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Manejo actualizado de las infecciones asociadas a dispositivos cardiovasculares implantables

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Agenda

- Epidemiología 
- Fundamentos para el diagnóstico y tratamiento 
- Estrategias para la recolocación (o no) de los dispositivos 
- Prevención 

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Epidemiología

- Las infecciones de los dispositivos cardiacos (CIED) como marcapasos (MCP) y cardiodesfibriladores (CDI) son infecciones graves asociadas a alta morbilidad y mortalidad (hasta un 70% sin tratamiento adecuado)
- Si bien el % de infecciones ha disminuido en relación al nº de dispositivos colocados, la cada vez mayor indicación en la colocación de estos ha provocado un aumento ⁓ 120% en la incidencia de estas infecciones en las ultimas 2 décadas.
- Alto impacto económico → Se estima que el costo en EE.UU de cada MCP infectado es de U$S 24.000 y el de cada CDI U$S 57.000.

- *Guidelines for the diagnosis, prevention and management of implantable cardiac electronic device infection. Report of a joint Working Party project on behalf of the British Society for Antimicrobial Chemotherapy (BSAC, host organization), British Heart Rhythm Society(BHRS), British Cardiovascular Society (BCS), British Heart Valve Society (BHVS) and British Society for Echocardiography (BSE). Jonathan A. T. Sandoe et al. J Antimicrob Chemother 2015; 70: 325–359 doi:10.1093/jac/dku383*
- *Sohail MR, Henrikson CA, Braid-Forbes MJ, et al. Mortality and cost associated with cardiovascular implantable electronic device infections. Arch Intern Med 011;171:1821*
- *Timing of device reimplantation and reinfection rates following cardiac implantable electronic device infection: a systematic review and meta-analysis. Derek Chew et al. BMJ Open 2019;9:e029537. doi:10.1136/bmjopen-2019-029537*

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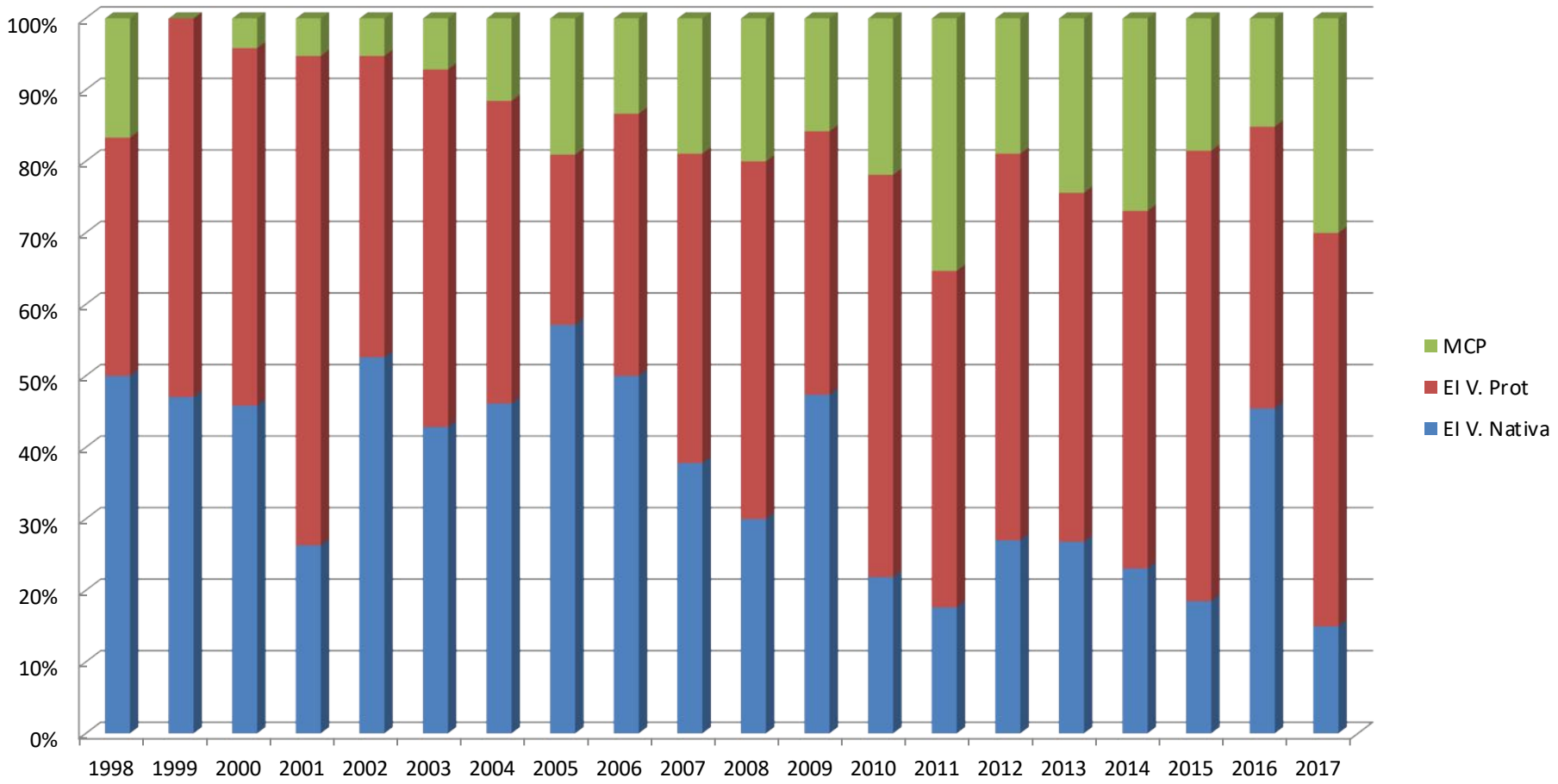
Casos consecutivos de EI (ICBA 1998-2022)



