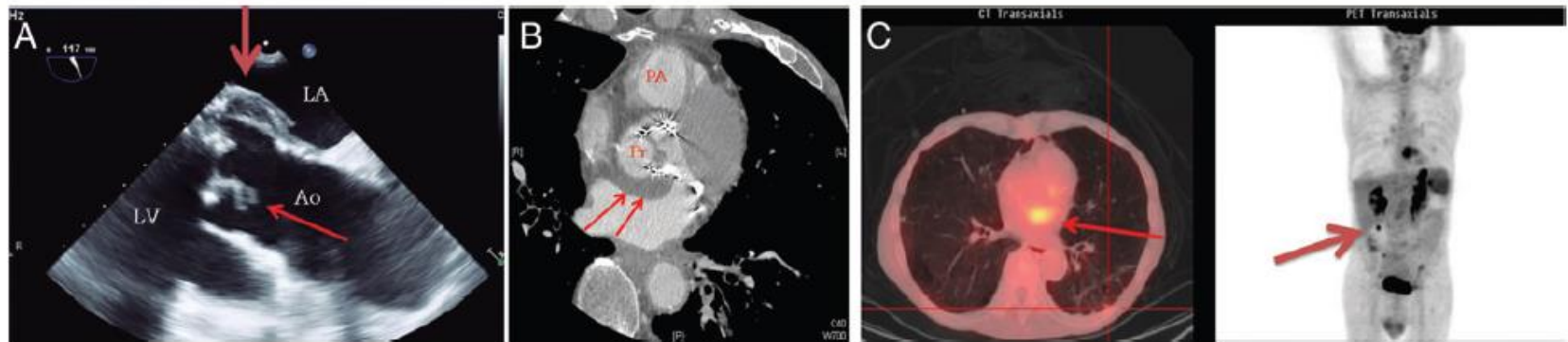
## CT



Courtesy Dr Alban Redheuil

# Cardiac imaging in infectious endocarditis

Niels Eske Bruun<sup>1\*</sup>, Gilbert Habib<sup>2\*</sup>, Franck Thuny<sup>2</sup>, and Peter Sogaard<sup>1</sup>

