



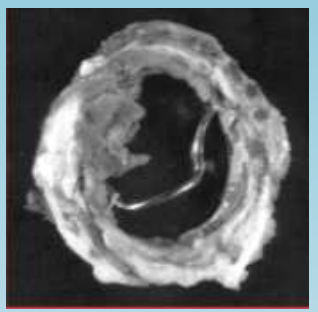

# Infezioni delle protesi valvolari e vascolari

## Aspetti Cardiologici

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# EI: Dimensioni del problema

- In USA da 10.000-15.000 nuovi casi di EI per anno
- EI incrementa con l'età ( > 50% EI >60 aa)
- Trend favorito dall'invecchiamento della popolazione
- Nei giovani ( <40 aa) abuso di droghe è la causa >

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# EIP: Dimensioni del problema

- Endocardite Infettiva Protesica: rappresenta il 20-26% di tutte le endocarditi Infettive / Euro Heart Survey

- In Italia vengono impiantate dalle 10/15.000 protesi valvolari all'anno

- EIP: incidenza da 1% al 6% delle valvole protesiche nel 1° anno dall'impianto e di circa l'1% ( 0,3-1,2%) negli anni successivi, ed ha una prognosi in genere sfavorevole

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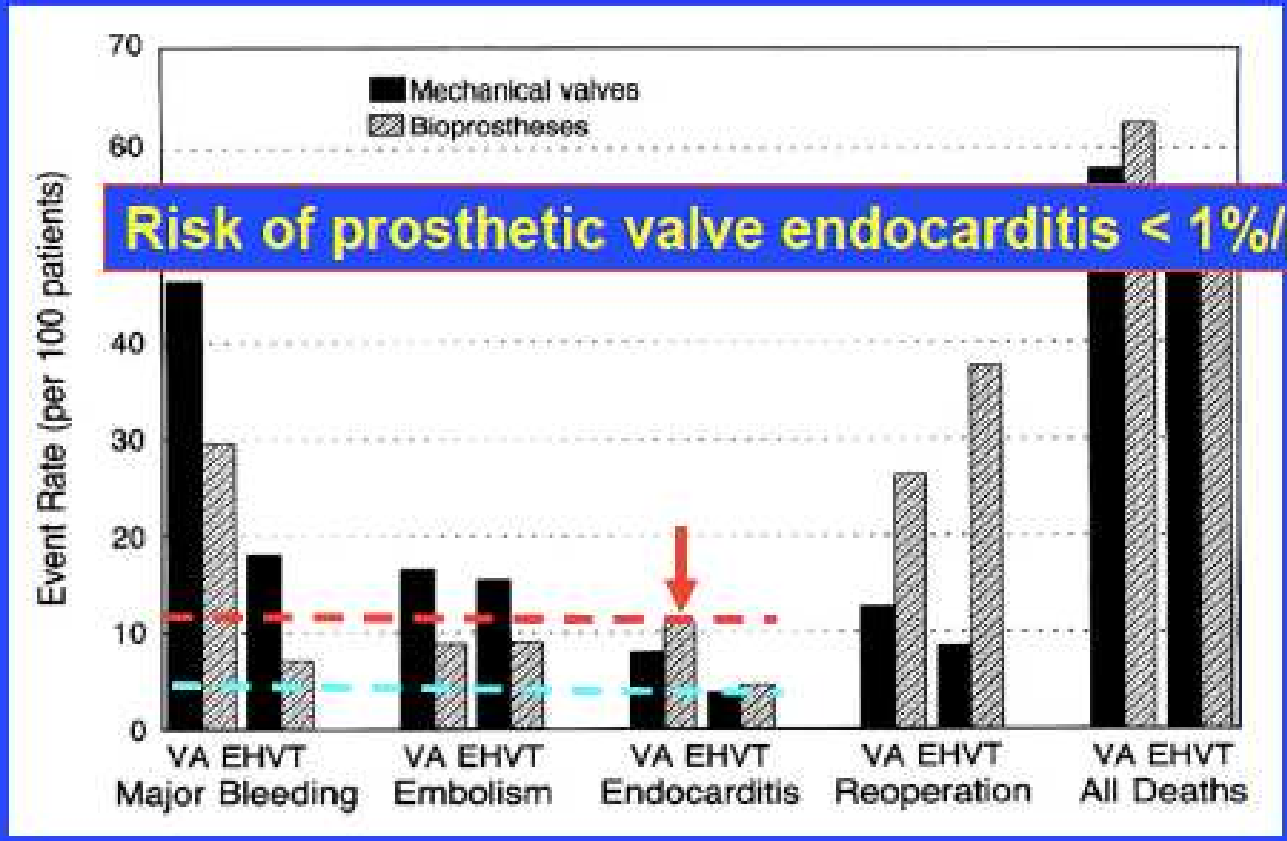
# PVE Dimensioni del problema

## Risk of Infection




Hammermeister KE et al, NEJM 1993 (12 yr event rates)

UW Medicine
REGIONAL HEART CENTER

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# EIP: Dimensioni del problema

- Colpisce indistintamente le protesi valvolari biologiche e meccaniche

- Patogenesi più frequentemente stafilococcica e micotica e più raramente streptococcica nella EIP precoce, mentre la tardiva è sostenuta da Stafil. Streptococchi orali e Gram neg.

- Elevata mortalità intraospedaliera: 15%-40%

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# Classification and definitions

## According to location of infection and absence or presence of intracardiac material

**Left-sided native valve IE**

**Left sided prosthetic valve IE (PVE)**

- Early PVE (< 1 year)
- Late PVE (>1 year)

**Right-sided IE**

**Device-related IE**

- Permanent pacemaker
- Permanent cardioverter-defibrillator

## According to the mode of acquisition

**Health care associated IE**

- Nosocomial (Hospitalisation >48 h before IE)
- Non nosocomial: IE starting <48 h after admission

  - Home based nursing, IV treatment, Haemodialysis, or IV chemotherapy (<30 days before)
  - Hospitalisation in acute care <90 days before IE
  - Resident in a nursing home or long-term facility

**Community-acquired IE**

**Intravenous drug-abuse IE**

# Infective Endocarditis
# New guidelines ESC 2009

1. Prevention
2. Diagnosis
3. Prognostic assessment
4. Treatment
5. Specific situations

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1. **Prevention**
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# IE prevention: main changes

1. The principle of antibiotic prophylaxis when performing procedures at risk of IE in patients with predisposing cardiac conditions is maintained but,
2. Antibiotic prophylaxis must be limited to patients with the highest risk of IE undergoing the highest risk dental procedure.
3. Good oral hygiene and regular dental review are more important than antibiotic prophylaxis to reduce the risk of IE.
4. Aseptic measures are mandatory during venous catheterization and during invasive procedures.
5. Prospective epidemiological studies are needed to evaluate if the reduced use of prophylaxis is associated with a change in the incidence of IE.