8/98 – 8/2022: 579 EI

↓

113 EI asoc. a CIED (19.5%)

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Endocarditis infecciosa.1998 – 2022 ICBA. Nacinovich F, Fernandez Oses P. Datos si publicar

Clasificación

- Inflamación/ Infección temprana de la herida del bolsillo
- Infección del bolsillo no complicada
- Infección del bolsillo complicada
- EI asociada al dispositivo y/o compromiso de los catéteres

Patogenia
- Infección primaria posterior a la colocación
- Infección 2ria a bacteremia de otro origen

→ *S. aureus*: 30-45 % de riesgo

- 2017 HRS expert consensus statement on cardiovascular implantable electronic device lead management and extraction . Heart Rhythm, Vol 14, No 12, December 2017. https://doi.org/10.1016/j.hrthm.2017.09.001
- *Uslan DZ, Dowsley TF, Sohail MR et al. Cardiovascular implantable electronic device infection in patients with Staphylococcus aureus bacteremia. Pacing Clin Electrophysiol 2010; 33: 407–13.*

Factores de riesgo

- Los factores de riesgo mayormente descriptos son:
  - Desnutrición
  - IRC
  - DBT
  - Anticoagulación
  - Enfermedad crónica subyacente (ej: neoplasia)

- Jordan M. y col → Pacientes con resincronizador (2% vs 1.5%)

Predisponentes

Table 1. Baseline Characteristics of Patients With ICD Infection Versus Those Without Infection

	No Infection (n=197 519)	Infection (n=3390)	*P* Value
Demographic			
Age, mean (SD), y	75.3 (6.4)	75.3 (6.4)	0.63
Male, %	74.2	75.5	0.07
Race, %			
White non-Hispanic	86.2	85.0	
Black non-Hispanic	7.3	8.1	0.054
Hispanic	3.9	4.5	
Other	2.6	2.3	
Clinical characteristics			
Syncope, %	20.1	19.3	0.26
Family history sudden death, %	3.5	3.0	0.09
Heart failure hospitalization, %			
No	55.3	49.4	
Yes-hospitalized ≤ 6 mo	22.0	26.3	<0.001
Yes-hospitalized > 6 mo	22.7	24.3	
NYHA Class, %			
I	11.3	8.8	
II	34.1	29.9	<0.001
III	50.4	56.3	
IV	4.2	5.1	
Atrial fibrillation/atrial flutter, %	42.1	48.7	<0.001
Ventricular tachycardia, %	41.6	40.2	0.09
Sinus node function, %			
Normal	65.6	60.0	<0.001
Abnormal	34.4	40.0	
Non-ischemic dilated cardiomyopathy, %	25.5	24.1	0.05
Ischemic heart disease, %	73.2	74.4	0.12
Previous ICD, %	28.7	32.0	<0.001
Previous MI, %	58.1	56.9	0.17
Previous CABG, %	42.3	46.5	<0.001

La incidencia de infección en un implante primario es entre 2 a 5 veces menor que en posteriores revisiones (independientemente de la causa)

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Previous valvular surgery, %	8.5	14.1	<0.001
Cerebrovascular disease, %	17.7	21.2	<0.001
Chronic lung disease, %	24.3	29.1	<0.001
Diabetes mellitus, %	37.7	40.1	0.005
Hypertension, %	79.1	80.1	0.12
Renal failure-dialysis, %	3.7	5.4	<0.001
Intraventricular conduction, %			
Normal	32.5	28.1)	
Abnormal-LBBB	26.4	25.4	<0.001
Abnormal-RBBB	7.4	7.6	
Other	33.6	38.9	
Ejection fraction, mean (SD), %	28.4 (10.8)	28.0 (10.5)	0.04
QRS duration, mean (SD), ms	135.1 (35.7)	139.4 (37.0)	<0.001
Creatinine, mean (SD), mg/dL	1.4 (1.0)	1.5 (1.1)	<0.001
BUN, mean (SD), mg/dL	26.5 (14.3)	28.1 (15.7)	<0.001
Sodium, mean (SD), mg/dL	138.7 (3.6)	138.3 (3.7)	<0.001
Systolic blood pressure, mean (SD),	132.5 (22.7)	132.0 (23.2)	0.17
Procedure factors			
Reimplantation, %			
No	71.3	68.0	
Yes-device upgrade, malfunction, manufacturer advisory	6.7	9.8	<0.001
Yes-battery change	22.1	22.2	
ICD type, %			
Single chamber	16.1	13.3	
Dual chamber	37.0	31.8	<0.001
Biventricular-LV lead (coronary sinus)	44.2	51.5	
Biventricular-LV lead (epicardial/ other)	2.7	3.4	
Multiple ICDs during admission, %	0.2	0.3	0.02
Adverse events, %	1.9	5.4	<0.001

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Operator factors			
EP operator ICD training, %			
Unknown	22.6	23.8	<0.001
Board-certified EP/EP fellowship	61.9	58.2	
Surgery board	1.8	2.1	
Other	13.8	15.9	
Physician volume, mean (SD)	87.2 (79.0)	84.5 (80.6)	0.049
Teaching status, %			
COTH	30.2	27.6	
Teaching	28.0	27.7	<0.001
Other	41.8	44.8	
Cardiac facility, %			
CABG availability	86.9	84.9	
Coronary catheterization	3.2	4.0	0.002
Other	9.9	11.1	
Number beds set up and staffed, mean (SD)	455.0 (270.0)	447.9 (270.9)	0.13
Medications			
Warfarin, %	33.2	39.6	<0.001
Aspirin, %	66.8	65.2	0.06
Clopidogrel, %	23.1	23.1	0.96
Ticlopidine, %	0.3	0.3	0.98

