A patient with cardiac device-related Infective endocarditis

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1. increasing incidence
2. difficult diagnosis
3. high-risk population
4. relatively bad prognosis
5. management controversial
CDRIE: incidence

- 0.13 to 10% of implanted devices
- 1.9 / 1000 devices / year (Uslan DZ, Arch Int Med 2007)
- higher probability of infection after ICD as compared with PPM

PPM: permanent pacemaker
ICD: implantable cardioverter-defibrillator
Case report

History of the disease

- 50 year-old man,
- severe dilated cardiomyopathy
- January 2010: ICD implanted
- March 2010: Cardiogenic shock
- ICU: dobutamine infusion

Clinical examination

- severe CHF
- fever = 38°5
- arterial pressure: 75 / 55 mmHg
- normal neurological examination
Case report

Laboratory data

- haemoglobin: 8.5 g / dl
- white blood cell count: 13,000 / mm$^3$
- sedimentation rate: 60 mm
- CRP = 136 mg/l
- creatinin = 160 mg

Blood cultures:

negative
TTE
TEE
TEE
CDRIE

1. Diagnosis

2. Treatment

3. Follow-up
1. Diagnosis

2. Treatment

3. Follow-up
Q1: is the diagnosis of IE?

1. definite?
2. possible?
3. rejected?
4. other investigations are needed?
# Modified Duke criteria

## MAJOR CRITERIA

**Blood cultures positive for IE:**

- Typical microorganisms consistent with IE from 2 separate blood cultures:
  - *Viridans streptococci*, *Streptococcus bovis*, HACEK group, *Staphylococcus aureus*; or
  - Community-acquired enterococci, in the absence of a primary focus;  
  - or

- Microorganisms consistent with IE from persistently 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 and last sample drawn at least 1 h apart)
  - or

- Single positive blood culture for Coxiella burnetii 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 aneurysm, intracranial haemorrhages, conjunctival haemorrhages, Janeway lesions
- Immunologic phenomena: glomerulonephritis, Osler’s nodes, Roth spots, 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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Evidence of endocardial involvement
- Echocardiogram positive for IE
  - Vegetation - Abscess - New partial dehiscence of prosthetic valve
- Microvascular recirculation

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- Microbiological evidence: positive blood culture but does not meet a major criterion or serological evidence of active infection with organism consistent with IE
**DEFINITE IE**

- 2 major criteria
- 1 major, 3 minor criteria
- 5 minor criteria

**POSSIBLE IE**

- 1 major, 1 minor criteria
- 3 minor criteria
Echocardiography in CDRIE

1. major criterion: *vegetation*  
   - on the lead  
   - on the tricuspid valve  
   - on the endocardial wall

2. minor criterion: *sleeve-like appearance*

3. others  
   - vegetation size  
   - tricuspid regurgitation  
   - right ventricular dilatation, PAP  
   - follow-up after extraction

4. need for a complete lead study from the SVC to the apex of the right ventricle
Pacemaker lead IE

Major role of echo, but ......
Pacemaker lead IE

... both TTE and TEE may be normal
CRDIE: TEE
PMLIE: PET / CT
PET CT in endocarditis

1. Early diagnosis of perivalvular lesions

2. Detection of secondary lesions

Q1: is the diagnosis of IE?

1. definite?
2. possible?
3. rejected?
4. other investigations are needed?
Q1: is the diagnosis of IE?

1. definite?
2. possible
3. rejected?
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Diagnosis and decision

1. Possible PMLIE
2. Empiric ATB therapy
CDRIE

1. Diagnosis

2. Treatment

3. Follow-up
Q2: what is the best treatment?

1. medical therapy alone?
2. percutaneous extraction?
3. surgical extraction?
4. other?
# CDRIE: ESC guidelines 2009

<table>
<thead>
<tr>
<th>Recommendations: IE on pacemakers and implantable defibrillators</th>
<th>Class(^a)</th>
<th>Level(^b)</th>
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<tbody>
<tr>
<td><strong>A - PRINCIPLES OF TREATMENT:</strong></td>
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<tr>
<td>Prolonged antibiotic therapy and device removal are recommended in definite CDRIE</td>
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<td>IIb</td>
<td>C</td>
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<td><strong>B - MODE OF DEVICE REMOVAL:</strong></td>
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<td>After device extraction, reassessment of the need for reimplantation is recommended</td>
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<td>When indicated, reimplantation should be postponed if possible to allow a few days or weeks of antibiotic therapy</td>
<td>IIa</td>
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<td>Temporary pacing is not recommended</td>
<td>III</td>
<td>C</td>
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<td><strong>D - PROPHYLAXIS</strong></td>
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<td>Routine antibiotic prophylaxis is recommended before device implantation</td>
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# CDRIE: ESC guidelines 2009

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CDRIE: treatment

- **mandatory**
  1. Prolonged antibiotic therapy
  2. Device extraction

- **percutaneous extraction:** +++

- **surgical extraction**
  1. failure of percutaneous extraction
  2. severe tricuspid damage
  3. associated left heart IE
  4. very large vegetations (> 25 mm ?)
PMLIE and PFO

before extraction

after extraction
Paradoxical embolism in IE

Le Dolley Y – Circulation 2009; 119: e223-4
Q2: what is the best treatment?