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# Cardiac conditions at highest risk of IE

| Recommendations | Class | Level |
|---|---|---|
| **Antibiotic prophylaxis should only be recommended for patients at highest risk of IE:** | IIa | C |
| 1. Patients with a prosthetic valve or any prosthetic material used for cardiac valve repair, | | |
| 2. Patients with previous IE, | | |
| 3. Patients with congenital heart disease (CHD):<br>a. Cyanotic CHD with or without previous interventions,<br>b. CHD with complete repair (surgical or percutaneous) for the next 6 months,<br>c. When a residual defect persists after cardiac surgery or percutaneous technique. | | |
| **Antibiotic prophylaxis is no longer recommended in other forms of valvular or CHD.** | III | C |

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# Procedures at highest risk of IE (1)

## Dental procedures

| Recommendations | Class | Level |
|---|---|---|
| **AB should be considered only** for dental procedures with manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa. | IIa | C |
| **AB is not recommended** for local anaesthetic injections in non infected tissue removal of sutures, dental X-rays.<br>Placement or adjustment of removable prosthodontic or orthodontic appliances or braces.<br>After the shedding of deciduous teeth or trauma to the lips and oral mucosa. | III | C |



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# Procedures at highest risk of IE (2)

## Antibiotic prophylaxis is not recommended for :

| Recommendations | Class | Level |
|---|---|---|
| 1. **Respiratory tract procedures** (Bronchoscopy, laryngoscopy, transnasal or endotracheal intubation). | III | C |
| 2. **Gastrointestinal procedures** (Gastroscopy, colonoscopy, cystoscopy, transoesophageal echo). | III | C |
| 3. **Skin and soft tissue procedures.** | III | C |

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# Recommended prophylaxis for dental procedures at risk

Single dose 30-60 min before procedure

| Situation | Antibiotic | Adults | Children |
|---|---|---|---|
| No allergy to penicillin or ampicillin | Amoxicillin or Ampicillin | 2 g p.o. or i.v. | 50 mg/kg p.o. or i.v. |
| Allergy to penicillin or ampicillin | Clindamycin | 600mg p.o. or i.v. | 20 mg/kg p.o. or i.v. |

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# Diagnosi di EVP

- **Clinica**
- **Strumentale**: eco TT, eco TE, RMN
- **Ematochimica-culturale**

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# 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.

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# Diagnosis of Prosthetic Valve Endocarditis

## Clinical Features

| | |
|---|---|
| Fever | 95% |
| New murmur or Δ murmur | 10- 25% |
| Pre-existing murmur | 85- 95% |
| Osler's nodes | 10-15% |
| Janeway lesions | 3- 5% |
| Roth spots | 2-10% |
| Anemia | 70-90% |
| Circulating immune complexes | 95% |
| Elevated CRP, RF | 94-97% |
| Microscopic hematuria | 30-60% |

Durack et al, Am J Med 1994; Li et al, Clin Infect Dis 2000

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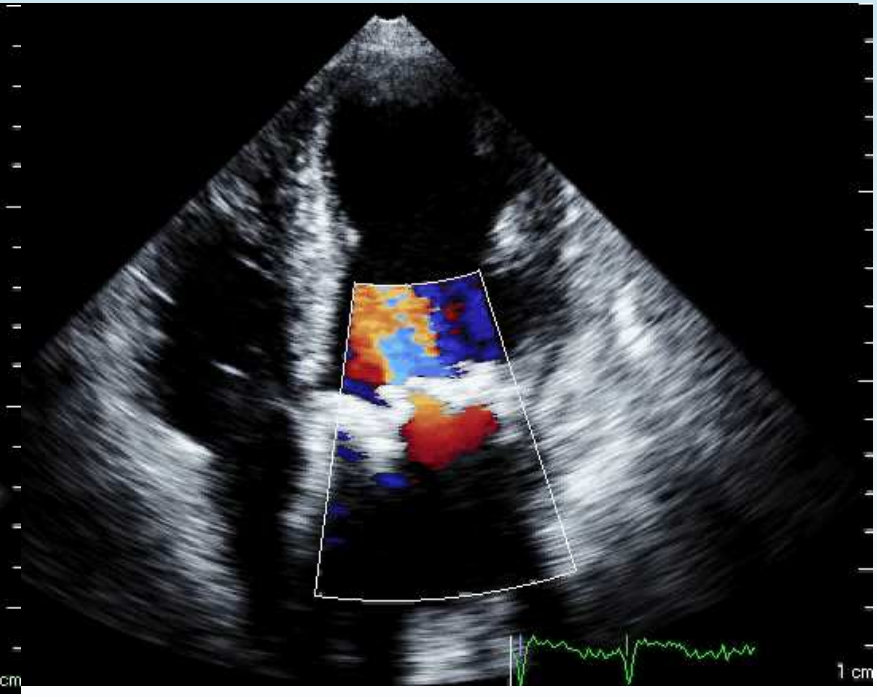
# EIP: Ruolo dell'ecocardiografia

- Uomo 72 aa
- 6 anni prima sottoposto SVM e SVA con due bioprotesi (RAA)
- Prostatite in ipertrofia prostatica 1 mese prima comparsa di febbre 38-38,5 da 2 settimane con qualche puntata settica da una settimana (terapia antibiotica inadeguata)
- Dolori toracici da 5 gg e ricovero in Malattie Infettive

