



18:30 - 19:50 h

MESA 4 INFECCIONES EN DISPOSITIVOS CARDIOVASCULARES

Moderadores

Eladio Sánchez Domínguez - Hospital Universitario Virgen del Rocío, Sevilla
Marta Hernández Meneses - Hospital Clínic, Barcelona

18:30 - 18:50 h

Endocarditis infecciosa en TAVIs y válvulas sin suturas

Ander Regueiro Cueva - Hospital Clínic, Barcelona

18:50 - 19:10 h

**Complicaciones de las infecciones en prótesis endovasculares.
¿Cuándo no se puede retirar una prótesis y qué hacer entonces?**

Dolores Sousa Regueiro - Hospital Universitario La Coruña

19:10 - 19:30 h

Infecciones en dispositivos de asistencia ventricular

Patricia Muñoz García - Hospital General Universitario Gregorio Marañón, Madrid

19:30 - 19:50 h

Discusión

MESA 4

Paciente "rechazado" para cirugía...



Tratamiento Conservador: distintos escenarios...

Paciente con
indicación
indiscutible, pero NO
quirúrgico



♥ Tratamiento paliativo,
definitivo

Preparar al paciente
para cirugía diferida



♥ Tratamiento quirúrgico,
definitivo

Alto riesgo de la
cirugía y "bajo grado"
de infección



♥ ¿Tratamiento conservador,
electivo?

Índice

♥ ¿Qué nos dicen las guías sobre el tratamiento quirúrgico conservador?

♥ ¿Tratamiento conservador electivo? ¿Cuándo?

♥ No explante: ¿Qué hacer entonces?

- Seguimiento. Valoración de respuesta al tratamiento
- Nuevos antibióticos



¿Qué nos dicen las Guías?

CLINICAL PRACTICE GUIDELINE DOCUMENT

Editor's Choice – European Society for Vascular Surgery (ESVS) 2020 Clinical Practice Guidelines on the Management of Vascular Graft and Endograft Infections^{1,2}

Nabil Chahid^{1,3,4}, Helge Dreier⁵, Anne Lajou^{6,7}, Ojan Asadian⁸, Bastien Bonard⁹, Jonathan Collier¹⁰, Inga Koutourelis¹¹, Andrei W.A.M. Grootenboer¹², Karl Kienast¹³, Jan Lindhult¹⁴, Giovanni Mulino¹⁵, Jan A. Sørensen¹⁶, Erik Stenroos¹⁷, Rainer M.J.A. Steh¹⁸, Zoltan Szederits¹⁹, Maurizio Verzaro²⁰, Frank Vermeulen²¹, Thomas R. Wijn²²

ESVS Guidelines Committee¹, Carl J. A. van Herle, Francesco Andrei, Giuseppe Valerio, E. Klok, Philippe Kuhl, Mikko Salonen, Mehdi Yaghi de Cange

Document Reviewers²: Raga S. van Alphen, Don C. van den Berg, E. Sabaletta Debus, Mark J.M. Baxterley, Jose P. Llanos Palencia, Gregory L. Monetti, Jean-Baptiste Rioux, Anders Wartholen

DECLARATION
After reading members of European Society for Vascular Surgery (ESVS) and previously and/or currently affiliated to the following (chronologically ordered): Oreste E. Nannoni, Università del Piemonte Orientale, University of East and West of the 1980s as a research fellow at the Clinic for Cardiovascular Surgery, Hospital of Aosta University, under Oreste E. Nannoni (now deceased).

In various studies working as a clinician, Oreste E. Nannoni was particularly active scientifically, contributing to the establishment of the first-level National Laboratory for Biotechnology and Artificial Organs (LBO). He was focused on regenerative medicine and tissue engineering, and subsequently he wrote his habilitation thesis in this field, after 3-year training in cardiac surgery. He specialized clinically in vascular surgery and played a pioneering role in the development of this field. After having assumed director of the Clinic for Vascular Surgery – Endovascular Surgery at the First Clinic in 2016, Oreste E. Nannoni headed the Vascular Surgery – Endovascular Surgery Division at the Department of Cardiothoracic, Thoracic, Transplantation and Vascular Surgery of former Medical Clinic Professor Tassinari at a highly specialized, coordinated, and competent collegial and medical team. In April 2020, Professor Nannoni passed away after a short and severe illness. He was member and author of the ESVS guideline writing committee, an editorial colleague, and friend. We will always have his memory.



Prof. Dr. med. Oreste Ettore Nannoni
21.8.1956 – 14.4.2020

¹ The 2020 Guidelines on Management of Vascular Graft Infections are endorsed by the European Association of Nuclear Medicine (EANM) and the Society of Interventional Radiology (SIR).
² Writing Committee: Nabil Chahid, Helge Dreier, Anne Lajou, Ojan Asadian, Bastien Bonard, Jonathan Collier, Inga Koutourelis, Andrei W.A.M. Grootenboer, Karl Kienast, Jan Lindhult, Giovanni Mulino, Jan A. Sørensen, Erik Stenroos, Rainer M.J.A. Steh, Zoltan Szederits, Maurizio Verzaro, Frank Vermeulen, Thomas R. Wijn.
³ The medical writing committee included: Nabil Chahid, Helge Dreier, Anne Lajou, Ojan Asadian, Bastien Bonard, Jonathan Collier, Inga Koutourelis, Andrei W.A.M. Grootenboer, Karl Kienast, Jan Lindhult, Giovanni Mulino, Jan A. Sørensen, Erik Stenroos, Rainer M.J.A. Steh, Zoltan Szederits, Maurizio Verzaro, Frank Vermeulen, Thomas R. Wijn.
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AHA SCIENTIFIC STATEMENT