Table 2. Adverse Events During Implant Hospitalization

Adverse Event	No Infection (n=197 519)	Infection (n=3390)	*P* Value
AV fistula	7 (0.004%)	2 (0.059%)	0.01
Cardiac arrest	174 (0.088%)	2 (0.059%)	0.99
Cardiac perforation	146 (0.074%)	2 (0.059%)	0.99
Conduction block	60 (0.030%)	2 (0.059%)	0.28
Coronary venous dissection	244 (0.124%)	2 (0.059%)	0.45
CVA/stroke	106 (0.054%)	1 (0.029%)	0.99
Drug reaction	155 (0.078%)	3 (0.088%)	0.75
Hematoma	1828 (0.925%)	127 (3.746%)	<0.001
Hemothorax	173 (0.088%)	7 (0.206%)	0.03
Lead dislodgement	1884 (0.954%)	56 (1.652%)	<0.001
Myocardial infarction	46 (0.023%)	0 (0.000%)	0.99
Pericardial tamponade	194 (0.098%)	3 (0.088%)	0.99
Peripheral embolus	49 (0.025%)	0 (0.000%)	0.99
Peripheral nerve injury	10 (0.005%)	0 (0.000%)	0.99
Phlebitis - deep	51 (0.026%)	1 (0.029%)	0.59
Phlebitis - superficial	64 (0.032%)	2 (0.059%)	0.31
Pneumothorax	954 (0.483%)	17 (0.501%)	0.88
TIA	37 (0.019%)	0 (0.000%)	0.99

Table 3. Multivariable Predictors of ICD Infection

Effect	OR (95% CI)	*P* Value
Clinical characteristics		
Previous valvular surgery	1.525 (1.375–1.692)	<0.0001
Cerebrovascular disease	1.172 (1.076–1.276)	.0003
Chronic lung disease	1.215 (1.125–1.312)	<0.0001
Renal failure-dialysis	1.342 (1.123–1.604)	.0012
Procedure factors		
Reimplantation		
No	Reference	
Yes-device upgrade, malfunction, manufacturer advisory	1.354 (1.196–1.533)	<0.0001
Yes-battery change	1.090 (0.992–1.198)	
Adverse events	2.692 (2.304–3.145)	<0.0001
Medications		
Warfarin	1.155 (1.060–1.257)	0.001

Diagnóstico

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Diagnóstico

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Diagnóstico

El diagnóstico se basa en 3 pilares:

1) Sospecha clínica
2) Estudios microbiológicos →HMC / cultivo de secreción del bolsillo / cultivo del materia extraído / PCR
3) Estudio por imágenes → Ecocardiografía
PET/Tc

Table 5 Recommendations for diagnosis of CIED infections and/or infective endocarditis: the Novel 2019 International CIED Infection Criteria[a]

Consensus statement	Statement class	Scientific evidence coding	Reference
'Definite' CIED clinical pocket/generator infection = generator pocket shows swelling, erythema, warmth, pain, and purulent discharge/sinus formation OR deformation of pocket, adherence, and threatened erosion OR exposed generator or proximal leads.			
'Definite' CIED/IE = presence of either two major criteria or one major + three minor criteria			
'Possible' CIED/IE = presence of either one major + one minor criteria or three minor criteria			
'Rejected' CIED/IE diagnosis = patients who did not meet the aforementioned criteria for IE			
Major criteria			59
Microbiology	A. Blood cultures positive for typical microorganisms found in CIED infection and/or IE (Coagulase-negative Staphylococci, *Staphylococcus aureus*)	E	
	B. Microorganisms consistent with IE from two separate blood cultures:		
	a. Viridans streptococci, *Streptococcus gallolyticus* (*Streptococcus bovis*), HACEK group, *S. aureus* or		
	b. Community-acquired enterococci, in the absence of a primary focus.		
	C. Microorganisms consistent with IE from persistently positive blood cultures:		
	a. ≥2 positive blood cultures of blood samples drawn >12 h apart; or		
	b. All of three or a majority of ≥4 separate cultures of blood (first and last samples drawn ≥1 h apart); or		
	c. Single positive blood culture for *Coxiella burnetii* or phase I IgG antibody titre >1:800		
Imaging positive for CIED infections and/or IE	D. Echocardiogram (*including ICE*) positive for:		
	a. CIED infection:		
	i. Clinical pocket/generator infection		
	b. Valve IE		
	i. Vegetations		
	ii. Abscess, pseudoaneurysm, intracardiac fistula;		
	iii. Valvular perforation or aneurysm;		
	iv. New partial dehiscence of prosthetic valve		
	E. [^{18}F]FDG PET/CT (caution should be taken in case of recent implants) or radiolabelled WBC SPECT/CT detection of abnormal activity at pocket/generator site, along leads or at valve site		
	F. Definite paravalvular leakage by cardiac CT		
Minor criteria			59
	a. Predisposition such as predisposing heart condition (e.g. new onset tricuspid valve regurgitation) or injection drug use	E	
	b. Fever (temperature >38°C)		
	c. Vascular phenomena (including those detected only by imaging): major arterial emboli, septic pulmonary embolisms, infectious (mycotic) aneurysm, intracranial haemorrhage, conjunctival haemorrhages, and Janeway's lesions		
	d. Microbiological evidence: positive blood culture which does not meet a major criterion as noted above or serological evidence of active infection with organism consistent with IE or pocket culture or leads culture (extracted by non-infected pocket)		