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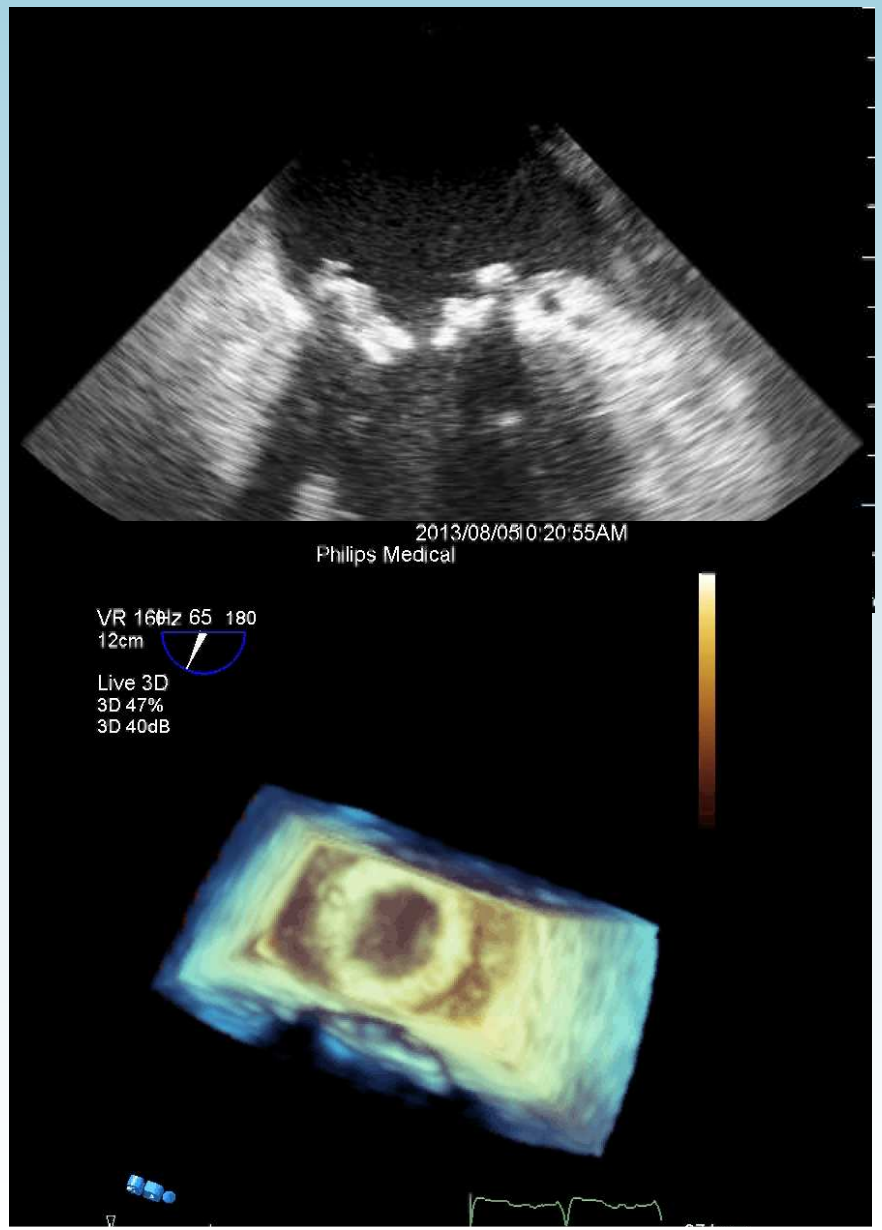
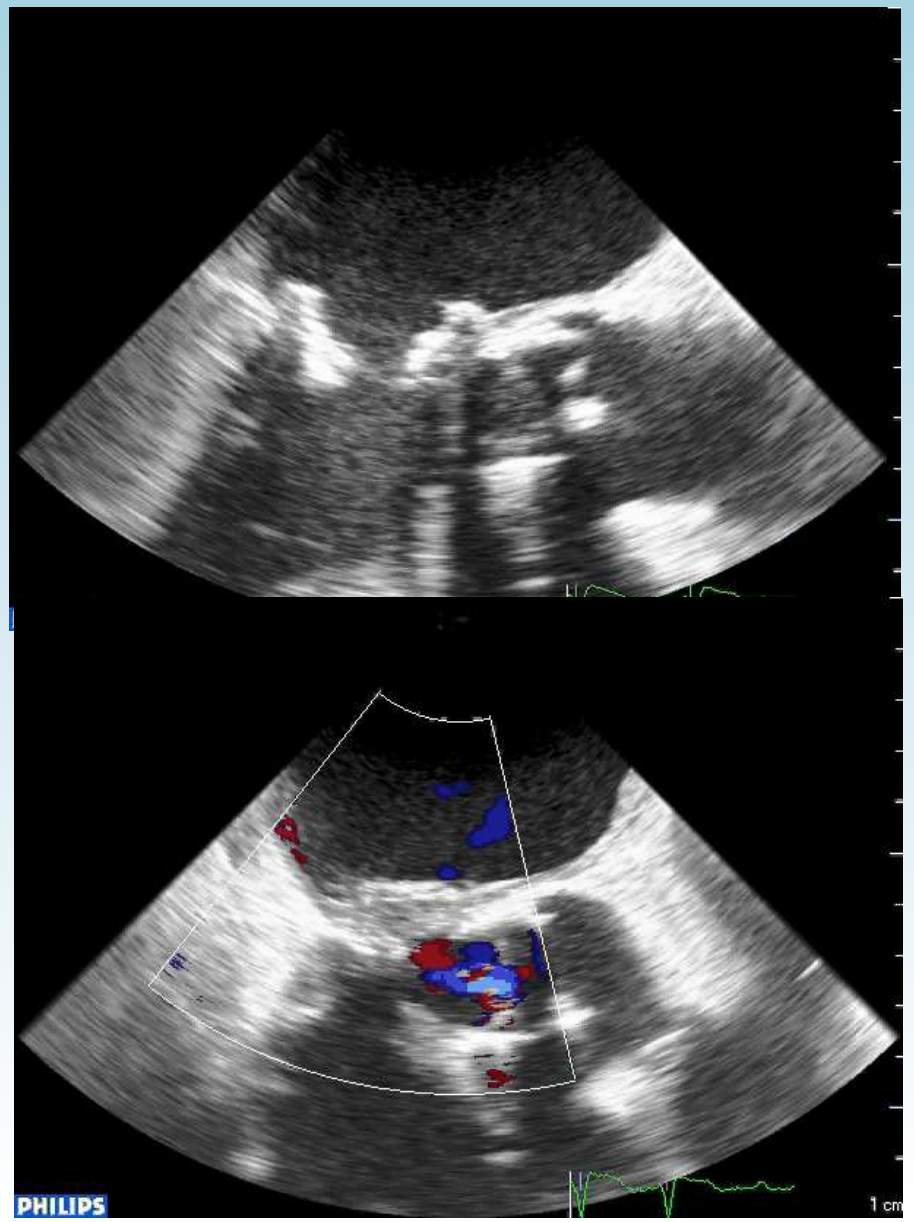
# EIP: Ruolo dell'ecocardiografia



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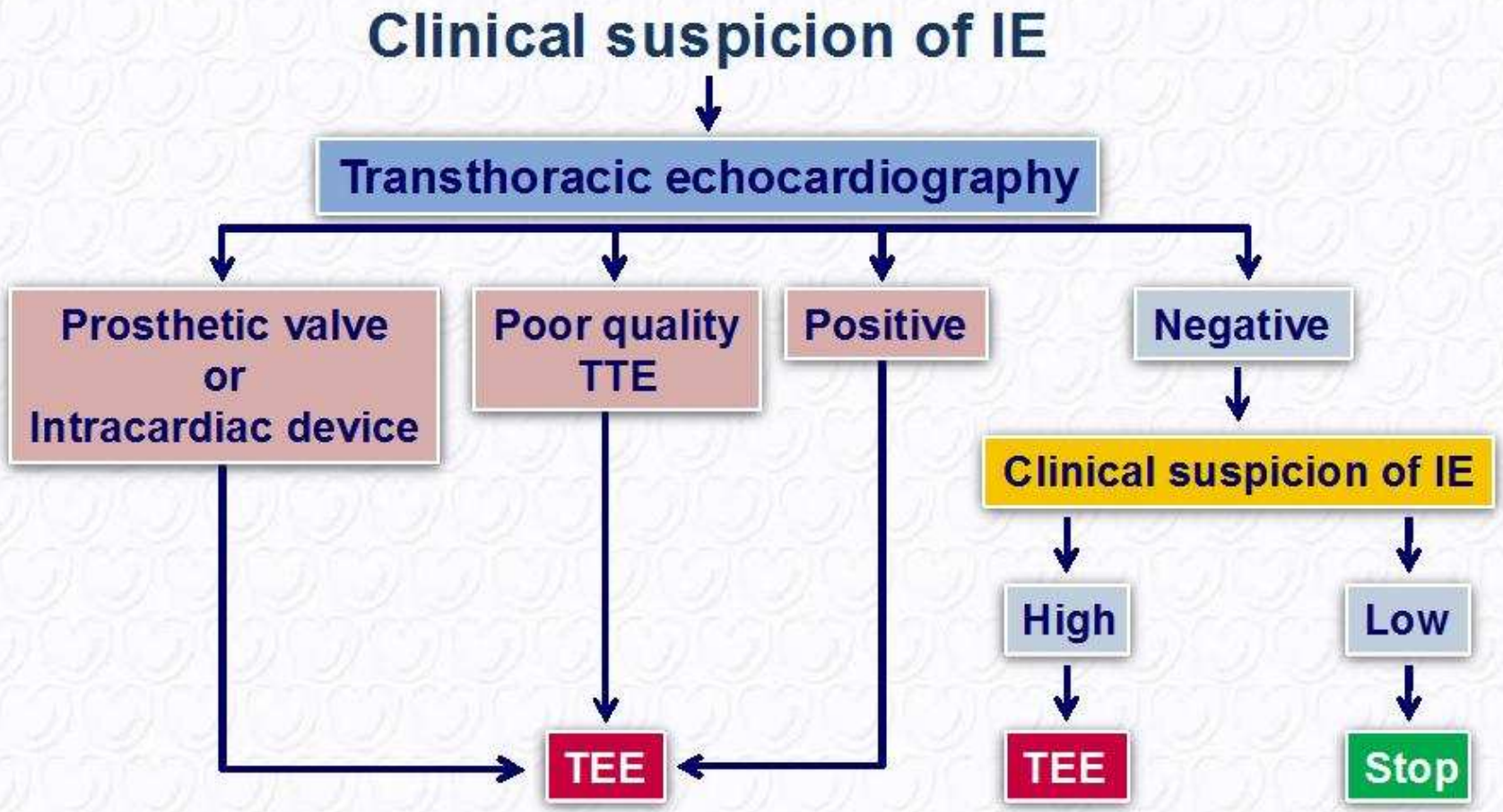
# Indications for echocardiography