Vascular Graft Infections, Mycotic Aneurysms, and Endovascular Infections
A Scientific Statement From the American Heart Association

VASCULAR GRAFT INFECTIONS

Background

The use of synthetic material for reconstructive vascular surgery was first reported during the early 1950s. Infection involving vascular graft procedures is an infrequent but devastating complication of reconstructive vascular graft surgery and is associated with a high mortality and, in some situations, mortality. Improvements in surgical techniques and graft design, including the use of native vessels or autologous tissue, have reduced the frequency of infection and severity of complications from vascular graft infection (VGI). However, these advances have also led to more frequent vascular graft procedures occurring in a patient population with multiple underlying comorbidities that would have previously disqualified them as candidates for vascular reconstructive surgery. Underlying comorbidities, such as diabetes mellitus or chronic corticosteroid use, increase the risk of infection and serious infection-related complications. The major complications of VGI include sepsis, amputation, disruption of infected anastomosis sites with rupture or pseudoaneurysm formation, embolism to the arm or leg, stroke, systemic, central or distant infection, other sites, and death. VGI can be categorized broadly into those that occur in an extra-aortic location, primarily in the arm or leg extremities, or in an intra-aortic location, primarily within the abdomen or less commonly within the thorax.

Frequency

The frequency of VGI depends on the anatomic location of the graft. The infection rate is 1.5% to 2% for most extra-aortic grafts and as high as 6% with vascular grafts in the groin.^{1,2} For intra-aortic grafts, the infection rate is 1.5% to 5%.^{3,4} Graft infection is most common after emergency procedures and after reoperation.^{1,2,5} Aortic graft erosion or fistula communication into the duodenum or other areas of the bowel reportedly occurs in 1% to 2% of patients after aortic reconstruction.^{1,2}

Microbiology

The microbiological causes of VGI have evolved over the years. In early published studies, Staphylococcus aureus was the predominant microorganism recovered.^{1,2} Improvements in surgical techniques, administration of prophylactic antimicrobial agents, and other factors have resulted in a changing microbiological epidemiology. Vascular graft surgery performed on patients with multiple underlying comorbidities and the increased frequency of emergency procedures have contributed to the changing spectrum of infection. Other factors such as changes in hospital flora, surgery in patients with complicated vascular anatomy, and multiple revisions of previous vascular surgery have resulted in a more diverse microbio-

Walter R. Wilson, MD, Chair
Thomas C. Brower, MD, Mark A. Creager, MD, FRCR, Stephen Anton-Alexander, MD, FRCR, Patrick C. Côté, MD, FRCR, Peter B. Landrath, DOD
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On behalf of the American Heart Association Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease of the Council on Cardiovascular Disease in the Young, Council on Cardiovascular and Stroke Nursing, Council on Clinical Cardiology and Interventional Cardiology, and Council on Peripheral Vascular Disease, and Stroke Council

Key Words: AHA Scientific Statement, Vascular Graft Infection, Mycotic Aneurysm, Endovascular Infection

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Principios generales

Explante siempre, salvo contraindicación quirúrgica

Explante siempre, salvo contraindicación quirúrgica

Condiciones:

- Alto riesgo quirúrgico
- Infecc bajo grado
- Microorg < virulentos
- Sensibles a posibles AB
- Sin otras complicaciones

1.- Eur J Vasc Endovasc Surg (2020) 59, 339e384
2.- Circulation. 2016;134:e412-e460

Unfit for surgery → Palliative strategy

**Infección
Aórtica**

- Desbridamiento
- Irrigaciones con antisépticos
- Resecciones parciales

**Infección
Periférica**

Unfit for surgery → Palliative strategy

**Infección
Aórtica**

- Desbridamiento
- Irrigaciones con antisépticos
- Resecciones parciales

**Infección
Periférica**

No-explante: raramente una opción

Puede no ser necesario el explante
de zona incorporada

Eur J Vasc Endovasc Surg (2020)

Circulation (2016)

Unfit for surgery → Palliative strategy

Infección Aórtica

- Desbridamiento
- Irrigaciones con antisépticos
- Resecciones parciales

Infección Periférica

No-explante: raramente una opción

Puede no ser necesario el explante de zona incorporada

Samson III (no anastomosis):
✓ < 2 m, mejor pronóstico

Samson IV (anastomosis), si :
✓ SARM, *Pseudomonas* sp.
✓ Sangrado, complicaciones



Cultivos cuantitativos (<10 ufc/gr)



¿Existe algún hueco para el tratamiento conservador electivo?

Las complicaciones de...

Explantar



Alternativas



Explante

No-explante



Tratamiento definitivo
Mejor pronóstico



Complicaciones de la cirugía
Reinfecciones
(Volver a empezar)