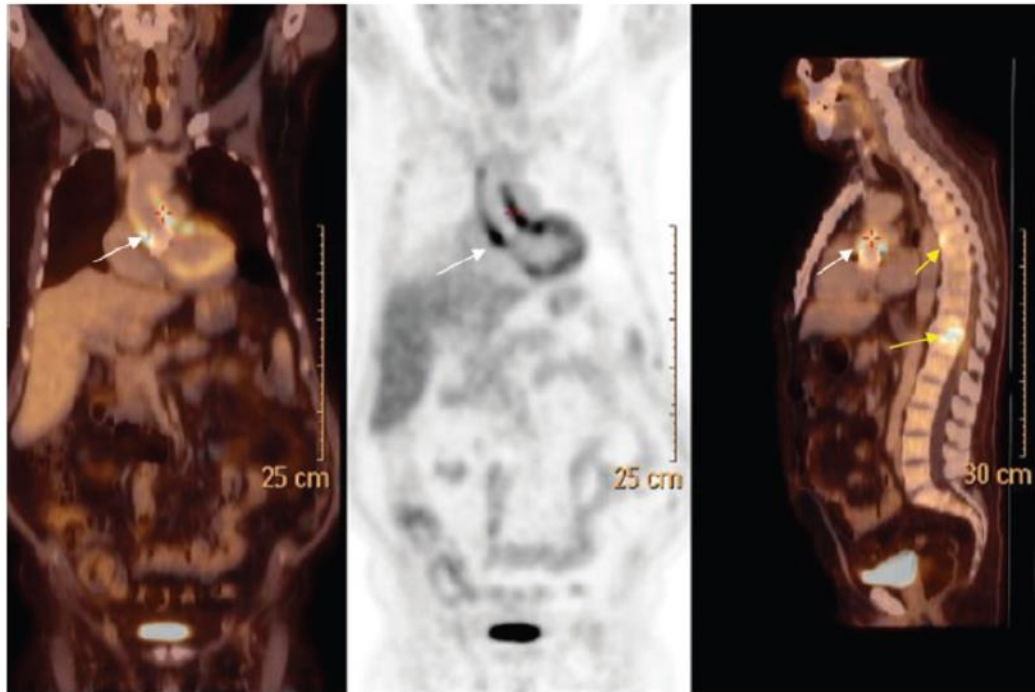


**Figure 9** Multimodality imaging of a bioprosthetic aortic valve endocarditis. (A) Transoesophageal echocardiography: vegetation on a bioprosthetic leaflet (thin arrow) and posterior aortic root abscess (thick arrow). (B) Posterior aortic root abscess visualized by CT-scan (arrows). (C) PET-CT showing increased <sup>18</sup>F-Fluorodeoxyglucose uptake on both the aortic prosthesis (left panel, arrow) and on a colonic tumour (right panel, arrow). LA, left atrium; LV, left ventricle; Ao, aorta; PA, pulmonary artery; Pr, prosthesis.

European Heart Journal (2014) 35, 624–632

# Cardiac imaging in infectious endocarditis

Niels Eske Bruun<sup>1\*</sup>, Gilbert Habib<sup>2\*</sup>, Franck Thuny<sup>2</sup>, and Peter Sogaard<sup>1</sup>



**Figure 10** PET-CT of infected composite aorta graft (white arrows) inserted 16 years previously. Note the two foci in the thoracic column (yellow arrows).

European Heart Journal (2014) 35, 624–632

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# Antibiotic treatment

## Oral *Streptococci* and *Streptococcus bovis* group

Antibiotic	Dosage and route	Duration (weeks)	Class	Level
Strains penicillin-susceptible ( <b>MIC <math>\leq</math> 0.125 mg/L</b> ) oral and digestive streptococci				
<b>Standard treatment: 4-week duration</b>				
Penicillin G	12–18 million U/day i.v. either in <b>4–6 doses</b> or continuously	4	<b>I</b>	<b>B</b>
<i>or</i>				
Amoxicillin	100–200 mg/kg/day i.v. in <b>4–6 doses</b>	4	<b>I</b>	<b>B</b>
<i>or</i>				
Ceftriaxone	2 g/day i.v. or i.m. in 1 dose	4	<b>I</b>	<b>B</b>
<b>In beta-lactam allergic patients</b>				
Vancomycin	30 mg/kg/day i.v. in 2 doses	4	<b>I</b>	<b>C</b>

# Antibiotic treatment

## Oral *Streptococci* and *Streptococcus bovis* group

### Standard treatment: 2-week duration

Penicillin G or Amoxicillin <sup>e</sup> or Ceftriaxone <sup>f</sup> combined with Gentamicin <sup>h</sup> or Netilmicin	12–18 million U/day i.v. either in 4–6 doses or continuously 100–200 mg/kg/day i.v. in 4–6 doses 2 g/day i.v. or i.m. in 1 dose 3 mg/kg/day i.v. or i.m. in 1 dose 4–5 mg/kg/day i.v. in 1 dose	2 2 2 2 2	I I I I I	B B B B B	6,8, 127, 135– 138	Only recommended in patients with non-complicated NVE with normal renal function.  Netilmicin is not available in all European countries.
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# Antibiotic treatment

## Oral *Streptococci* and *Streptococcus bovis* group

Antibiotic	Dosage and route	Duration (weeks)	Class	Level
Strains relatively resistant to penicillin ( <b>MIC 0.250–2 mg/l</b> )				
<b>Standard treatment</b>				
Penicillin G	24 million U/day i.v. either in <b>4–6 doses</b> or continuously	4	<b>I</b>	<b>B</b>
<i>or</i>				
Amoxicillin	200 mg/kg/day i.v. in 4–6 doses	4	<b>I</b>	<b>B</b>
<i>or</i>				
Ceftriaxone	2 g/day i.v. or i.m. in 1 dose	4		
<i>with</i>				
<b>Gentamicin</b>	3 mg/kg/day i.v. or i.m. in 1 dose	2		
<b>In beta-lactam allergic patients</b>				
Vancomycin	30 mg/kg/day i.v. in 2 doses	4	<b>I</b>	<b>C</b>
<i>with</i>				
Gentamicin	3 mg/kg/day i.v. or i.m. in 1 dose	2		

