

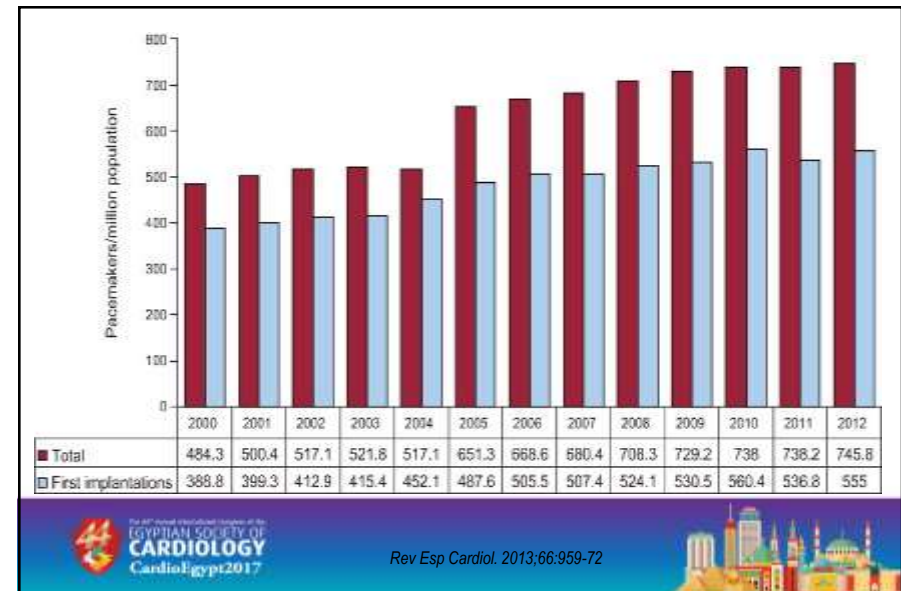


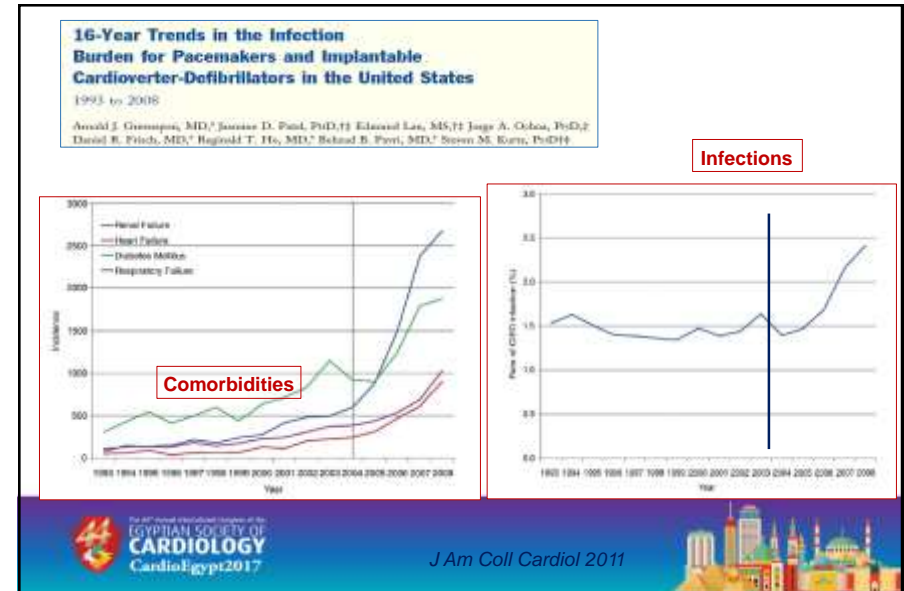
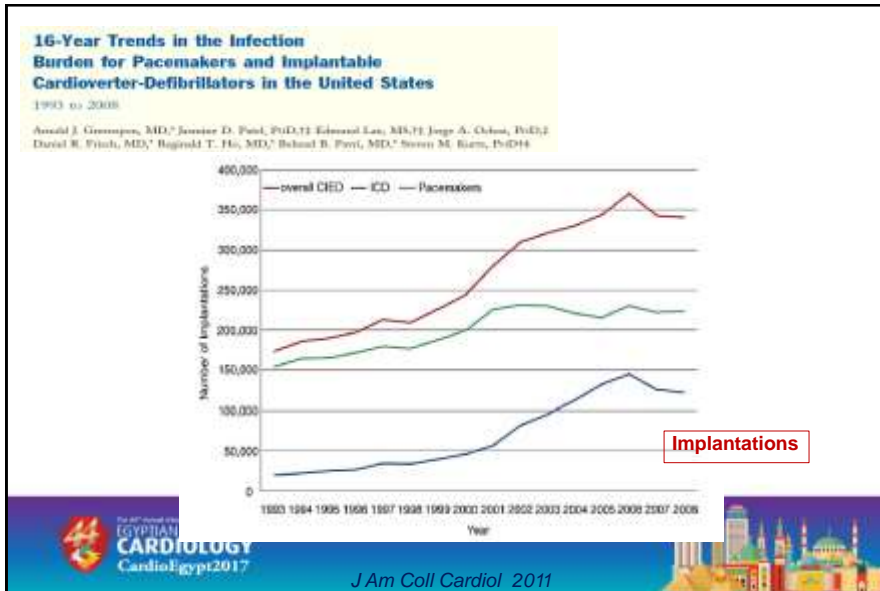
The 44th Annual International Congress of the
**EGYPTIAN SOCIETY OF
CARDIOLOGY**
CardioEgyt2017