Explante

No-explante



Tratamiento definitivo
Mejor pronóstico

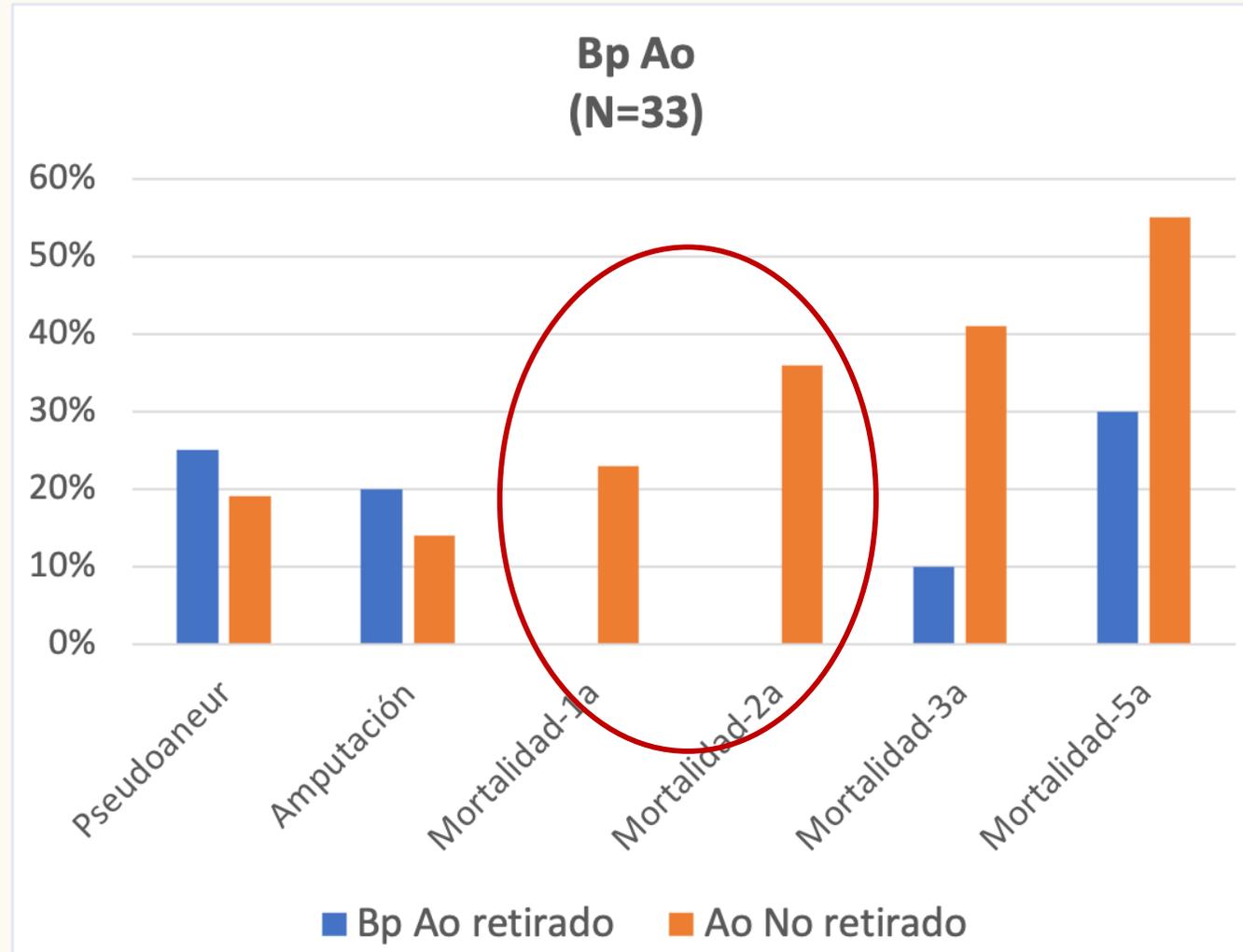
Evita los sufrimientos Qx
¿Alternativas?



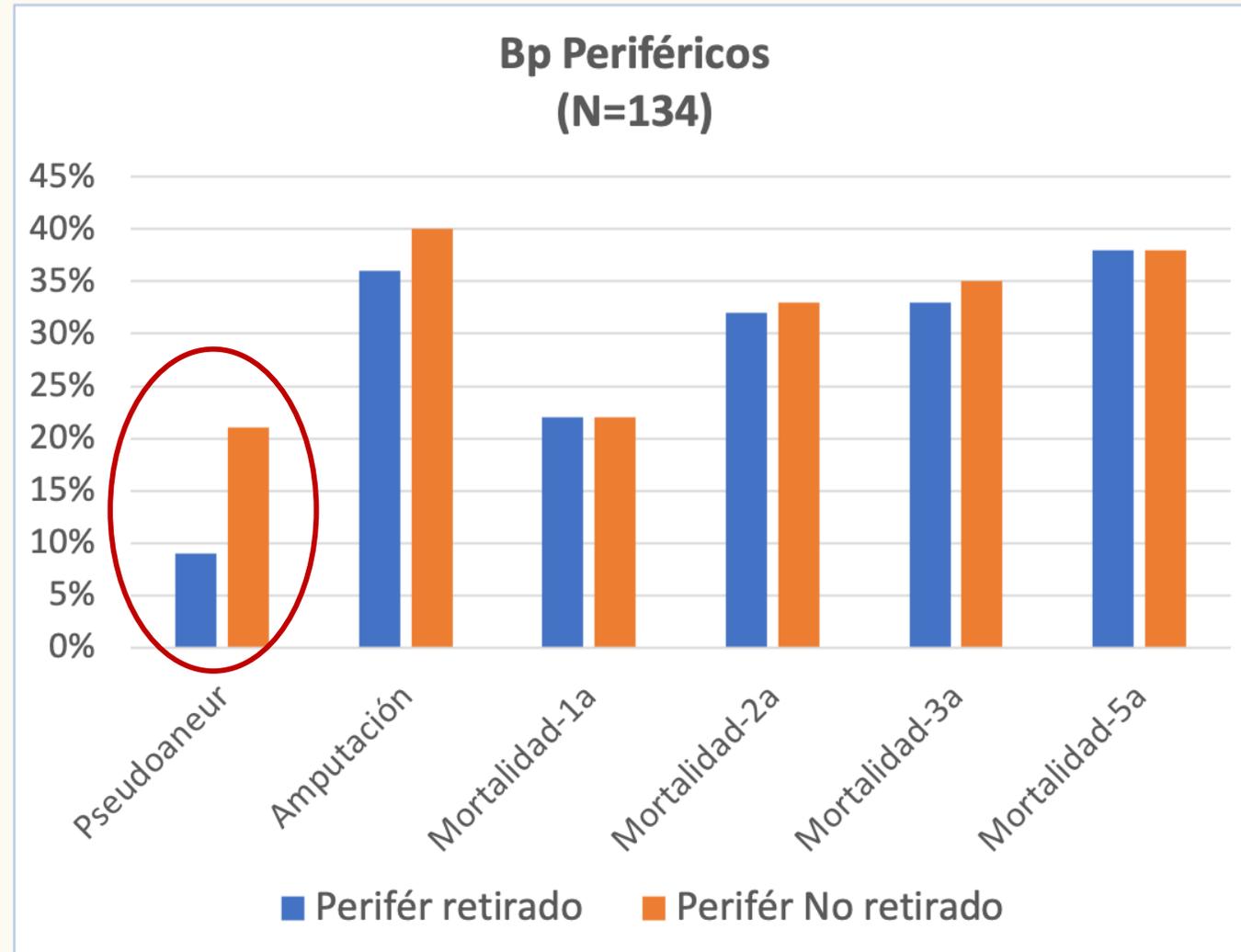
Complicaciones de la cirugía
Reinfecciones
(Volver a empezar)