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

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# 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 |

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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 |



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# Role of echocardiography in IE (2)

| Recommendations | Class | Level |
|---|---|---|
| **B. Follow-up under medical therapy:** | | |
| 1. **Repeat TTE and TEE** is recommended as soon as a new complication of IE is suspected. | I | B |
| 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. | IIa | B |
| **C. Intraoperative echocardiography**<br>Recommended in all cases of IE requiring surgery. | I | C |
| **D. Following completion of treatment**<br>TTE is recommended at completion of antibiotic treatment for evaluation of cardiac and valve morphology and function. | I | C |



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# Microbiological diagnosis

## Diagnosis of Prosthetic Valve Endocarditis

## Bacteriology

***Early (within 2 months)***

- Staph aureus
- Staph epidermidis
- Gram negative bacilli

***Late***

- Strep viridans
- Staph aureus

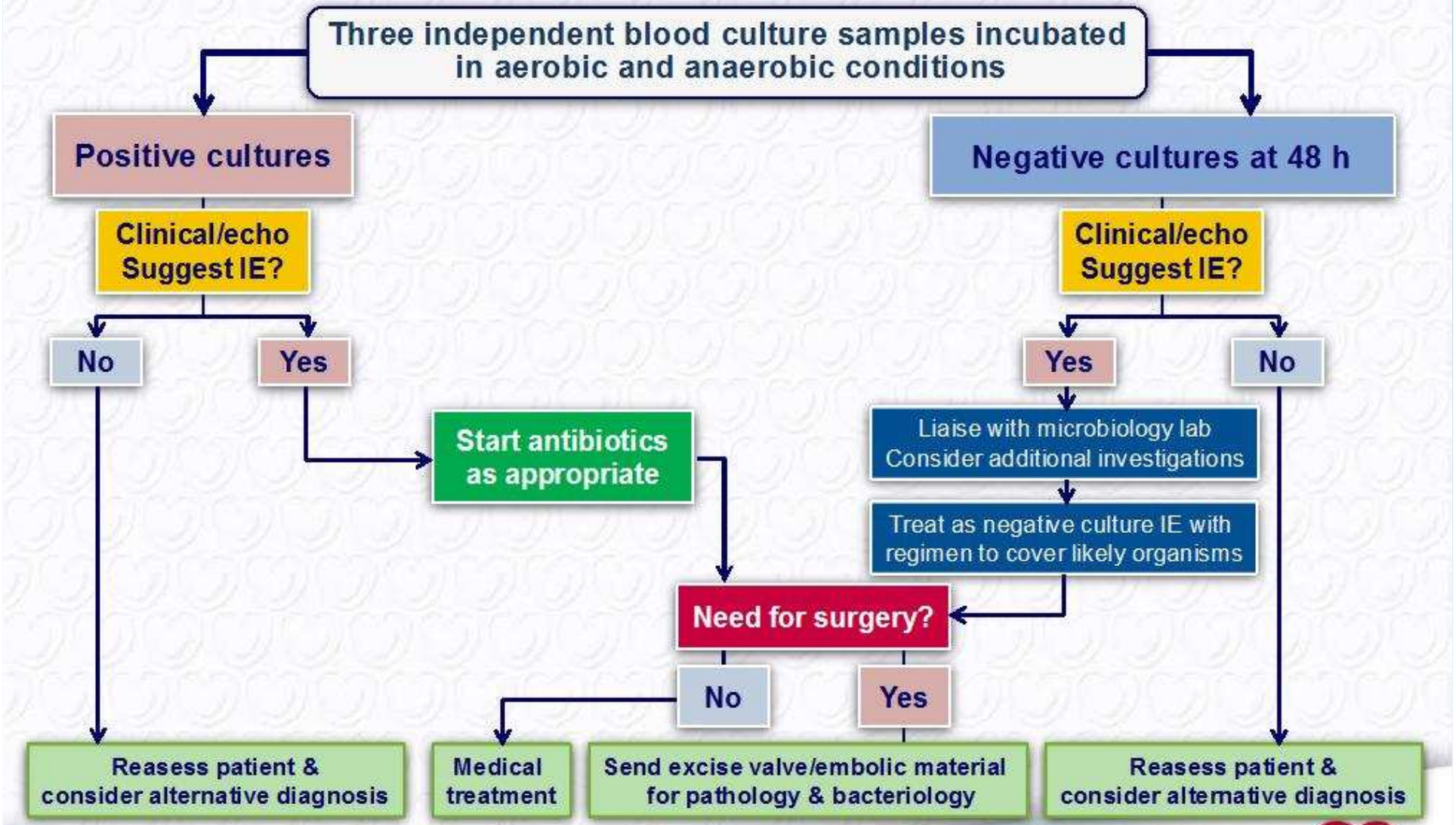
Culture negative in 5%

***Other***

- HACEK group
- Fungi
- Coxiella (Q-fever)
- Brucella
- Bartonella
- Chamydia

Almost any organism can cause endocarditis

# Microbiological diagnosis

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# 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, 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.