Green text refers to CIED-related infection criteria.
CIED, cardiac implantable electronic device; E, expert opinion; ICE, intracardiac echocardiography; IE, infective endocarditis; M, meta-analysis; O, observational studies; R, randomized trials.
[a]Based on merging of the modified Duke- and ESC 2015 Guidelines criteria, see text.[63,64]

European Heart RhythmAssociation (EHRA) international consensus document on how to prevent, diagnose, and treat cardiac implantable electronic device infection
Carina Blomstro¨m-Lundqvist et al. European Heart Journal (2020) 41, 2012–2032. doi:10.1093/eurheartj/ehaa010

Diagnóstico microbiológico

Table 3 Microbiology of CIED infections

Organism	Infections rate[a]
Staphylococci	
S. aureus	29–44%
Methicillin sensitive	12–25%
Methicillin resistant	4–22%
Coagulase negative	26–42%
Methicillin sensitive	~19%
Methicillin resistant	~19%
Streptococci	0.6–2.5%
Enterococci	4–13%
Anaerobes	1.6–6.5%
Gram negative	5–9%
Fungi	1–2%
Mycobacteria	0.2%
Polymicrobial	2–14%
Culture negative	7–21%

Table 1. Summary of the microbiology of implantable cardiac electronic device infection

Pathogen (number of studies reporting this pathogen)	Range in studies using patients as the denominator	Range in studies using isolates as the denominator
CoNS (17)	10%[a]–68%	42%–77%
Staphylococcus aureus (16)	24%–59%	10%–30%
Gram-negative bacilli (11)	1%–17%	6%–11%
Enterococcus spp. (6)	5%–6%[b]	0.4%–10%[b]
Streptococcus spp. (5)	4%–6%[b]	3%–10%[b]
Propionibacterium spp. (3)	—	0.8%–8%
Fungi (5)	0.5%–2%	0.4%–1.4%

[a]This study only used blood cultures and had high culture negativity (49%).
[b]This study reported *Streptococcus* and *Enterococcus* spp. together.

≈ 80% cocos Gram +
> 70% Staphylococcus

- *Epidemiology of cardiac implantable electronic device infections: incidence and risk factors.* Hui-Chen Han et al. Europace (2021) 23, iv3–iv10 supplement paper doi:10.1093/europace/euab042
- *Guidelines for the diagnosis, prevention and management of implantable cardiac electronic device infection. Report of a joint Working Party project on behalf of the British Society for Antimicrobial Chemotherapy (BSAC, host organization), British Heart Rhythm Society(BHRS), British Cardiovascular Society (BCS), British Heart Valve Society (BHVS) and British Society for Echocardiography (BSE). Jonathan A. T. Sandoe et al. J Antimicrob Chemother 2015; 70: 325–359 doi:10.1093/jac/dku383*

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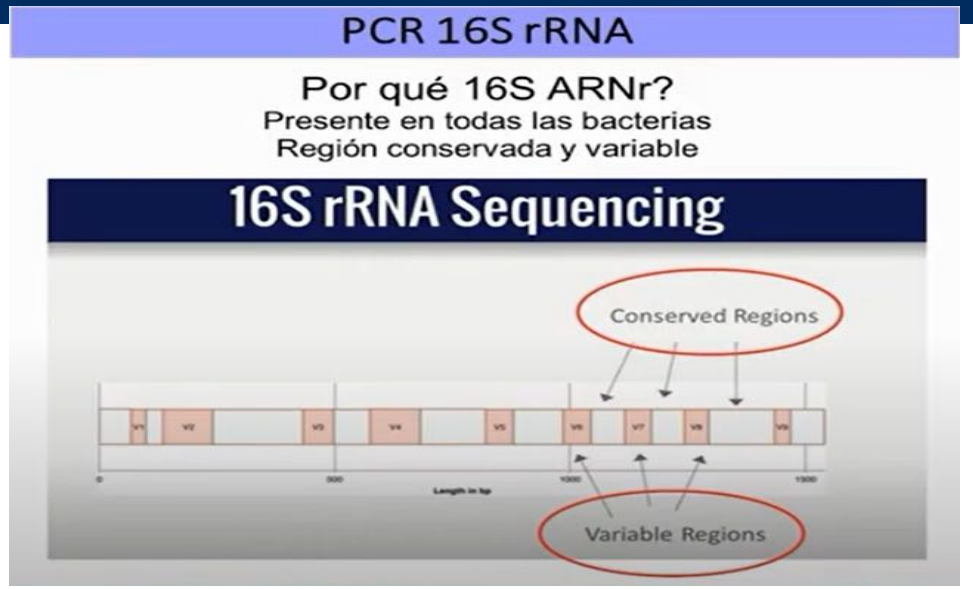
Diagnóstico microbiológico

S: 77%

Fotos 2- 3 : Infections on Cardiovascular Implantable Electronic Devices: a Critical Review
Aristides de Alarcon y col . Medical Research Archives, vol. 7, issue 3, March 2019

Guía de práctica clínica para prevención, diagnóstico y tratamiento de la endocarditis infecciosa. Grupo de Trabajo de la Sociedad Europea de Cardiología (ESC) para Prevención, Diagnóstico y Tratamiento de la Endocarditis Infecciosa En colaboración con la European Society of Clinical Microbiology and Infectious Diseases (ESCMID) y la International Society of Chemotherapy (ISC) for Infection and Cancer. Gilbert Habib et al. Rev Esp Cardiol. 2009;62(12):1465.e1-.e54

Diagnóstico por biología molecular



Fotografías: Dra. Sonia Castillo. Bioquímica.
Departamento de Biología Molecular.
Laboratorio Dr. Stamboulian

Diagnóstico por imágenes
Ecocardiografía

- La ecocardiografía debe ser la primera herramienta de imagen en la evaluación de los pacientes con sospecha de EI asoc a CIED para identificar vegetaciones en los catéteres y/o afectación valvular.