# Antibiotic treatment

## *Staphylococcus* spp. Native valves

### Pas d'aminosides

Antibiotic	Dosage and route	Duration (weeks)	Class	Level
<b>Native valves</b>				
<b>Methicillin-susceptible staphylococci</b>				
(Flu) cloxacillin or <b>oxacillin</b>	12 g/day i.v. in 4-6 doses	4-6	<b>I</b>	<b>B</b>
Alternative therapy				
Cotrimoxazole WITH Clindamycin	Sulfamethoxazole 4800 mg/day and Trimethoprim 960 mg/day (i.v. in 4-6 doses)  1800 mg/day IV in 3 doses	1 i.v. + 5 oral intake  1	<b>IIb</b>	<b>C</b>
<b>Penicillin-allergic patients or methicillin-resistant staphylococci</b>				
Vancomycin	30-60 mg/kg/day i.v. in 2-3 doses	4-6	<b>I</b>	<b>B</b>
Alternative therapy				
Daptomycin	10 mg/kg/day i.v. once daily	4-6	<b>IIa</b>	<b>C</b>
Alternative therapy				
Cotrimoxazole WITH Clindamycin	Sulfamethoxazole 4800 mg/day and Trimethoprim 960 mg/day (i.v. in 4-6 doses)  1800 mg/day IV in 3 doses	1 i.v. + 5 oral intake  1	<b>IIb</b>	<b>C</b>

# Antibiotic treatment

## *Staphylococcus* spp. Prosthetic valves

Antibiotic	Dosage and route	Duration (weeks)	Class	Level
<b>Prosthetic valves</b>				
<b>Methicillin-susceptible staphylococci</b>				
(Flu) cloxacillin or <b>oxacillin</b>	12 g/day i.v. in 4–6 doses	≥6	<b>I</b>	<b>B</b>
WITH <b>Rifampin</b>	900–1200 mg i.v. or orally in 2 or 3 divided doses	≥6		
AND <b>Gentamicin</b>	3 mg/kg/day i.v. or i.m. in 1 or 2 doses	2		
<b>Penicillin-allergic patients and methicillin-resistant staphylococci</b>				
Vancomycin	30–60 mg/kg/day i.v. in 2–3 doses	≥6	<b>I</b>	<b>B</b>
WITH Rifampin	900–1200 mg i.v. or orally in 2 or 3 divided doses	≥6		
AND Gentamicin	3 mg/kg/day i.v. or i.m. in 1 or 2 doses	2		

# Antibiotic treatment *Enterococcus spp.*

Antibiotic	Dosage and route	Duration weeks	Class	Level
<b>Beta-lactam and gentamicin-susceptible strains</b>				
Amoxicillin <i>with</i> Gentamicin	200 mg/kg/day i.v. in 4-6 doses	4-6	<b>I</b>	<b>B</b>
	3 mg/kg/day i.v. or i.m. in 1 dose	2-6		
<b>or</b>				
Ampicillin <i>with</i> Ceftriaxone	200 mg/kg/day i.v. in 4-6 doses	6	<b>I</b>	<b>B</b>
	4 g/day i.v. or i.m. in 2 doses	6		
<b>or</b>				
Vancomycin <i>with</i> Gentamicin	30 mg/kg/day i.v. in 2 doses	6	<b>I</b>	<b>C</b>
	3 mg/kg/day i.v. or i.m. in 1 dose	6		

# Antibiotic therapy

## Empirical treatment

Antibiotic	Dosage and route	Class	Level
<b>Community-acquired NVE or late PVE (<math>\geq 12</math> months post surgery)</b>			
<b>Ampicillin</b> WITH (Flu) cloxacillin or <b>oxacillin</b> WITH <b>Gentamicin</b>	12 g/day i.v. in 4–6 doses  12 g/day i.v. in 4–6 doses  3 mg/kg/day i.v. or i.m. in 1 dose	<b>IIa</b>	<b>C</b>
Vancomycin WITH Gentamicin	30–60 mg/kg/day i.v. in 2–3 doses  3 mg/kg/day i.v. or i.m. in 1 dose		
<b>Early PVE (&lt;12 months post surgery) or nosocomial and non-nosocomial healthcare associated endocarditis</b>			
<b>Vancomycin</b> WITH <b>Gentamicin</b> WITH <b>Rifampin</b>	30 mg/kg/day i.v. in 2 doses  3 mg/kg/day i.v. or i.m. in 1 dose  900–1200 mg i.v. or orally in 2 or 3 divided doses	<b>IIb</b>	<b>C</b>

**Table 19** Antibiotic treatment of blood culture-negative infective endocarditis (adapted from Brouqui et al.<sup>193</sup>)