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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<br>or<br>1 major and 3 minor criteria<br>or<br>5 minor criteria | 1 Major and 1 minor criteria<br>or<br>3 minor criteria |

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

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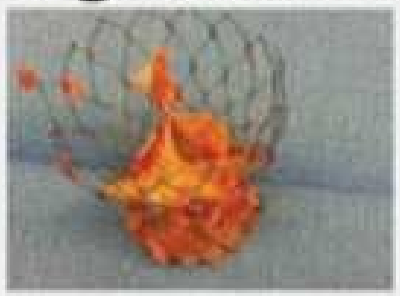
# Diagnosis of IE

# A Diagnostic Challenge

- **The sensitivity of the modified-Duke criteria is lower** than in native valve IE especially when applied early in the course of the disease **≈ 70%**
- Blood cultures are more frequently **negative**
- Echocardiography (TTE + TEE) are **negative or inconclusive in ≈ 30% of cases**
- Emergence of "**TAVI endocarditis**"



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# New guidelines ESC 2009

1. Prevention
2. Diagnosis
3. **Prognostic assessment**
4. Treatment
5. Specific situations

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# 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 regurgitation
- Low LVEF
- Pulmonary hypertension
- Large vegetations
- Severe prosthetic dysfunction
- Premature valve closure/signs of ↑ diastolic Pr.

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# Antibiotics
## *Staphylococcus spp.* Prosthetic valves

| Antibiotic | Dosage & route | Duration | Class | Level |
|---|---|---|---|---|
| **Prosthetic valves** | | | | |
| ***Methicillin-susceptible Staphylococci*** | | | | |
| **(Flu)cloxacillin** | 12 g/day i.v. in 4-6 doses | ≥ 6 weeks | I | B |
| **or** | | | | |
| **Oxacillin** | | | | |
| ***with*** | | | | |
| **Rifampin** | 1200 mg/day i.v. or orally in 2 doses | ≥ 6 weeks | | |
| **and** | | | | |
| **Gentalmicin** | 3 mg/kg/day i.v or i.m. in 2 or 3 doses | 2 weeks | | |
| | *Paediatric doses*<br>– Oxacillin and (Flu)cloxacillin as above<br>– Rifampicin 20 mg/kg/day i.v. or orally in 3 equally divided doses | | | |
| **Penicillin-allergic patients and Methicillin-resistant Staphylococci** | | | | |
| **Vancomycin** | 30 mg/kg/day i.v. in 2 doses | ≥ 6 weeks | I | B |
| ***with*** | | | | |
| **Rifampin and** | 1200 mg/day i.v. or orally in 2 doses | ≥ 6 weeks | | |
| **Gentamicin** | 3 mg/kg/day i.v or i.m. in 2 or 3 doses | 2 weeks | | |
| | *Pediatric doses as above* | | | |



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# Antibiotics
## *Enterococcus spp.*

| Antibiotic | Dosage & route | Duration | Class | Level |
|---|---|---|---|---|
| **Beta-lactam and Gentamicin suceptible strain** | | | | |
| **Amoxicillin**<br>*with*<br>**Gentamicin** | 200 mg/kg/day i.v. in 4-6 doses<br><br>3 mg/kg/day i.v. in 2 or 3 doses | 4-6 weeks | I | B |
| OR | | | | |
| **Ampicillin**<br>*with*<br>**Gentamicin** | 200 mg/kg/day i.v. in 4-6 doses<br><br>3 mg/kg/day i.v. in 2 or 3 doses | 4-6 weeks | I | B |
| OR | | | | |
| **Vancomycin** [a]<br>*with*<br>**Gentamicin** | 30 mg/kg/day i.v. in 2 doses<br><br>3 mg/kg/day i.v. or i.m. in 2 or 3 doses | 6 weeks | I | C |

[a] = for patients unable to tolerate beta-lactams



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# Antibiotics
## *Empirical treatment*

| Antibiotic | Dosage & route | Duration | Comments | Class | Level |
|---|---|---|---|---|---|
| **Native valves** | | | | | |
| **Ampicillin-Sulbactam** | 12 g/day i.v. in 4 doses | 4-6 weeks | Patients with blood-culture negative should be treated in consultation with an infectious disease specialist | IIb | C |
| *or* | | | | | |
| **Amoxicillin-Clavulanate** | 12 g/day i.v. in 4 doses | 4-6 weeks | | IIb | C |
| *with* | | | | | |
| **Gentamicin** | 3 mg/kg/day i.v or i.m. in 2 or 3 doses | 4-6 weeks | | | |
| **Vancomycin** | 30 mg/kg/day i.v. in 2 doses | 4-6 weeks | For patients unable to tolerate β-lactams | IIb | C |
| *with* | | | | | |
| **Gentamicin** | 3 mg/kg/day i.v. or i.m. in 2 or 3 doses | 4-6 weeks | | | |
| *with* | | | | | |
| **Ciprofloxacin** | 1000 mg/day orally in 2 doses or 800 mg/day i.v. in 2 doses | 4-6 weeks | Ciprofloxacim is not uniformly active on Bartonella spp.. Addition of Doxycycline is an option if Bartonella spp. is likely | | |
| **Prosthetic valves (early < 12 months post surgery)** | | | | | |
| **Vancomycin** | 30 mg/kg/day i.v. in 2 doses | 6 weeks | If no clinical response, surgery and perhaps extension of the antibiotic spectrum to gram-negative pathogens must be considered | IIb | C |
| *with* | | | | | |
| **Gentamicin** | 3 mg/kg/day i.v or i.m. in 2 or 3 doses | 2 weeks | | | |
| *with* | | | | | |
| **Rifampin** | 1200 mg/day i.v. or orally in 2 doses | | | | |
| **Prosthetic valves (late > 12 months post surgery)** | | | | | |
| **Same as Native valves** | | | | | |



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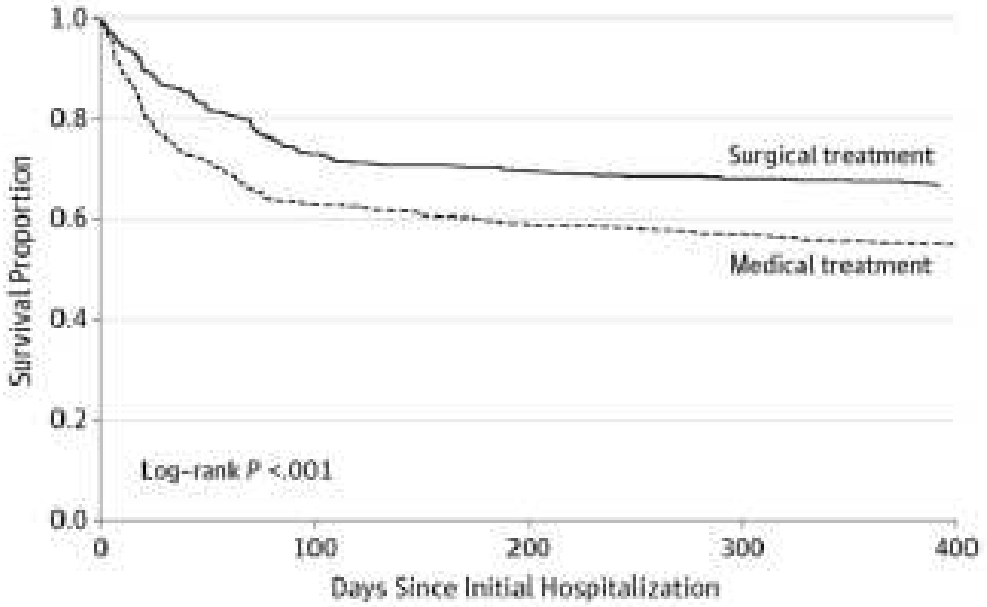
# Is surgery always needed in PVE?