- El ETE es hoy en día el gold standard para el diagnostico de EI asociado a CIED (Sensibilidad > 90% vs 30% ETT para la detección de vegetaciones sobre los catéteres)

- El ETT define mejor la presencia de derrame pericárdico, la disfunción ventricular y la presión vascular pulmonar

-

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Pacemaker lead infection: echocardiographic features, management, and outcome
F Victor et al. Heart . 1999 Jan;81(1):82-7. doi: 10.1136/hrt.81.1.82.

PET-tc

- Herramienta útil para aumentar la sensibilidad frente a diagnósticos dudosos.
- Útil en el diagnóstico de EI VP y asociado a dispositivos
- Sensibilidad >90%
- Útil después del mes de colocación del dispositivo
- Criterio > de Duke modificado en las guías Europeas de EI 2015
- FDG PET / CT tiene la capacidad de evaluación de todo el cuerpo, por lo que es particularmente útil para la identificación de localizaciones embólicas inesperadas (silentes) e infecciones metastásicas, aneurismas micóticos , y espondilodiscitis (no émbolias cerebrales)

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- *Positron Emission Tomography and Single-Photon Emission Computed Tomography Imaging in the Diagnosis of Cardiac Implantable Electronic Device Infection A Systematic Review and Meta-Analysis. Daniel Juneau et al. Circ Cardiovasc Imaging. 2017;10. doi: 10.1161/CIRCIMAGING.116.005772*
- *Infections in Cardiac Implantable Electronic Devices: Diagnosis and Management in a Referral Center.* E. Gutierrez Carretero et al. / Rev Esp Cardiol. 2017;70(5):355–362

PREGUNTA 1

En un paciente con diagnóstico de infección del bolsillo de MCP. Usted

A- Indica tto ATB intentando conservar el dispositivo

B- Solicita el retiro del generador con conservación de los catéteres

C- Solicita el retiro de todo el sistema (generador y cables)

Tratamiento

- Con excepción de la inflamación/infección localizada en la herida del bolsillo, el resto de las presentaciones requiere tratamiento combinado “medico-quirúrgico”
- Es IMPRESCINDIBLE la remoción completa del dispositivo (generador y cable)
- La extracción parcial (solo generador) tiene una eficacia < 20%
- La mortalidad de la EI asoc. a MCP sin remoción completa del sistema es cercana al 70% vs 18% con tratamiento adecuado
- El tto ATB empírico inicial (de ser necesario) debe contemplar cobertura para cocos Gram positivos y que alcancen concentraciones adecuadas en el *biofilm*

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Guidelines for the diagnosis, prevention and management of implantable cardiac electronic device infection. Report of a joint Working Party project on behalf of the British Society for Antimicrobial Chemotherapy (BSAC, host organization), British Heart Rhythm Society(BHRS), British Cardiovascular Society (BCS), British Heart Valve Society (BHVS) and British Society for Echocardiography (BSE). Jonathan A. T. Sandoe et al. J Antimicrob Chemother 2015; 70: 325–359 doi:10.1093/jac/dku383

Instrumental para extracción percutánea

Estilete de Fijación *LIBERATOR®*

A

Extensor de Electrodo *BULLDOG®*

B

Cánulas Manuales

C

Cánulas Energizadas por Radiofrecuencia (PeRFecta®)

E

Acoplador
Canulas-Generador RF

D

Pin Vise

F

Force FX-C®
Force FX-C® Autobipolar

Sistema Rotacional de Extracción Evolution ®

Equipos Para Abordaje SUPERIOR

Equipos Para Abordaje INFERIOR

H

I

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Infections on Cardiovascular Implantable Electronic Devices: a Critical Review.
E. Gutiérrez-Carretero, K.Rezaei, F. Rodríguez-Mora,Arístides de Alarcón.
Medical Research Archives, vol. 7, issue 3, March 2019

Reimplante

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Reimplante

- La extr
- Grande requirió recoloc
- No exis anto, dicha decisió

Table 10 Recommendations for preventive strategies after device implantation and for new reimplantations including alternative novel devices

Consensus statement	Statement class	Scientific evidence coding	References
After device extraction, reassessment of the indication for reimplantation is recommended		O	39,122
Whenever possible, reimplantation may be avoided or delayed until symptoms and signs of systemic and local infection have resolved		O	39,123
A temporary pacemaker with ipsilateral active fixation strategy may be considered in pacemaker-dependent patients requiring appropriate antibiotic treatment before reimplantation		O	124–127
Preferred access sites for replacement device are the contralateral side, the femoral vein, or epicardially		E, O	39,128,129
Temporary pacing in patients who are not pacemaker dependent		O	28
Replacement device implantation ipsilateral to the extraction site		E	39
Alternative novel devices as LPM and S-ICD may be considered in selected patients with high infective risk or in patients in whom these devices are considered better options after a CIED infection		O	129–133

CIED, cardiac implantable electronic device; E, expert opinion; LPM, leadless pacemaker; M, meta-analysis; O, observational studies; R, randomized trials; S-ICD, subcutaneous implantable defibrillator.

r S, Baddour LM.
infections. *J Am Coll*

İpek EG, Güray Ü, Demirkan D, Güray Y, Aksu T. Infections of implantable cardiac rhythm devices: predisposing factors and outcome. Acta Cardiol. 2012 Jun;67(3):303-10