Pathogens	Proposed therapy <sup>a</sup>	Treatment outcome
<i>Brucella</i> spp.	Doxycycline (200 mg/24 h) plus cotrimoxazole (960 mg/12 h) plus rifampin (300–600/24 h) for ≥3–6 months <sup>b</sup> orally	Treatment success defined as an antibody titre <1:60. Some authors recommend adding gentamicin for the first 3 weeks.
<i>C. burnetii</i> (agent of Q fever)	Doxycycline (200 mg/24 h) plus hydroxychloroquine (200–600 mg/24 h) <sup>c</sup> orally (>18 months of treatment)	Treatment success defined as anti-phase I IgG titre <1:200, and IgA and IgM titres <1:50.
<i>Bartonella</i> spp. <sup>d</sup>	Doxycycline 100 mg/12 h orally for 4 weeks plus gentamicin (3 mg/24 h) i.v. for 2 weeks	Treatment success expected in ≥90%.
<i>Legionella</i> spp.	Levofloxacin (500 mg/12 h) i.v. or orally for ≥6 weeks or clarithromycin (500 mg/12 h) i.v. for 2 weeks, then orally for 4 weeks plus rifampin (300–1200 mg/24 h)	Optimal treatment unknown.
<i>Mycoplasma</i> spp.	Levofloxacin (500 mg/12 h) i.v. or orally for ≥6 months <sup>e</sup>	Optimal treatment unknown.
<i>T. whipplei</i> (agent of Whipple's disease) <sup>f</sup>	Doxycycline (200 mg/24 h) plus hydroxychloroquine (200–600 mg/24 h) <sup>c</sup> orally for ≥18 months	Long-term treatment, optimal duration unknown.

# Indications and timing of surgery:

## “Team-endocardite”

Indications for surgery	Timing	Class	Level
<b>1. Heart Failure</b>			
Aortic or mitral NVE or PVE with <b>severe</b> acute <b>regurgitation, obstruction or fistula</b> causing refractory pulmonary oedema or <b>cardiogenic shock</b> .	Emergency	<b>I</b>	<b>B</b>
Aortic or mitral NVE or PVE <b>with severe regurgitation or obstruction causing symptoms of HF</b> or echocardiographic signs of poor haemodynamic tolerance.	Urgent	<b>I</b>	<b>B</b>
<b>2. Uncontrolled infection: vérifier l'absence d'autres causes</b>			
Locally uncontrolled infection (abscess, false aneurysm, fistula, enlarging vegetation).	Urgent	<b>I</b>	<b>B</b>
Infection caused by fungi or multiresistant organisms.	Urgent/elective	<b>I</b>	<b>C</b>
Persisting positive blood cultures despite appropriate antibiotic therapy and adequate control of septic metastatic foci.	Urgent	<b>IIa</b>	<b>B</b>
PVE caused by staphylococci or non-HACEK Gram negative bacteria.	Urgent/elective	<b>IIa</b>	<b>C</b>
<b>3. Prevention of embolism: toujours difficile, idéalement &lt;2 semaines début du traitement</b>			
Aortic or mitral NVE or PVE with persistent vegetations >10 mm after one or more embolic episode despite appropriate antibiotic therapy.	Urgent	<b>I</b>	<b>B</b>
Aortic or mitral NVE with vegetations >10 mm, associated with severe valve stenosis or regurgitation, and low operative risk.	Urgent	<b>IIa</b>	<b>B</b>
Aortic or mitral NVE or PVE with isolated very large vegetations (>30 mm).	Urgent	<b>IIa</b>	<b>B</b>
v Aortic or mitral NVE or PVE with isolated large vegetations (>15 mm) and no other indication for surgery.	Urgent	<b>IIb</b>	<b>C</b>

Finally, although no single operative risk score is perfect, pre-operative assessment of operative risk is of utmost importance.

Although the theoretical indications for surgery in IE are clear (*Table 22*), their practical application relies largely on the clinical status of the patient, the patient's co-morbidities and the patient's operative risk.