20-23
February 2017

Clinical approach for device related Infective Endocarditis

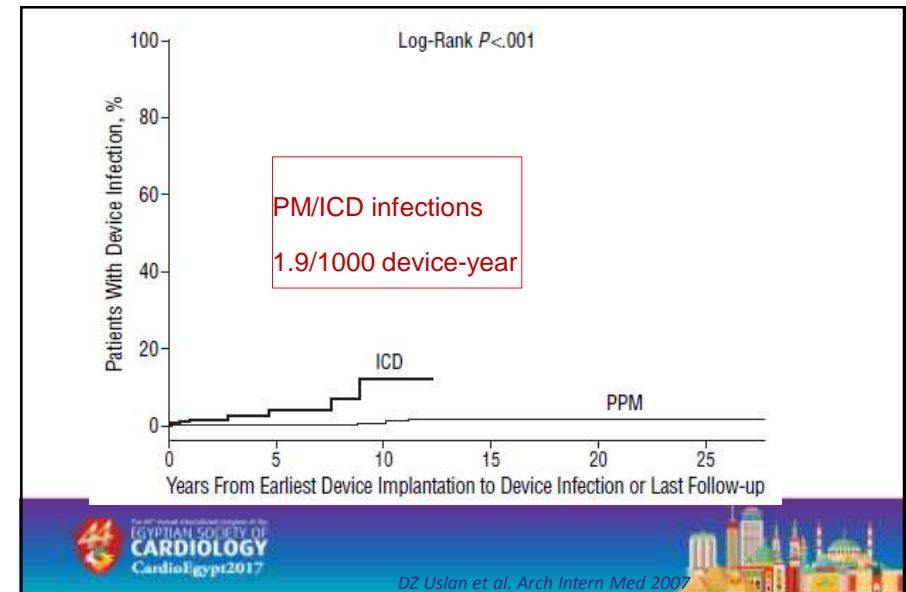
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Lecturer of Cardiology, Mansoura University





Most frequent/important complications of PM and CRT

Related to venous access:	<ul style="list-style-type: none"> • Pneumothorax • Haemothorax
Lead-related:	<ul style="list-style-type: none"> • Brady/tachyarrhythmias • Cardiac perforation • Cardiac tamponade • Coronary sinus dissection/perforation • Dislodgement • Diaphragmatic stimulation • Lead malposition • Venous thrombosis
Pocket-related:	<ul style="list-style-type: none"> • Haematoma • Wound pain
Infections:	<ul style="list-style-type: none"> • Pocket infection without bloodstream infection • Pocket infection with bloodstream infection • Device-related endocarditis



Cardiac implantable electronic device infections: Incidence, risk factors, and the effect of the AigisRx antibacterial envelope