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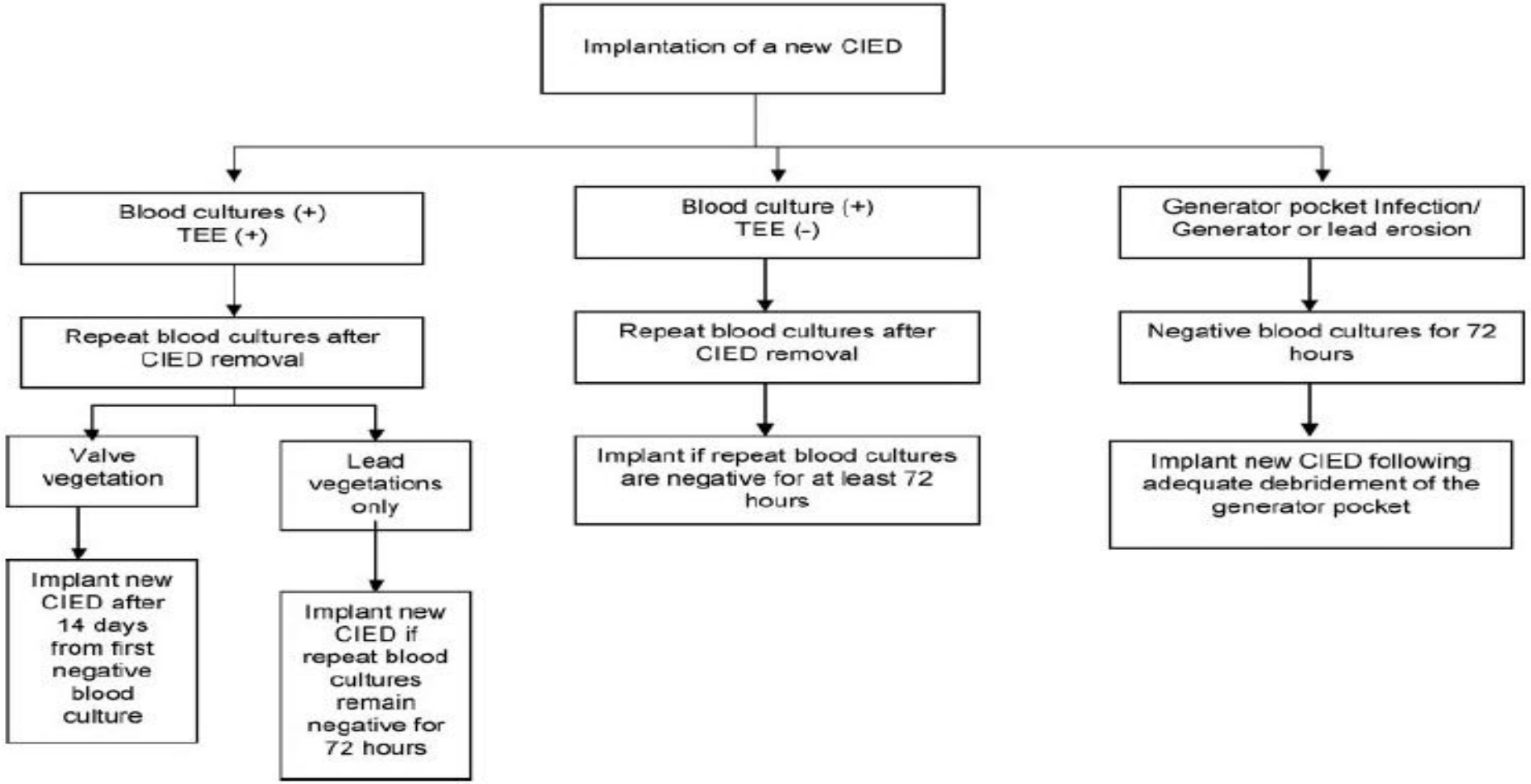
Reimplante



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Update on Cardiovascular Implantable Electronic Device Infections and Their Management: A Scientific Statement From the American Heart Association. Larry M. Baddour. Circulation 2010;121;458-477DOI: 10.1161/CIRCULATION AHA.109.192665

Reimplante. Nuevas estrategias

Europace (2014) **16**, 252–257
doi:10.1093/europace/eut220

CLINICAL RESEARCH
Pacing and resynchronization therapy

Same-day contralateral implantation of a permanent device after lead extraction for isolated pocket infection

Stavros E. Mountantonakis[1]*, Cory M. Tschabrunn[2], Marc W. Deyell[2], and Joshua M. Cooper[2]

- n: 15 pacientes dependientes
- Sin signos de infección sistémica
- Recolocación el mismo procedimiento contralateral
- Tratamiento ATB previo EV 48/72hs
- Sin nuevas infecciones en seguimiento 12 a 74 meses

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Same-day contralateral implantation of a permanent device after lead extraction for isolated pocket infection. Mountantonakis SE, Europace. 2014 Feb;16(2):252-7

One Stage Side-to-Side Replacement of Infected Pulse Generators and Leads

RAMAVATHI NANDYALA and VICTOR PARSONNET

From the Pacemaker and Defibrillator Evaluation Center at Newark Beth Israel Medical Center, an affiliate of the Saint Barnabas Health Care System; Newark, New Jersey

	Prior Surgery			
Procedure	**Number (%)**	**Endocarditis**	**Abscess, Cellulitis**	**Erosion, Extrusion**
Primary implant only	26 (38%)	4	9	13
Reoperation (replacement, lead revision, etc.)	42 (62%)	13	14	15
Totals	68 (100%)	17 (24%)	23 (35%)	28 (41%)

- 68 pacientes
- Seguimiento >1 año 59 pacientes (9 se perdieron) → Ninguno tuvo infección recurrente

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One stage side-to-side replacement of infected pulse generators and leads. Nandyala R1, Parsonnet V. Pacing Clin Electrophysiol. 2006 Apr;29(4):393-6.