## « Team-endocardite »

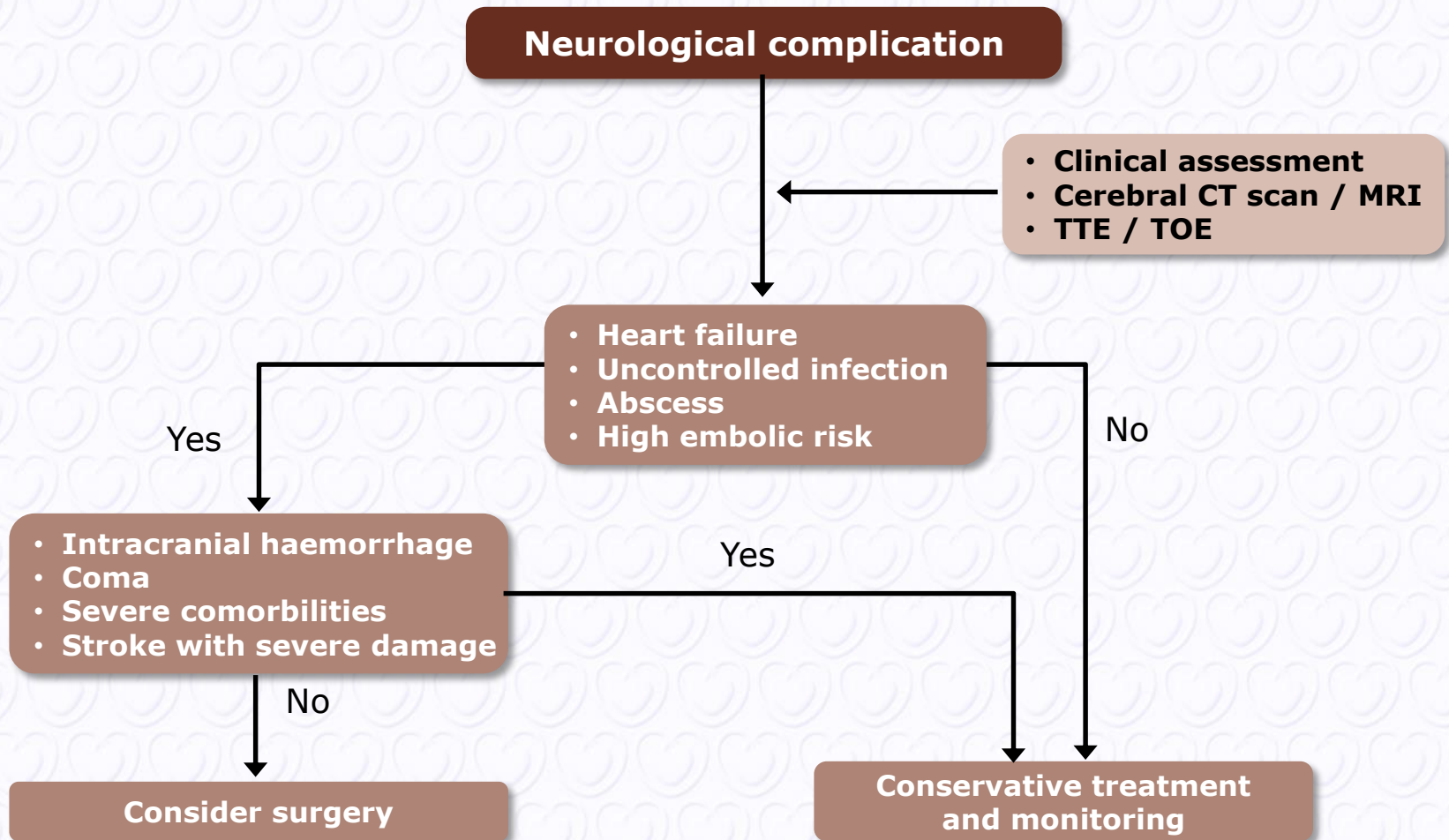


# Infective Endocarditis

## New guidelines ESC 2015

1. prevention
2. the “Endocarditis Team”
3. diagnosis
4. treatment
5. ***specific situations***

# Complication Neurologique: Faut il opérer?



# Management of neurological complications

Recommendations	Class	Level
After a silent embolism or transient ischaemic attack, cardiac surgery, if indicated, is recommended without delay.	<b>I</b>	<b>B</b>
Neurosurgery or endovascular therapy is indicated for very large, enlarging or ruptured intracranial infectious aneurysms.	<b>I</b>	<b>C</b>
Following intracranial haemorrhage, surgery should generally be postponed for $\geq 1$ month.	<b>IIa</b>	<b>B</b>
After a stroke, surgery indicated for HF, uncontrolled infection, abscess, or persistent high embolic risk should be considered without any delay as long as coma is absent and the presence of cerebral haemorrhage has been excluded by cranial CT or MRI.	<b>IIa</b>	<b>B</b>
Intracranial infectious aneurysms should be looked for in patients with IE and neurological symptoms. CT or MR angiography should be considered for diagnosis. If non-invasive techniques are negative and the suspicion of intracranial aneurysm remains, conventional angiography should be considered.	<b>IIa</b>	<b>B</b>