Persistencia de la infección
Complicaciones relacionadas
Tratamiento supresivo

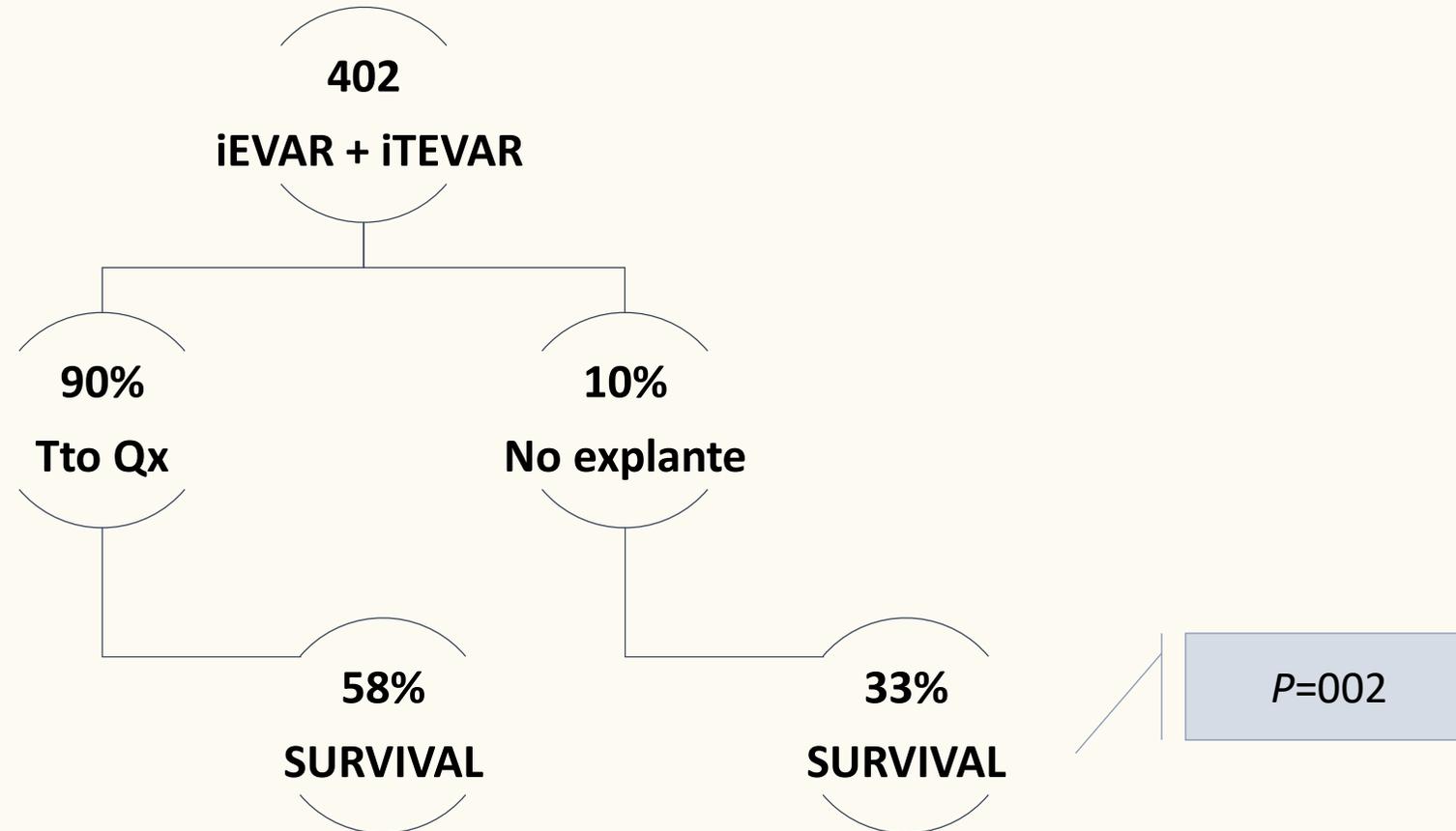
Infección Bypass Vascular: Complicaciones



Infección Bypass Vascular: Complicaciones



Current Evidence on Management of Aortic Stent-graft Infection: A Systematic Review and Meta-Analysis