Suneet Mittal, MD, FHRS, Richard E. Shaw, MA, PhD, Kimberly Michel, RN, Rachel Palekar, BA, Aysha Arshad, MD, FHRS, Dan Musat, MD, Mark Preminger, MD, Tina Sichrovsky, MD, Jonathan S. Steinberg, MD, FHRS

Clinical characteristic	Point score
Early pocket re-exploration	11
Sex: male	6
Diabetes	3
Device upgrade	2
Congestive heart failure	1
Hypertension	1
GFR < 60 mL/min	1

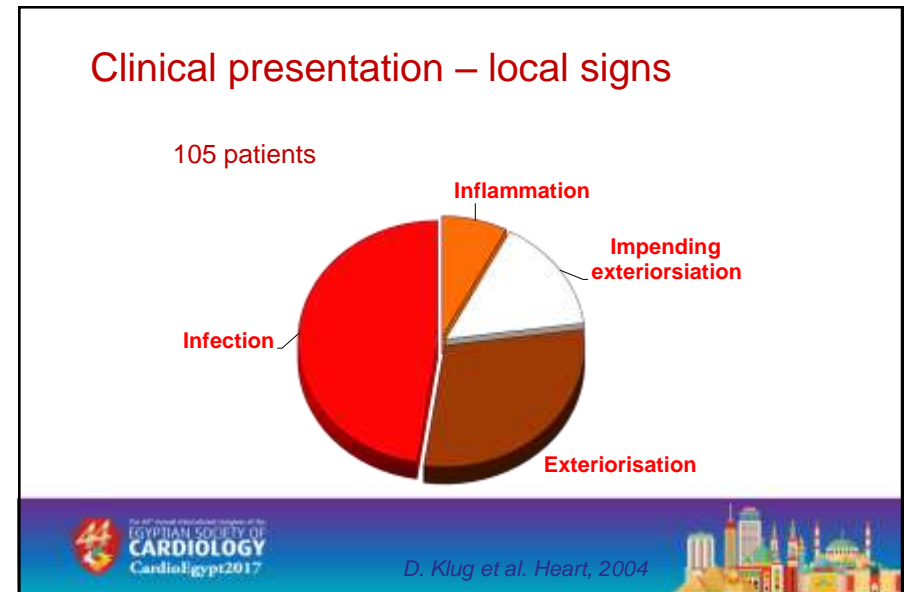
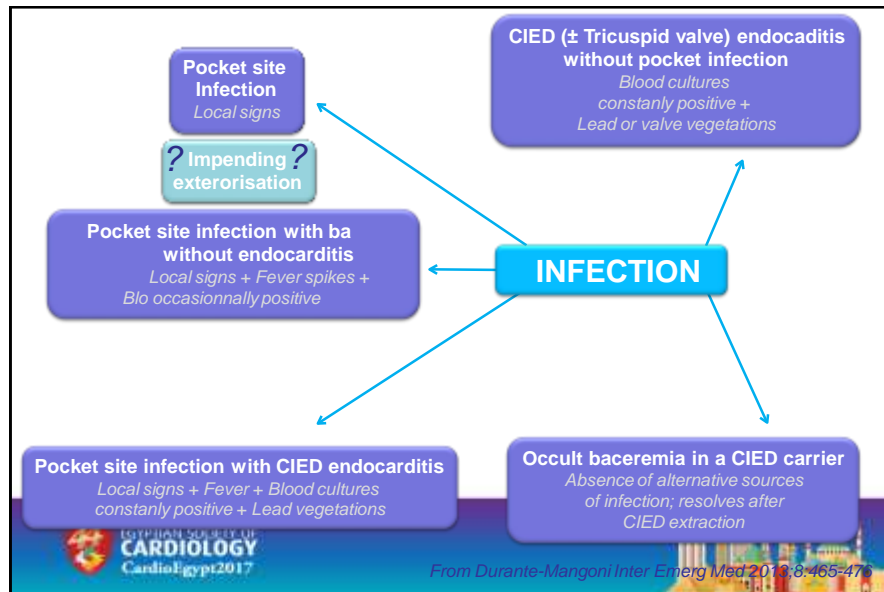
C = 0.72

Definitions of cardiac device infections

A distinction should be made between local device infection and cardiac device-related IE (CDRIE).