1. medical therapy alone?
2. percutaneous extraction?
3. surgical extraction?
4. other?
Q2: what is the best treatment?

1. medical therapy alone?
2. *percutaneous extraction*
3. surgical extraction?
4. other?
Decision and follow-up

1. ATB therapy: Vancomycin + Gentamycin
2. Percutaneous extraction on day 7, without reimplantation
3. Good immediate outcome
4. Positive lead culture: Staphylococcus Aureus
5. Persisting CHF and LV dysfunction
6. No fever but persisting high inflammatory markers
CDRIE

1. Diagnosis
2. Treatment
3. Follow-up
TTE after extraction
TEE after extraction
Q3: what is it?

1. Remaining pacemaker lead?
2. Relapsing infective endocarditis?
3. Ghost?
4. Nothing?
Q3: what is it?

1. Remaining pacemaker lead?
2. Relapsing infective endocarditis?
3. Ghost
4. Nothing?
Ghosts of infected leads are associated with CDRIE diagnosis ($p<0.001$, OR=7.63 (2.12-27.45))

16% (14pts/88) of all percutaneous removal for CDRIE

Outcomes (one year follow up):
- 3 deaths (2 sudden deaths, 1 heart failure)
- 2 surgery
- 1 symptomatic PE
Final outcome

1. Persisting heart failure
2. Urgent heart transplantation 2 months later
3. Good outcome
Take-home message

1. Clinical presentation is frequently misleading, particularly in elderly patients
2. Both TTE and TEE are mandatory in suspected CDRIE
3. Risk of pulmonary embolism is high and is related to the size of the vegetation
4. Prolonged antibiotic therapy and device removal are recommended in definite CDRIE
5. Percutaneous extraction is feasible in the majority of patients
6. Optimal timing and mode of reimplantation are still debated
Join us in Istanbul!
11-14 December 2013

Main Themes
- Heart Failure
- Imaging in Interventional Cardiology

Important deadlines
Abstract Submission  31 May 2013
Early Registration  30 September 2013

www.escardio.org/EACVI
French survey 1999: (1-year epidemiologic survey): 559 IE
- 45 had pacemaker
- 33 pacemaker IE (6%)
- 12 native valve IE

Duval X – CID 2004 ; 39 : 68-74

CDRIE: incidence
CDRIE: pathophysiology

Main mechanisms:
- contamination by local bacteriological flora
- infection spreads along the electrode to the endocardium
- formation of vegetations
- septic pulmonary embolisms

Factors associated with CDRIE:
- fever before implantation
- use of temporary pacing
- early reimplantation
- ATB prophylaxis is protective
CDRIE: definitions

- **Local device infection (LDI)**
  - infection limited to the pocket of the cardiac device
  - local signs of inflammation

- **CDRIE: infection extending to:**
  - the electrode leads
  - the cardiac valve leaflets
  - the endocardial surface
Modified Duke criteria

Li JS, CID 2000; 30: 633-8

Definite infective endocarditis
Pathologic criteria
(1) Microorganisms demonstrated by culture or histologic examination of a vegetation, a vegetation that has embolized, or an intracardiac abscess specimen; or
(2) Pathologic lesions: vegetation or intracardiac abscess confirmed by histologic examination showing active endocarditis

Clinical criteria\(^a\)
(1) 2 major criteria; or
(2) 1 major criterion and 3 minor criteria; or
(3) 5 minor criteria

Possible infective endocarditis
(1) 1 major criterion and 1 minor criterion; or
(2) 3 minor criteria

Rejected
(1) Firm alternate diagnosis explaining evidence of infective endocarditis; or
(2) Resolution of infective endocarditis syndrome with antibiotic therapy for \(\leq 4\) days; or
(3) No pathologic evidence of infective endocarditis at surgery or autopsy, with antibiotic therapy for \(\leq 4\) days; or
(4) Does not meet criteria for possible infective endocarditis, as above
Modified Duke criteria

1 – major criteria:
• positive blood cultures
• vegetation on pacemaker lead

2 – minor criteria:
• fever
• vascular phenomena
• immunologic phenomena:
  • sleevelike appearance (echo)
  • minor bacteriological criterion

3 – new major criteria
• local symptoms
• pulmonary symptoms
Ghost of Infected Leads

A New Criterion for the Diagnosis of Cardiac Device-Related Infective Endocarditis?

Yvan Le Dolley, MD, Franck Thuny, MD, Julien Mancini, MD, PhD, Jean-Paul Casalta, MD, Alberto Riberi, MD, Frédérique Gouriet, MD, Emilie Bastard, MD, Sebastien Ansaldi, MD, Frederic Franceschi, MD, Sebastien Renard, MD, Sebastien Prevot, MD, Roch Giorgi, MD, PhD, Laurence Tafanelli, MD, Jean-François Avierinos, MD, Didier Raoult, MD, PhD, Jean-Claude Deharo, MD, Gilbert Habib, MD

Marseille, France

OBJECTIVES We sought to determine the incidence, diagnostic value, and outcome of intracardiac masses observed by echocardiography after device removal. We hypothesized that these “ghosts” of leads could be associated with the diagnosis of cardiac device-related infective endocarditis (CDRIE).
ORIGINAL RESEARCH

Diagnosis of Cardiac Device–Related Infective Endocarditis After Device Removal

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BACKGROUND The echocardiographic appearance of residual floating masses in the right atrium...