Recolocación en un tiempo

Rev Esp Cardiol. 2017;70(5):355–362

Artículo original

Infecciones en dispositivos de estimulación cardiaca: diagnóstico y tratamiento en un centro de referencia

Encarnación Gutiérrez Carretero[a], Eduardo Arana Rueda[b], José Manuel Lomas Cabezas[c], Fernando Laviana Martínez[a], Manuel Villa Gil-Ortega[d], Jesús Acosta Martínez[e], Alonso Pedrote Martínez[b] y Arístides de Alarcón González[f,*]

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Infections in Cardiac Implantable Electronic Devices: Diagnosis and Management in a Referral Center.
E. Gutierrez Carretero et al. / Rev Esp Cardiol. 2017;70(5):355–362

Recolocación en un tiempo

Características de los pacientes sometidos a tracción percutánea y reimplante en 1 o 2 tiempos

	1 tiempo	2 tiempos	p
Infecciones locales			
Pacientes (n)	96	32	
Tipo de dispositivo			
MP	82 (85,5)	7 (21,8)	<0,01
DAI/TRC	14 (14,5)	25 (78,2)	
Estancia hospitalaria	8 [6-17]	8 [5-23]	NS
Tiempo de tratamiento ATB	21 [17-28]	21 [21-28]	NS
Intervalo de recambio (días)	0	6 [4-9]	
N.º de recidivas	1 (1)[a]	1 (3)[b]	NS
N.º de reinfecciones	2 (2)[c]	0	NS
Infecciones sistémicas			
Pacientes (n)	56	25	
Tipo de dispositivo			
MP	52 (92,8)	9 (36)	<0,01
DAI/TRC	4 (7,2)	16 (64)	
Estancia hospitalaria	22 [16-32]	32 [10-53]	<0,05
Tiempo de tratamiento ATB	29 [28-45]	32 [21-43]	NS
Intervalo de recambio (días)	0	10,5 [5-21]	
N.º de recidivas	1 (1,8)[d]	0	NS
N.º de reinfecciones	1 (1,8)[e]	4 (16)[f]	<0,05

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Recolocación (contralateral) en un tiempo

- Infecciones locales.
- Infecciones sistémicas: en pacientes dependientes 100% con:
  - -HMC: negativos
  - -Tratamiento ATB útil al menos 48 hs previas

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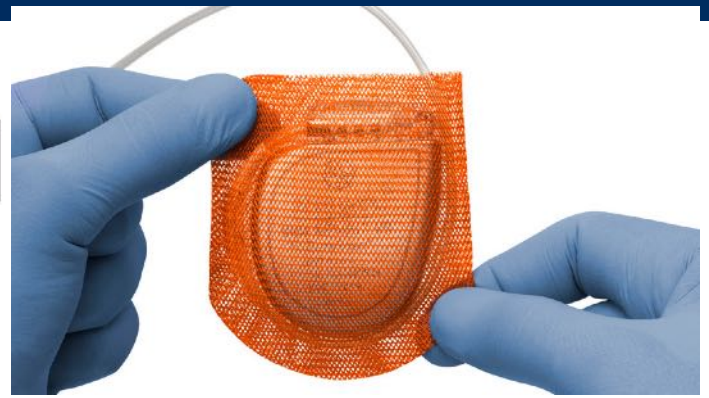
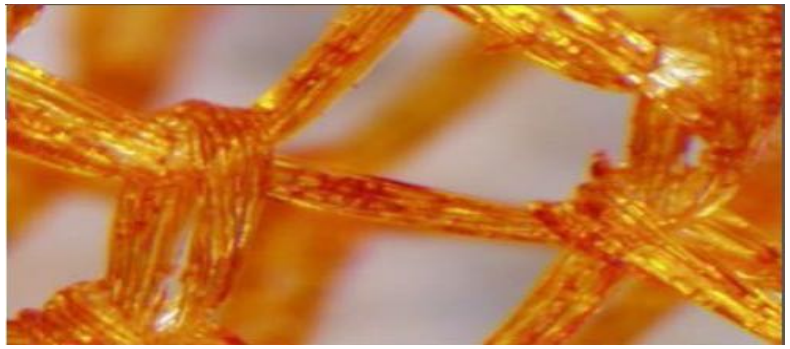
Novedades en prevención

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Antibacterial Envelope to Prevent Cardiac Implantable Device Infection





- TYRX, Medtronic
- Aprobado por la FDA en 2013
- Malla tejida recubierto con un polímero absorbible impregnado con Minociclina y Rifampicina