Outcomes of Patients with Aortic Vascular Graft and Endograft Infections Initially Contra-Indicated for Complete Graft Explantation



Two center Retrospective Observational Analysis of Life Expectancy and Sepsis Free Survival



74 patients

INDEX PROCEDURE FOR PATIENTS WITH INFECTED VASCULAR GRAFT

44.6% Open

25.7% Endovascular

29.7% Hybrid

75.7% Causative Organism Identified

OUTCOMES

In-Hospital Mortality

20.3%

Sepsis Recurrence

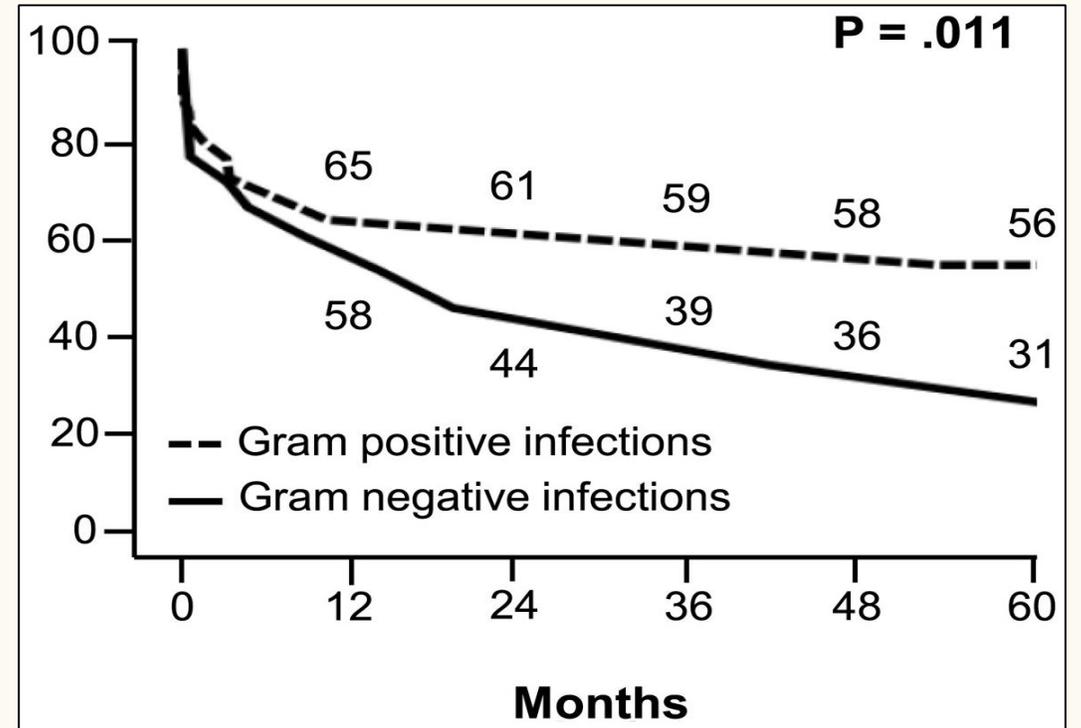
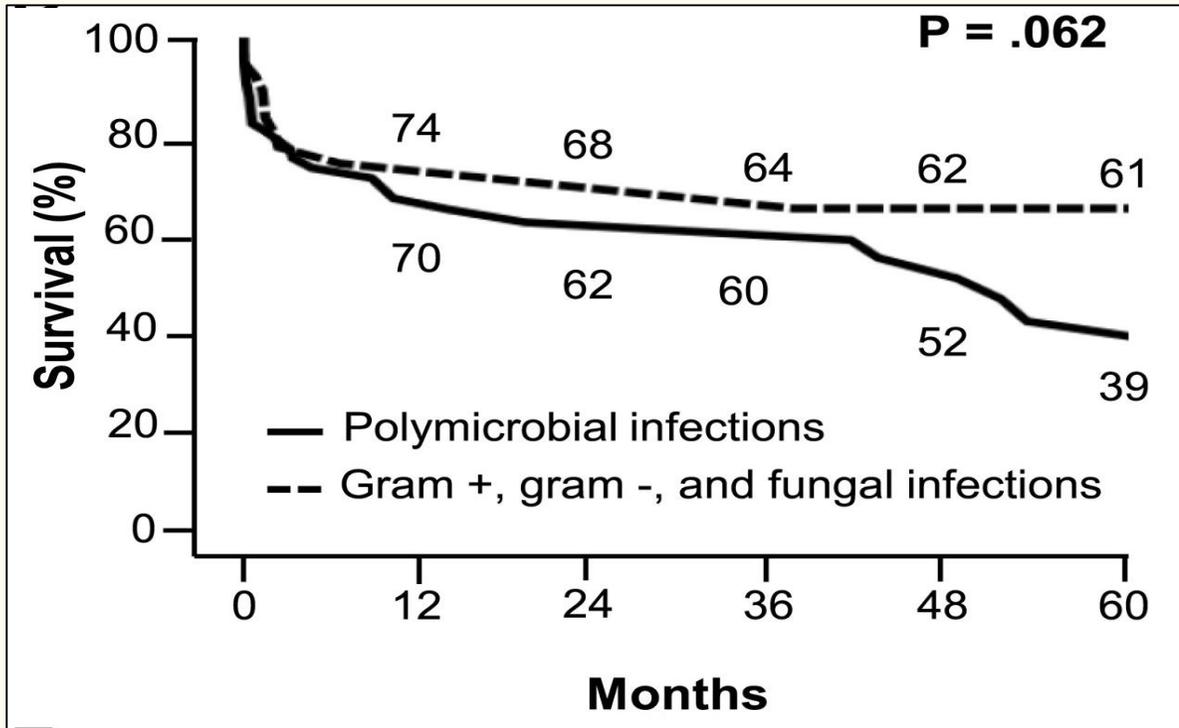
50.0%