Local device infection is defined as an infection **limited to the pocket** of the cardiac device and is clinically suspected in the presence of **local signs of inflammation** at the generator pocket, including erythema, warmth, fluctulance, wound dehiscence, erosion, tenderness or purulent drainage.

CDRIE is defined as an infection **extending to the electrode leads**, cardiac valve leaflets or endocardial surface. However, differentiating local device infection and CDRIE is frequently difficult.





PATHOPHYSIOLOGY

The pocket may become infected **at the time of implantation**, during subsequent surgical manipulation of the pocket or if the generator or subcutaneous electrodes **erode through the skin**.

Pocket infection may track along the intravascular portion of the electrode to involve the intracardiac portion of the pacemaker or implantable cardioverter defibrillator.

Alternatively, the pocket or intracardiac portion of the electrode may become infected as a result of **haematogenous seeding** during a bacteraemia secondary to a distant infected focus. The consequence may be formation of vegetations, which can be found anywhere from the insertion vein to the superior vena cava, on the lead or on the tricuspid valve, as well as on the right atrial and ventricular endocardium.

Septic pulmonary embolism is a very frequent complication of CDRIE.



DEFINITE INFECTIVE ENDOCARDITIS

Pathological criteria

Microorganisms: demonstrated by culture or histology in vegetation, in a vegetation that has embolized, or in intracardiac abscess, or

Microorganisms demonstrated by culture of the lead

Clinical criteria,

- Two major criteria, or
- One major and three minor criteria, or
- Five minor criteria

POSSIBLE INFECTIVE ENDOCARDITIS

Findings consistent with infective endocarditis that fall short of "definite" but not "rejected"

REJECTED

Firm alternate diagnosis explaining evidence of infective endocarditis, or



Resolution of infective endocarditis syndrome, with antibiotic therapy for ≤ 4 days, or

No pathological evidence of infective endocarditis at surgery or autopsy, with antibiotic therapy for ≤ 4 days

Circulation. 1997;95:2098-2107

Major criteria
Positive blood culture for infective endocarditis
Typical microorganisms for infective endocarditis from two separate blood cultures
<i>Streptococcus viridans</i> , <i>Streptococcus bovis</i> , HACEK group, or
Community-acquired <i>Staphylococcus aureus</i> or enterococci, in absence of a primary focus, or
Persistently positive blood culture, defined as microorganism consistent with infective endocarditis from
Blood cultures drawn >12 hours apart, or
All of three or a majority of four or more separate blood cultures first and last drawn at least 1 hour apart
Evidence of endocardial involvement:
Positive echocardiogram for infective endocarditis:
Oscillating intracardiac mass on PM leads or on the endocardial structure in contact with PM leads
Abscess in contact with PM leads

Minor criteria
Fever >38°C
Vascular phenomena: arterial embolism, septic pulmonary infarcts, mycotic aneurysm, intracranial hemorrhage, Janeway lesions
Immunologic phenomena: glomerulonephritis, Osler nodes, Roth spots
Echocardiogram: consistent with infective endocarditis but not meeting major criterion as noted previously (sleeve-like appearance)
Microbiological evidence: positive blood culture but not meeting major criterion as noted previously