# Cardiac device-related infective endocarditis (CDRIE)

Recommendations	Class	Level
<b>A. Diagnosis</b>		
1. Three or more sets of <b>blood cultures</b> are recommended before prompt initiation of antimicrobial therapy for CIED infection.	<b>I</b>	<b>C</b>
2. <b>Lead-tip culture</b> is indicated when the CIED is explanted.	<b>I</b>	<b>C</b>
3. <b>TOE</b> is recommended in patients with suspected CDRIE with positive or negative blood cultures, independent of the results of TTE, to evaluate lead-related endocarditis and heart valve infection	<b>I</b>	<b>C</b>
4. Intracardiac echocardiography may be considered in patients with suspected CDRIE, positive blood cultures and negative TTE and TOE.	<b>IIb</b>	<b>C</b>
5. Radiolabelled leukocyte scintigraphy and <sup>18</sup> F-FDG PET/CT scanning may be considered additive tools in patients with suspected CDRIE, positive blood cultures, and negative echocardiography.	<b>IIb</b>	<b>C</b>

# Cardiac device-related infective endocarditis (CDRIE)

Recommendations	Class	Level
<b>B. Principles of treatment</b>		
1. Prolonged (i.e. before and after extraction) <b>antibiotic therapy</b> and complete hardware (device and leads) removal are recommended in definite CDRIE, as well as in presumably isolated pocket infection.	<b>I</b>	<b>C</b>
2. <b>Complete hardware removal</b> should be considered on the basis of occult infection without other apparent source of infection.	<b>IIa</b>	<b>C</b>
3. In patients with NVE or PVE and an intracardiac device with no evidence of associated device infection, complete hardware extraction may be considered.	<b>IIb</b>	<b>C</b>
<b>C. Mode of device removal</b>		
1. <b>Percutaneous extraction</b> is recommended in most patients with CDRIE, even those with vegetations >10 mm.	<b>I</b>	<b>B</b>
2. Surgical extraction should be considered if percutaneous extraction is incomplete or impossible or when there is associated severe destructive tricuspid IE.	<b>IIa</b>	<b>C</b>
3. Surgical extraction may be considered in patients with large vegetations ( <b>&gt;20 mm</b> ).	<b>IIb</b>	<b>C</b>

# Cardiac device-related infective endocarditis (CDRIE)

Recommendations	Class	Level
<b>D. Reimplantation</b>		
1. After device extraction, <b>reassessment of the need for reimplantation</b> is recommended.	<b>I</b>	<b>C</b>
2. When indicated, definite reimplantation should be postponed if possible to allow a few days or weeks of antibiotic therapy.	<b>IIa</b>	<b>C</b>
3. A “temporary” ipsilateral active fixation strategy may be considered in PM-dependent patients requiring appropriate antibiotic treatment before reimplantation.	<b>IIb</b>	<b>C</b>
4. Temporary pacing is not routinely recommended.	<b>III</b>	<b>C</b>
<b>E. Prophylaxis</b>		
1. Routine antibiotic prophylaxis is recommended before device implantation.	<b>I</b>	<b>B</b>
2. Potential sources of sepsis should be eliminated $\geq 2$ weeks before implantation of a intravascular/cardiac foreign material, except in urgent procedures.	<b>IIa</b>	<b>C</b>

# Endocardites du coeur droit

- terrain “particulier”, récidives ++
- IT souvent bien tolérées
- embolies pulmonaires ≠ systémiques

Recommendations	Class	Level
<p><b>Surgical treatment should be considered in the following scenarios:</b></p> <ul style="list-style-type: none"> <li>• <b>Microorganisms difficult to eradicate</b> (e.g. <i>persistent fungi</i>) or bacteraemia for &gt;7 days (e.g. <i>Staphylococcus aureus</i>, <i>P. aeruginosa</i>) despite adequate antimicrobial therapy or</li> <li>• <b>Persistent tricuspid valve vegetations &gt;20 mm</b> after recurrent pulmonary emboli or</li> <li>• <b>Right HF secondary to severe tricuspid regurgitation.</b></li> </ul>	<b>IIa</b>	<b>C</b>