- 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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# PVE: is surgery the best option?

| Author | Patients (n) | % surgery (%) | mortality (med) (%) | mortality (surg) (%) | surgery better |
|---|---|---|---|---|---|
| Wang (2005) | 367 | 42 | 23 | 25 | NO |
| Akowuah (2003) | 66 | 57 | 46 | 24 | YES |
| Habib (2005) | 104 | 49 | 25 | 17 | NO |
| Alonso-Valle (2010) | 133 | 80 | 42 | 26 | YES |
| Lopez (2013) | 257 | 61 | 33 | 33 | NO |
| Wolff (1995) | 122 | 53 | 48 | 25 | YES |
| Lalani (2013) | 1025 | 48 | 27 | 22 | NO |

# 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 |

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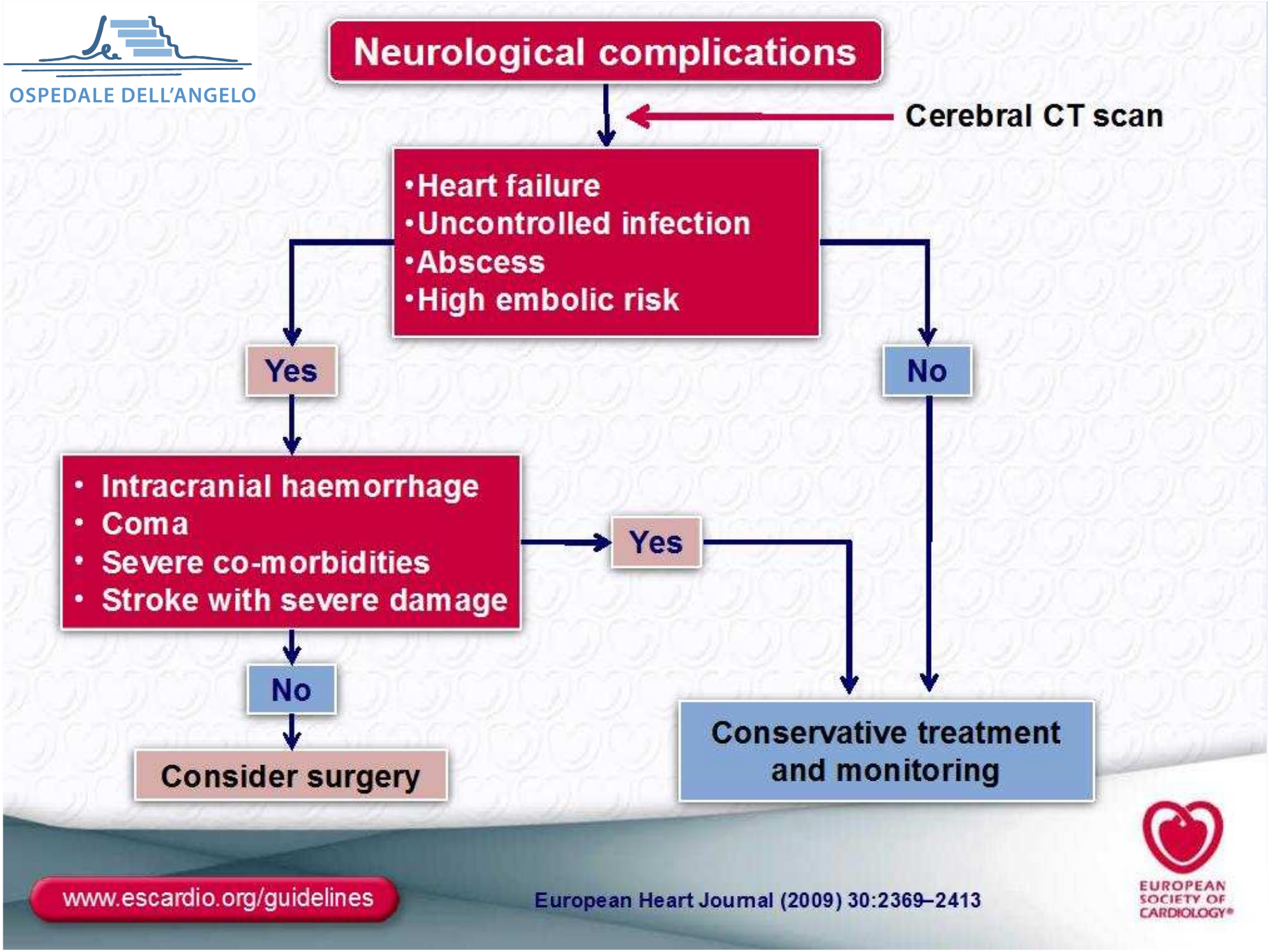

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# EI su pace maker e ICD

- IE su CD: 1,9 x 1000 dispositivi impiantabile (5%)
- Local device Infection (LDI= tasca)
- Cardiac device related EI (CDRIE): coinvolgono device e cateteri
- Prognosi sfavorevole

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# Cardiac device related IE

| Recommendations | Class | Level |
|---|---|---|
| **A. PRINCIPLES of TREATMENT** | | |
| Prolonged antibiotic therapy and device removal are recommended in definite CDRIE. | I | B |
| Device removal should be considered when CDRIE is suspected on the basis of occult infection without other apparent source of infection. | IIa | C |
| In patients with native or prosthetic valve IE and an intracardiac device with no evidence of associated device infection, device extraction must be considered. | IIb | C |
| **B. MODE of DEVICE REMOVAL** | | |
| Percutaneous extraction is recommended in most patients with CDRIE even those with large (>10 mm) vegetations. | I | B |
| Surgical extraction shoud be considered if percutaneous extraction is incomplete or impossible or when severe destructive tricuspid IE is associated. | IIa | C |
| Surgical extraction may be considered if in patients with very large (>25 mm) vegetations. | IIb | C |
| **C. REIMPLANTATION** | | |
| After device extraction, reassessment of the need for reimplantation is recommended. | I | B |
| When indicated, reimplantation should be postponed if possible to allow a few days or weeks of antibiotic therapy. | IIa | B |
| Temporary pacing is not recommended. | III | C |
| **D. PROPHYLAXIS** | | |
| Routine antibiotic prophylaxis is recommended before device implantation. | I | B |

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# Antithrombotic therapy

| Recommendations: antithrombotic therapy | Class | Level |
|---|---|---|
| Interruption of antiplatelet treatment is only recommended in case of major bleeding. | I | B |
| In haemorrhagic stroke without cerebral haemorrhage, replacement of oral anticoagulation by Unfractionated heparin (UFH) for 2 weeks with a close monitoring of APT or ACT. | I | C |
| In intracranial haemorrhage (ICH), interruption of all anticoagulation is recommended. | I | C |
| In patients with ICH and a mechanical valve, UFH should be re-initiated asap with a close monitoring of APT or ACT following multi-disciplinary discussion. | IIb | C |
| In the absence of stroke, replacement of oral anticoagulation by UFH during 2 weeks may be considered in case of *S. aureus* IE with a close monitoring of APT or ACT. | IIb | C |

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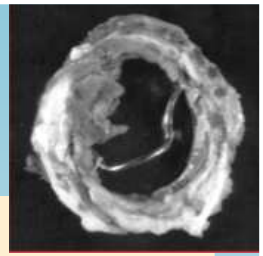
# " Take home message..."