	1 Year	5 Years
Freedom from Aortic Related Death	77.1%	61.7%
Overall Survival	70.4%	43.1%

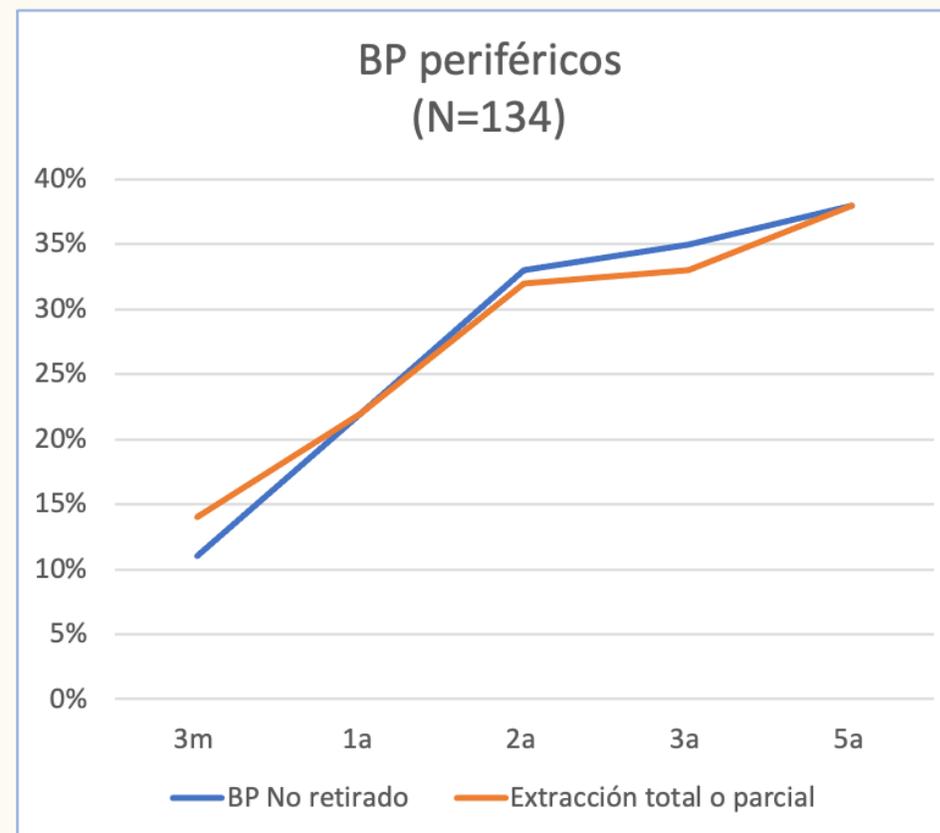
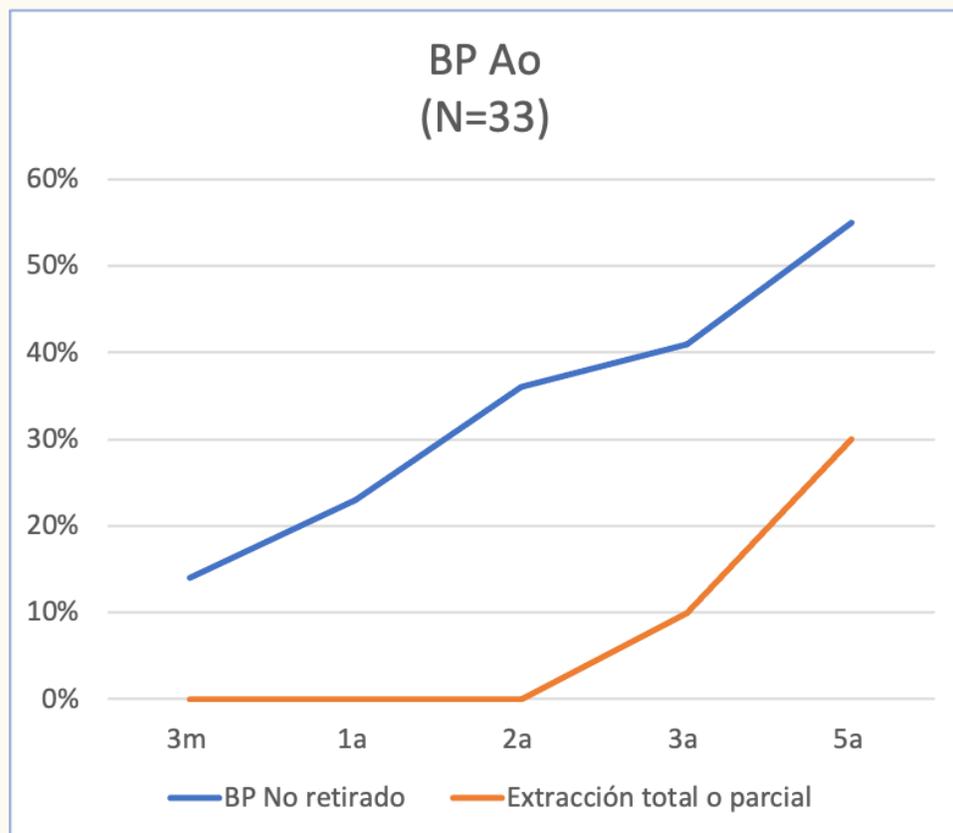
Factors Associated with Worse Survival Without Sepsis