« Team-endocardite »

# Anti-thrombotic therapy in IE

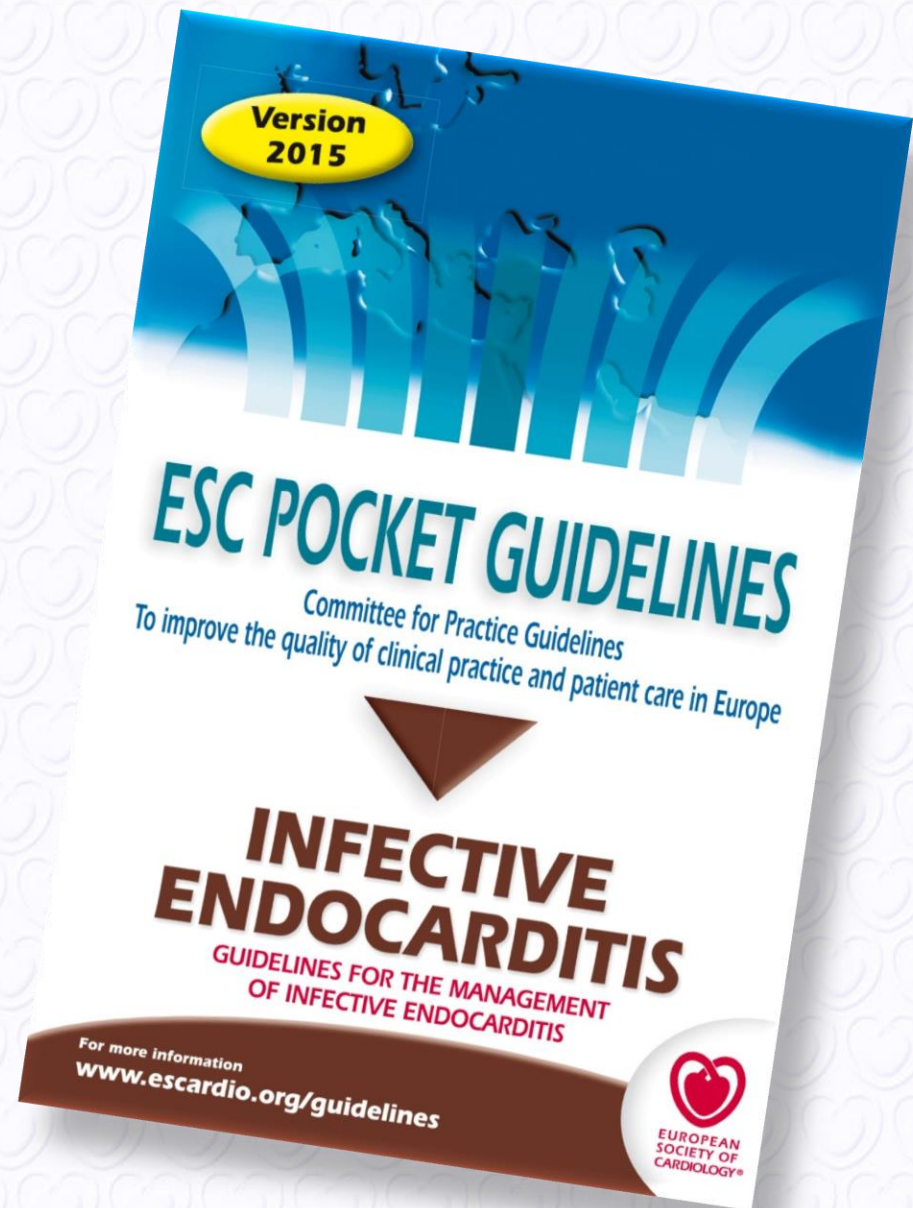
Recommendations	Class	Level
Interruption of antiplatelet therapy is recommended in the presence of major bleeding.	<b>I</b>	<b>B</b>
In intracranial haemorrhage, interruption of all anticoagulation is recommended.	<b>I</b>	<b>C</b>
In ischaemic stroke without haemorrhage, replacement of oral anticoagulant (Vitamin K antagonist) therapy by unfractionated or low-molecular-weight heparin for 1–2 weeks should be considered under close monitoring.	<b>IIa</b>	<b>C</b>
In patients with intracranial haemorrhage and a mechanical valve, unfractionated or low-molecular-weight heparin should be reinitiated as soon as possible following multidisciplinary discussion.	<b>IIa</b>	<b>C</b>
In the absence of stroke, replacement of oral anticoagulant therapy by unfractionated or low-molecular-weight heparin for 1–2 weeks should be considered in case of <i>Staphylococcus aureus</i> IE under close monitoring.	<b>IIa</b>	<b>C</b>
Thrombolytic therapy is not recommended in patients with IE.	<b>III</b>	<b>C</b>