- Stratificare il paziente in base al sospetto clinico,strumentale, laboratoristico
- Gestione in team: cardiologo/infettivologo/cardiochirurgo/neurologo
- Partire sempre d
- Approccio diagn n esame ma dei quesiti clinici
- Utilizzare al meg r stratificare al meglio ogni sing
- Approccio multi paziente sulle strategie più ade erapeutica

Thank you

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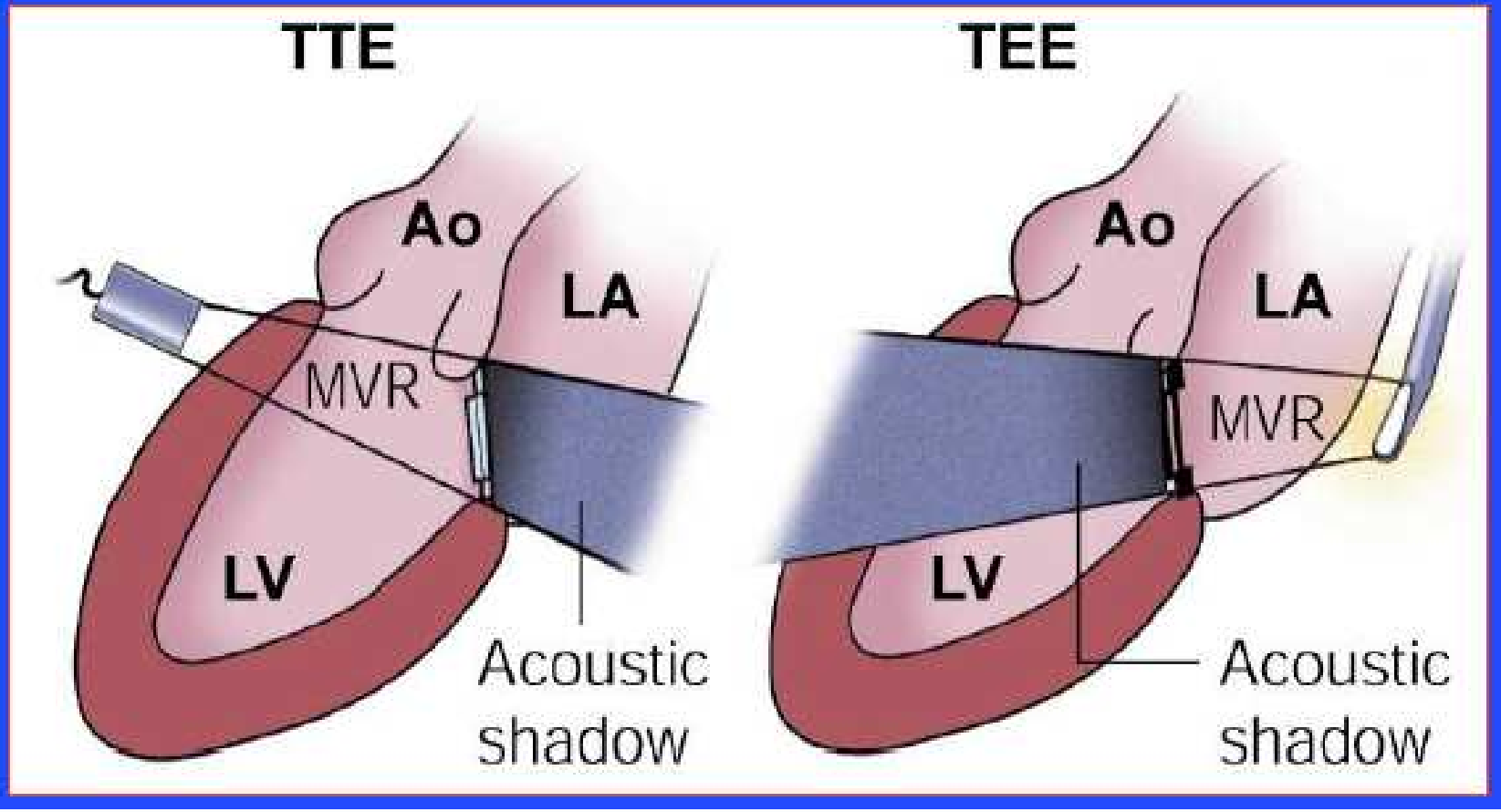
# Diagnosis of Prosthetic Valve Endocarditis

## Echocardiography



# Indications for surgery - Native IE

| Recommendations: Indications for surgery | Timing | Class | Level |
|---|---|---|---|
| **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 cardiogenic shock. | Emergency | I | B |
| Aortic or mitral IE with severe acute regurgitation and persisting HF or echo-cardiographic signs of poor hemodynamic tolerance (early mitral closure or pulmonary hypertension). | Urgent | I | B |
| Aortic or mitral IE with severe acute regurgitation and no HF. | Elective | IIa | B |
| **B. UNCONTROLLED INFECTION** | | | |
| Locally uncontrolled infection. | Urgent | I | B |
| Persisting fever and positive blood culture > 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 treatment. | Urgent | I | B |
| Aortic or mitral IE with large vegetations (10 mm) and other predictors of complicated course (HF, persistent infection, abscess). | Urgent | I | C |
| Isolated very large vegetations (>15 mm). | Urgent | IIb | C |

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# Right sided endocarditis

## Surgical treatment should be considered in the following scenarios

| Recommendations | Class | Level |
|---|---|---|
| Microorganisms difficult to eradicate (e.g. persistent fungi) or bacteriemia for > 7 days (e.g. *S. aureus*, *P. aeruginosa*) despite adequate antimicrobial therapy. | IIa | C |
| Persistent tricuspid valve vegetations > 20 mm after recurrent pulmonary emboli with or without concomitant right heart failure. | | |
| Right heart failure secondary to severe tricuspid regurgitation with poor response to diuretic therapy. | | |

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# Infective Endocarditis
# New guidelines ESC 2009