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

ESC GUIDELINES

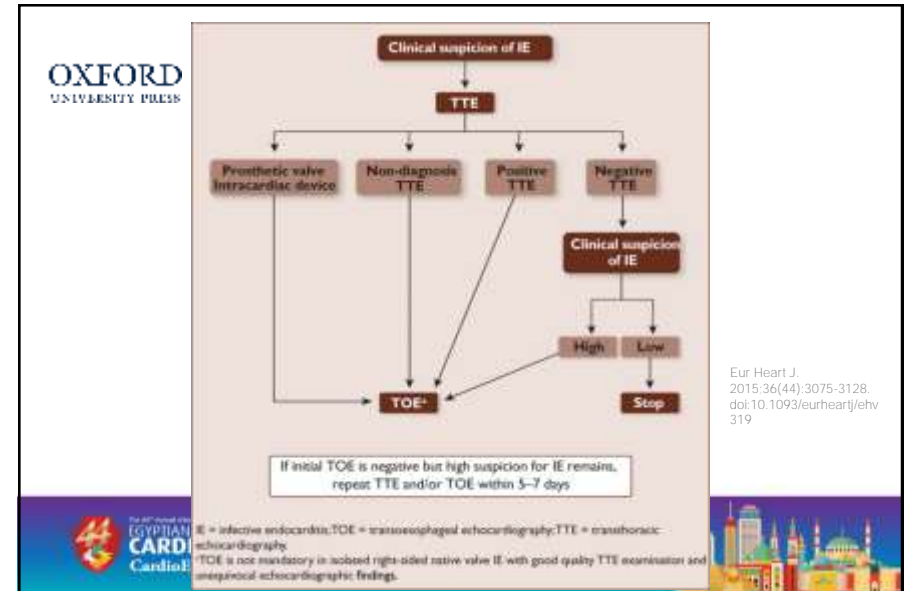
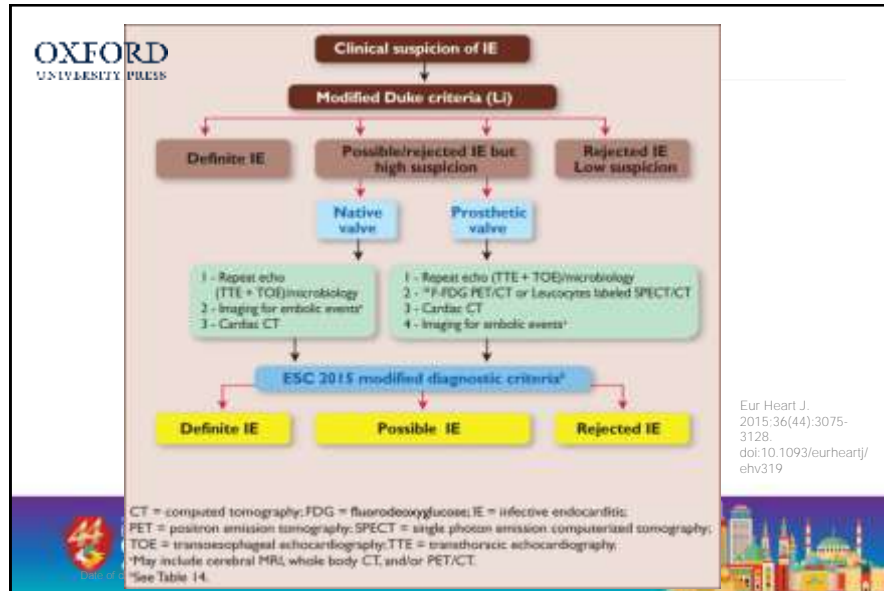


2015 ESC Guidelines for the management of infective endocarditis

The Duke criteria are difficult to apply in these patients because of lower sensitivity.³⁴⁷ Modifications of the Duke criteria have been proposed,^{382,391} including local signs of infection and pulmonary embolism as major criteria.³⁸²

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Echocardiography plays a key role in CDRIE and is helpful for the diagnosis of both lead vegetations and tricuspid involvement, quantification of tricuspid regurgitation, sizing of vegetations and follow-up after lead extraction. Several prognostic features may be better defined on TTE than on TOE, such as pericardial effusion, ventricular dysfunction and pulmonary vascular pressure estimations. TOE has superior sensitivity and specificity to TTE for diagnosis of lead-related endocarditis.³⁸¹⁻³⁸⁵ TOE allows visualization of the lead in atypical locations, such as the proximal superior vena cava, and of regions that are difficult to visualize by TTE. In addition, the sensitivity of TOE for left-sided involvement and for perivalvular extension of infection is superior to that of TTE. Considering their complementary role, it is recommended to perform both investigations in suspected CDRIE.