- ▶ Malnutrition (HR 3.3)
- ▶ Hemorrhagic Shock (HR 2.9)
- ▶ Aorto-Enteric Fistula (HR 3.3)
- ▶ Fungal Coinfection (HR 3.5)
- ▶ Infection with resistant micro-organisms (HR 3.1)

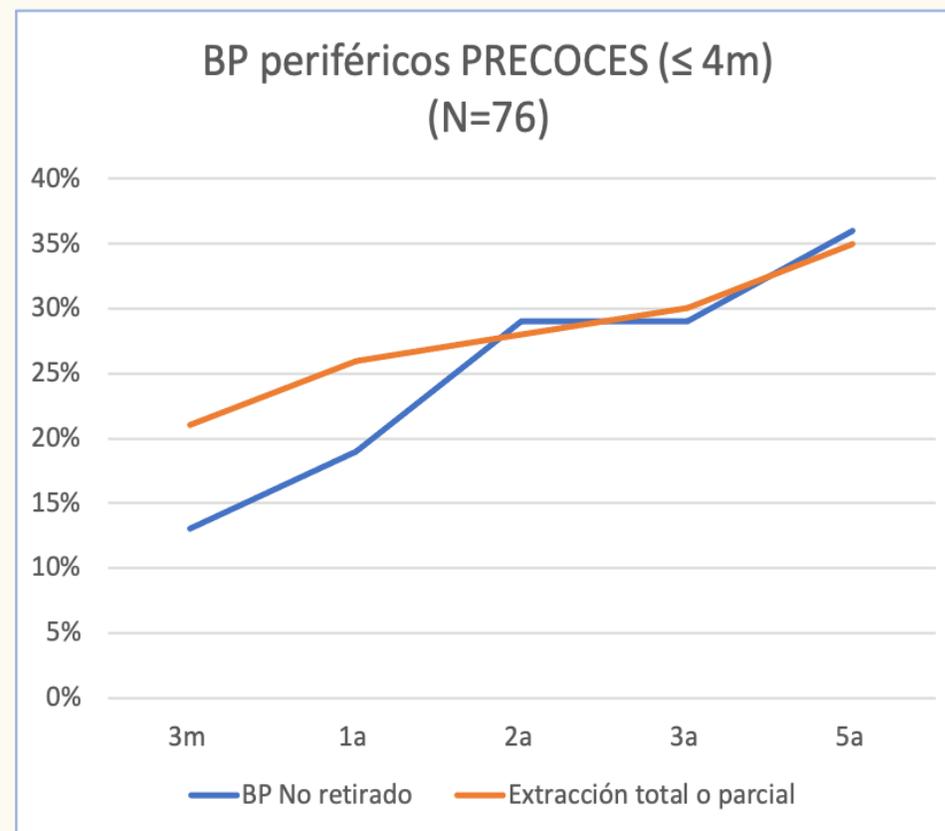
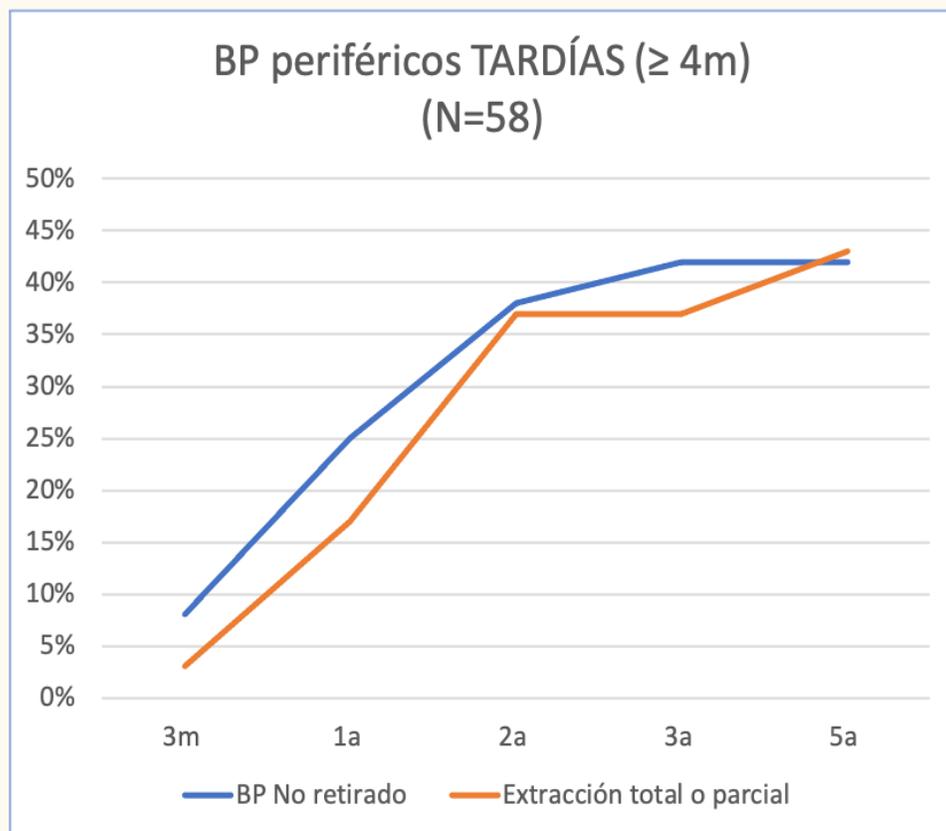
Treatment and outcomes of aortic endograft infection