1. Prevention
2. Diagnosis
3. Prognostic assessment
4. Treatment
5. **Specific situations**

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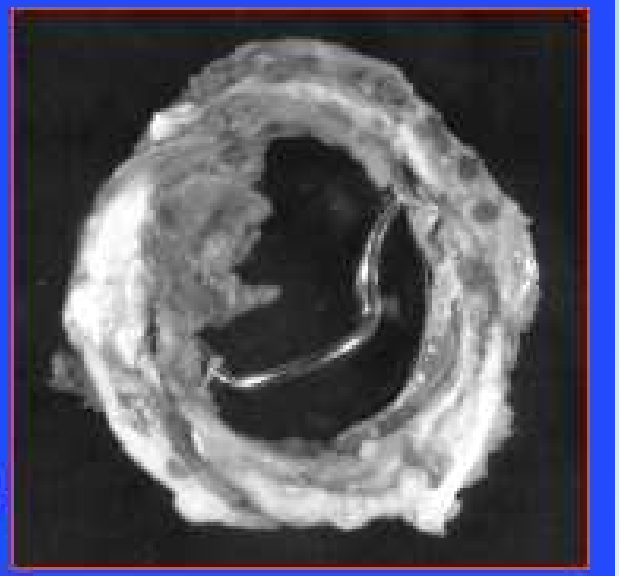
# Conclusions

- High index of suspicion
- Patient education
- Start with Duke criteria
- Hold blood cultures for 4-6 wks
- TEE early in disease course
- Re-evaluate if symptoms persist
- New molecular techniques have promise



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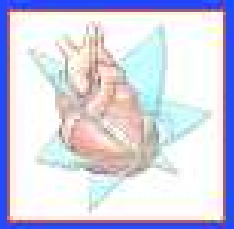
# Diagnosis of Prosthetic Valve Endocarditis
# Duke Criteria



***Definite Endocarditis***

2 major

1 major + 3 minor

5 minor

***Probable Endocarditis***

1 major + 1 minor

3 minor

**Pt with prosthetic valve and history of fever and embolic events**

**Already has 3 minor criteria for endocarditis ?**

Durack et al, Am J Med 1994; Li et al, Clin Infect Dis 2000

UW Medicine

# Antibiotics
## Oral & group *D Streptococci*

| Antibiotic | Dosage & route | Duration | Class | level |
|---|---|---|---|---|
| **Penicilline susceptible (MIC < 0.125 mg/L) oral & group *D streptococci*** | | | | |
| **Standard treatment** | | | | |
| Penicilline G<br>or | 12-18 millions U/day in IV in 6 doses | 4 weeks | I | B |
| Amoxicilline<br>or | 100-200 mg/kg/day in 4-6 doses | 4 weeks | I | B |
| Ceftriaxone | 2 g/day i.v or i.m. in 1 dose<br>*Paediatric doses*<br>– Penicillin G 200,000 U/kg/day i.v. in 4-6 divided doses<br>– Amoxicilline 300 mg/kg/day i.v. in 4-6 equally divided doses<br>– Ceftriaxone 100 mg/lg/day i.v. or i.m. in one dose | 4 weeks | I | B |



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# Neurological complications

| Recommendations | Class | Level |
|---|---|---|
| After a silent cerebral embolism or TIA, surgery is recommended without delay if an indication remains. | I | B |
| Following intracranial haemorrhage, surgery must be postponed for a least one month. | I | C |
| Neurosurgery or endovascular therapy are indicated for very large, enlarging or ruptured intracranial aneurysm. | I | C |
| After a stroke, surgery indicated for HF, uncontrolled infection, abscess or persistent high embolic risk should not be delayed.<br>Surgery should be considered as long as coma is absent and cerebral haemorrhage has been excluded by cranial CT. | IIa | B |
| Intracranial aneurysm should be looked for in any patient with IE and neurological symptoms. CT or MR angiography should be considered for diagnosis. | IIa | B |
| Conventional angiography should be considered when non-invasive techniques are negative and the suspicion of intracranial aneurysm remains. | IIa | B |

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# Antibiotics
## Oral & group *D Streptococci*

| Antibiotic | Dosage & route | Duration | Class | Level |
|---|---|---|---|---|
| **Penicilline susceptible (MIC < 0.125 mg/L) oral & group *D streptococci*** | | | | |
| **Two-week treatment** | | | | |
| **Penicilline G**<br>**or** | 12-18 millions U/day in IV in 6 doses | 2 weeks | I | B |
| **Amoxicilline**<br>**or** | 100-200 mg/kg/day in 4-6 doses | 2 weeks | I | B |
| **Ceftriaxone**<br>**with** | 2 g/day i.v or i.m. in 1 dose | 2 weeks | | |
| **Gentamycin**<br>**or**<br>**Netilmicin** | 3 mg/kg/day i.v. or i.m. in 1 dose<br>4-5 mg/day<br>*Pediatric doses:*<br>– Penicillin, Amoxicillin and Ceftriaxone as above<br>– Gentamycin 3 mg/kg/day i.v. or i.m. in one dose or 3 equally divided doses | 2 weeks<br>2 weeks | I<br>I | B<br>B |
| **In-beta-lactam allergic patients** | | | | |
| **Vancomycin** | 30 mg/kg/day i.v. in 2 doses<br>*Paediatric doses:*<br>– 40 mg/kg/day i.v. in 2-3 equally divided doses | 4 weeks | I | C |

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# Antibiotics
## Oral & group *D Streptococci*

| Antibiotic | Dosage & route | Duration | Class | Level |
|---|---|---|---|---|
| **Strains relatively resistant to Penicillin (MIC 0.125-2 mg/L)** | | | | |
| **Standard treatment** | | | | |
| **Penicilline G**<br>**or** | 24 million U/day in IV in 6 doses | 4 weeks | I | B |
| **Amoxicilline**<br>**or**<br>***with***<br>**Gentamycin** | 200 mg/kg/day in 4-6 doses<br><br>3 mg/kg/day i.v. or i.m. in 1 dose | 4 weeks<br><br>2 weeks | I | B |
| **In-beta-lactam allergic patients** | | | | |
| **Vancomycin**<br>***with***<br>**Gentamycin** | 30 mg/kg/day i.v. in 2 doses<br>*(same for pediatric doses)*<br>3 mg/kg/day i.v. or i.m. in 1 dose | 4 weeks<br><br>2 weeks | I | C |



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# Antibiotics
## *Staphylococcus spp.* Native valves

| Antibiotic | Dosage & route | Duration | Class | Level |
|---|---|---|---|---|
| **Native valves** | | | | |
| ***Methicillin susceptible Staphylococci*** | | | | |
| **(Flu) cloxacillin**<br>**or** | 12 g/day i.v. in 4-6 doses | 4-6 weeks | I | B |
| **Oxacillin**<br>***with***<br>**Gentamicin** | <br><br>3 mg/kg/day i.v. or i.m. in 2 or 3 doses<br>*Pediatric doses*<br>– Oxacillin or (Flu)cloxacillin 200 mg/kg/day i.v. in 4-6 equally divided doses<br>– Gentamicin 3mg/kg/day i.v. or i.m. in 3 equally divided doses | 4-6 weeks<br><br>3-5 days | I | B |
| **Penicillin-allergic patients or Methicillin-resistant *Staphylococci*** | | | | |
| **Vancomycin**<br>***with***<br>**Gentamicin** | 30 mg/kg/day i.v. in 2 doses<br><br>3 mg/kg/day i.v. or i.m. in 2 or 3 doses | 4-6 weeks<br><br>3-5 days | I | B |



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