1 día post colocación

7 días post colocación

9 semanas post colocación

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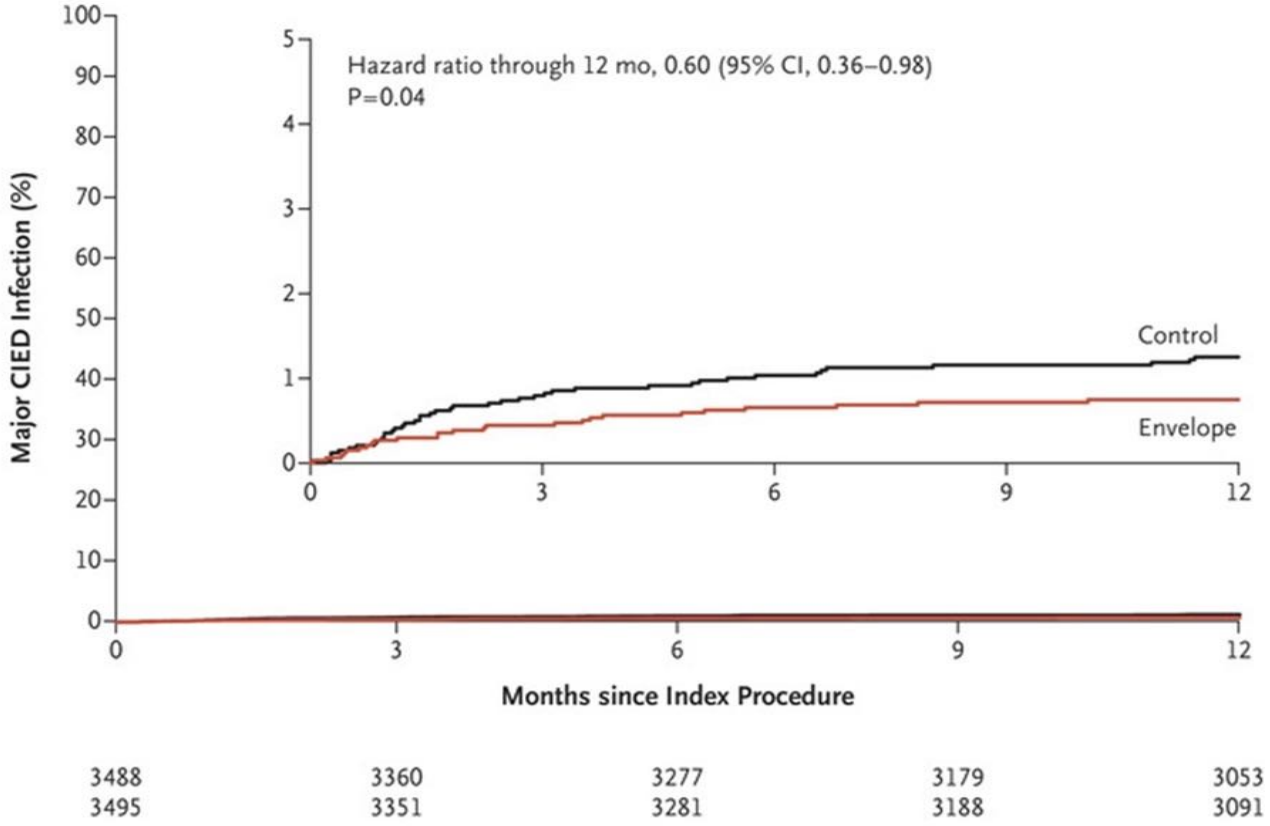
Antibacterial Envelope to Prevent Cardiac Implantable Device Infection
Khaldoun G. Tarakji, N Engl J Med 2019; 380:1895-1905

Table 2. Summary of Initial Major CIED Infections within 12 Months.

End Point	Envelope (N=3495)	Control (N=3488)	Total (N=6983)	Hazard Ratio (95% CI)
	number of patients (percent)			
Primary end point: major CIED infection within 12 mo	25 (0.7)	42 (1.2)	67 (1.0)	0.60 (0.36–0.98)*
Type of major CIED infection				
Pocket infection	14 (0.4)	36 (1.0)	50 (0.7)	0.39 (0.21–0.72)
Bacteremia or endocarditis	11 (0.3)	6 (0.2)	17 (0.2)	1.57 (0.61–4.05)

* P=0.04.



Se produjeron infecciones de CIED en 25 pacientes del grupo en estudio Vs 42 pacientes del grupo de control.

Kaplan-Meier: a 12 meses del 0,7 % y el 1,2 %, respectivamente ([HR] = 0,60; IC del 95 % , 0,36-0,98; p = 0,041), lo que representa una reducción relativa del 40% en el riesgo de desarrollar una infección de CIED

Antibacterial Envelope to Prevent Cardiac Implantable Device Infection . Khaldoun G. Tarakji, N Engl J Med 2019; 380:1895-1905

Costo efectividad

ELSEVIER

Cost-Effectivene
Use in Patients
Infection in Ger

Giuseppe Boriani, MD, Ch
Janet M. McComb, MD, A
Phuong Lien Carion, Phar

- Ambos est
  (Ej: antico
- Score PA
- Argentina

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Cardiov

UNIVERSITY OF OTTAWA HEART INSTITUTE
INSTITUT DE CARDIOLOGIE DE L'UNIVERSITÉ D'OTTAWA

Population Health Research Institute

CIHR IRSC

UBC THE UNIVERSITY OF BRITISH COLUMBIA

Prior Procedure(s) on the same pocket

0
1
2 or more

Age

Less than 60
60 - 69
70 or over

Depressed Renal Function

Yes (estimated glomerular filtration rate < 30ml/min)
No

Immunocompromised

Yes (receiving therapy that suppresses resistance to infection or has a disease that is sufficiently advanced to suppress resistance to infection)
No

Type of Procedure

Pacemaker: new pacemaker or pacemaker generator change
Implantable cardioverter defibrillator (ICD): new ICD or ICD generator change
Cardiac resynchronization therapy (CRT): new CRT pacemaker or defibrillator or CRT generator change
Revision / Upgrade: Pocket and/or lead revision and/or system upgrade, i.e. with adding new lead(s)

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r & Interventional
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em, Camden, NJ;
ltants, Scottsdale,
Oklahoma Heart
iew, MN

Conclusiones

- Las CIED son infecciones cada vez más frecuentes (relacionado al mayor número de dispositivos implantados)
- Su diagnóstico puede ser desafiante (requiere alta sospecha clínica, dada su presentación oligosintomática)
- La evolución, si no se realiza el diagnóstico y tratamiento adecuado tiene alta morbi-mortalidad
- Existen nuevas estrategias diagnósticas (ej: Biol molecular / PET), de tratamiento (extracción percutánea / reimplante en 1 tiempo) y de prevención (TYRX)

- Trabajo multidisciplinario (“Endocarditis Team”)

Muchas gracias

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