# MERCI

# Pocket guidelines

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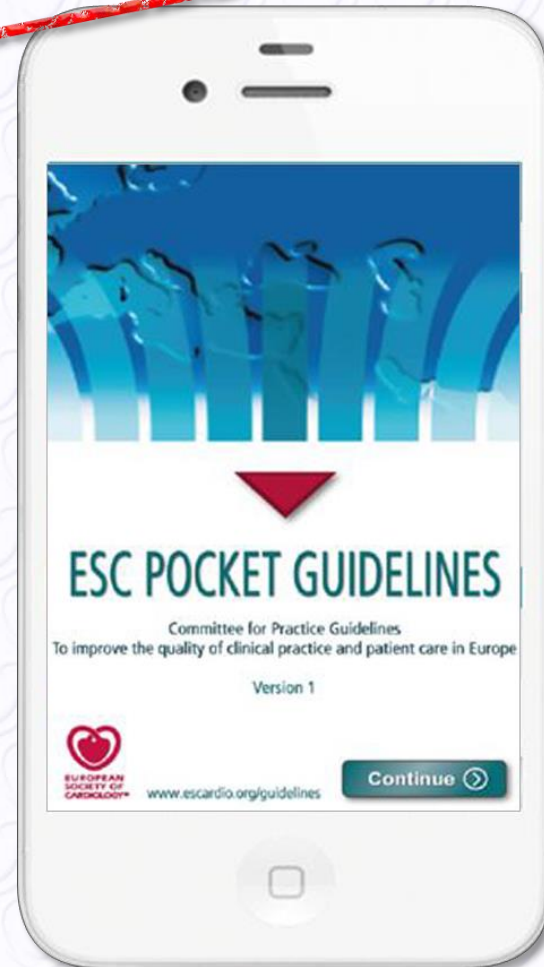
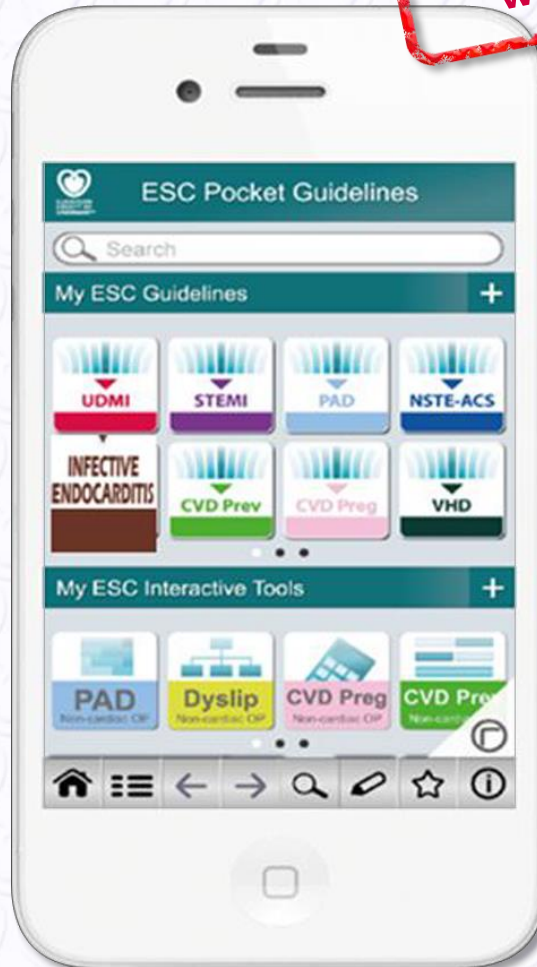
<http://www.escardio.org/guidelines>

European Heart Journal (2015) doi:10.1093/eurheartj/ehv319

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European Heart Journal (2015) doi:10.1093/eurheartj/ehv319