In the presence of infective material along the lead course not providing typical vegetations of measurable size, both TTE and TOE may be falsely negative in CDRIE. Intracardiac echocardiography was recently found to be feasible and effective in cardiac device patients³⁸⁶ and to have a superior sensitivity for the detection of vegetations in cardiac devices



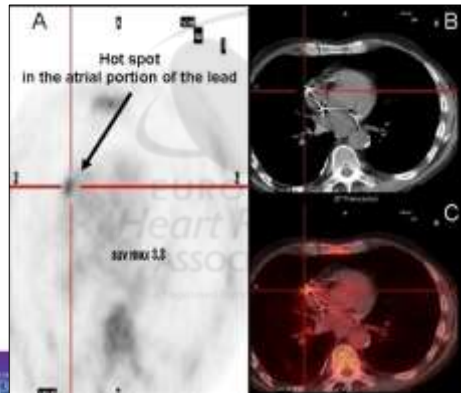
Major role of TEE



Le Dolley et al., *Circulation*2009

New diagnostic methods:

(18)F-fluorodeoxyglucose positron emission tomography/computerized tomography (FDG-PET/CT) scanning



Ploux S et al, Heart Rhythm 2011.

New diagnostic methods:

(18)F-fluorodeoxyglucose positron emission tomography/computerized tomography (FDG-PET/CT) scanning

N= 20 pts with definite PM/ICD infection

		Endocarditis
True-positive (V-P)		4
True-negative (V-N)		5
False-positive (F-P)		3
False-negative (F-N)		9
Sensitivity (%)	86.7	30.8
Specificity (%)	100	62.5

Kappa

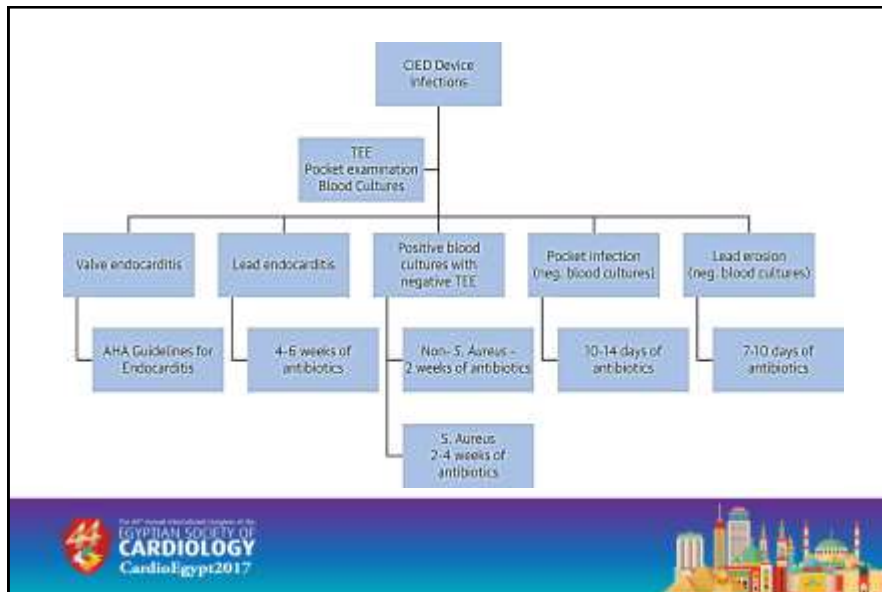
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-0.06

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Cautela et al, Europace

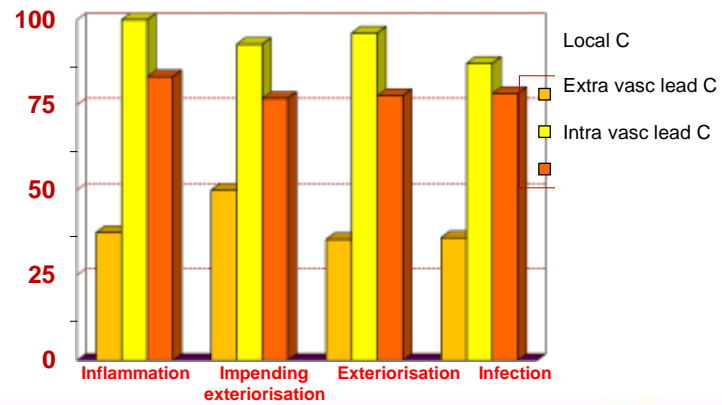
2013



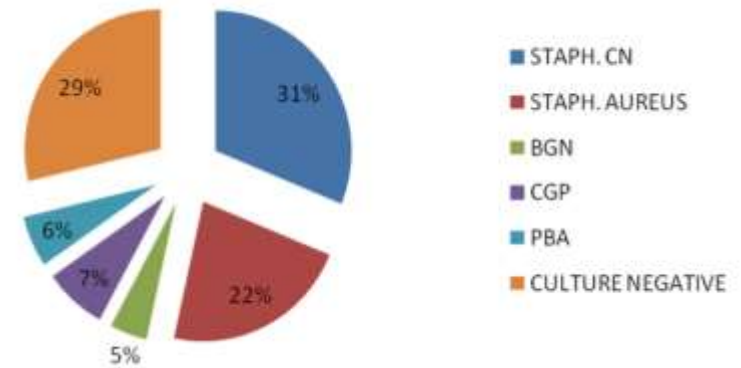
In Short ...

- CDRIE must be treated by prolonged antibiotic therapy associated with complete hardware removal



Cultures are frequently positive



... but not always



INFECTIONS	
<i>Wilkoff et al., Heart Rhythm 2009</i>	
Infective endocarditis (valves or leads) or sepsis	I, B
Pocket infection (any type)	I, B
Valvular endocarditis	I, B
Occult Gram positive bacteremia	I, B
EUROPEAN CLASSIFICATION	
Persistent occult Gram negative bacteremia	IIa, B
Superficial (incisional) infection	III, C
Chronic bacteremia with a source other than CIED	III, C

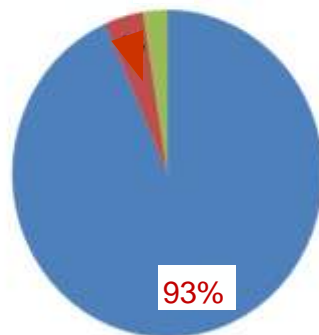





Complete lead and generator removal

■ Percutaneous ■ Surgical ■ Combined

N = 197 pt
(2004-2008)



Deharo et al, Heart 2012

Recommendations for New CIED Implantation After Removal of an Infected CIED

Class I

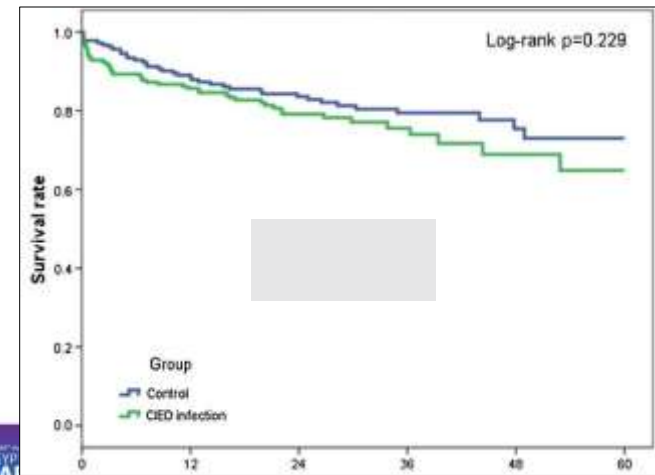
1. Each patient should be evaluated carefully to determine whether there is a continued need for a new CIED. (Level of Evidence: C)
2. The replacement device implantation should not be ipsilateral to the extraction site. Preferred alternative locations include the contralateral side, the iliac vein, and epicardial implantation. (Level of Evidence: C)

Class IIa

1. When positive before extraction, blood cultures should be drawn after device removal and should be negative for at least 72 hours before new device placement is performed. (Level of Evidence: C)
2. New transvenous lead placement should be delayed for at least 14 days after CIED system removal when there is evidence of valvular infection. (Level of Evidence: C)

And Remember...

CIED Infection - Prognosis



A CASE







CONCLUSION

- Increasing incidence of the problem
- Need for:
 - Systematic approach
 - Strict assessment of the practices at our center
 - Better identification of the patients at high risk of infection
 - New diagnostic methods
 - Clear attitude regarding reimplantation



THANK YOU