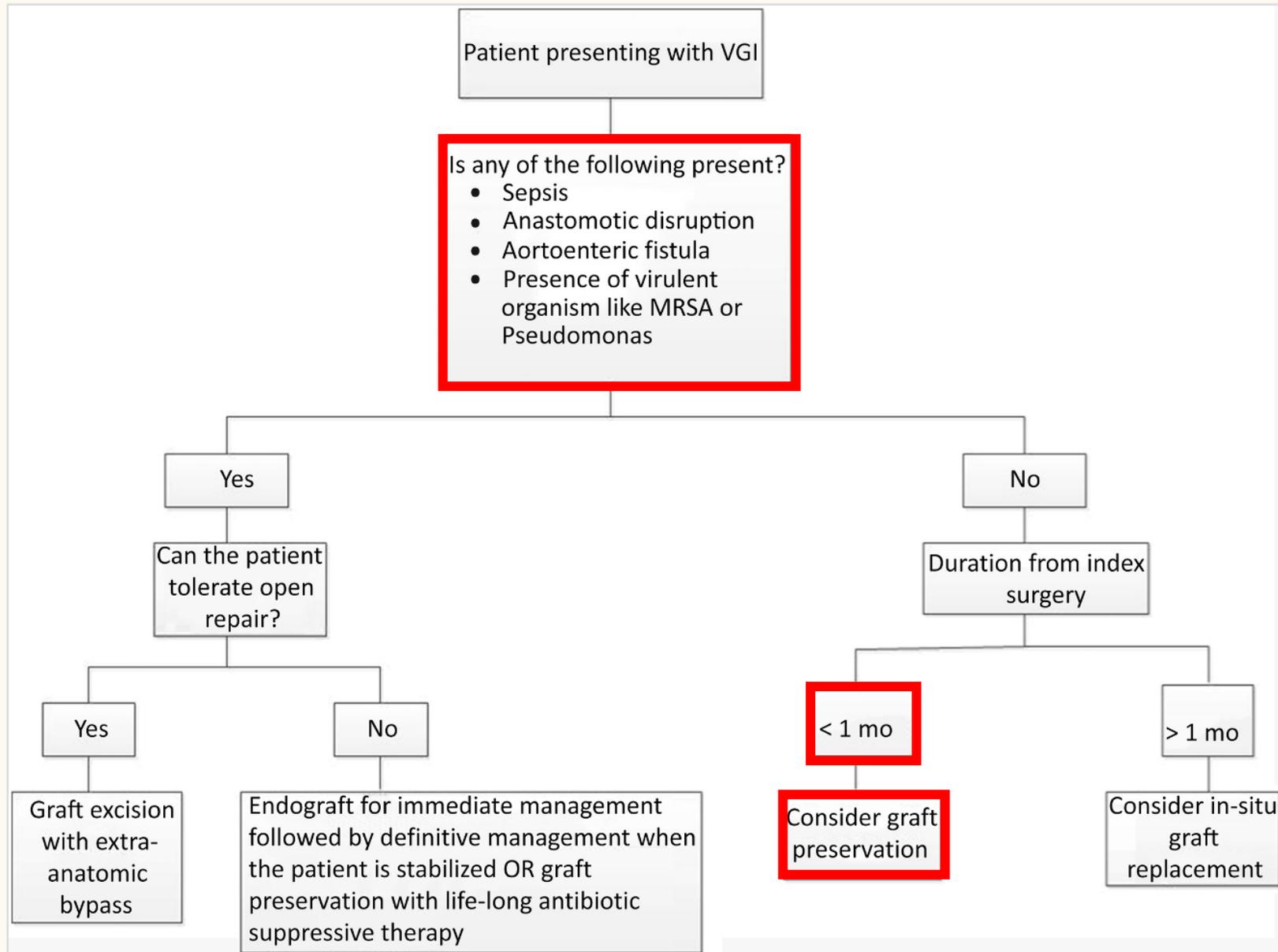


Mortalidad Global. Tratamiento Conservador vs. Explante



Mortalidad Global. Tratamiento Conservador vs. Explante





Selection Criteria for Appropriate Operative Management of Prosthetic Vascular Graft Infection

Treatment Option

Graft preservation/local therapy

Manifestations	Extent of Infection	Microbiology
Early infection, no sepsis	Not Dacron, graft body only, no anastomosis, segmental	Gram-positive organism, <i>Staphylococcus</i> spp.
No sangrado, trombosis No fístula Drenaje de colecciones	No pseudoaneurisma	No SARM No <i>Pseudomonas</i> spp. No polimicrobianas o fúngicas Posibilidad de AB supresivo

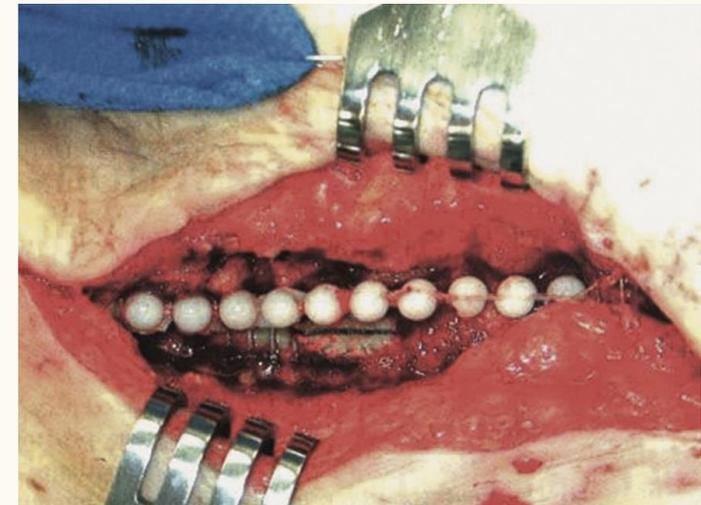
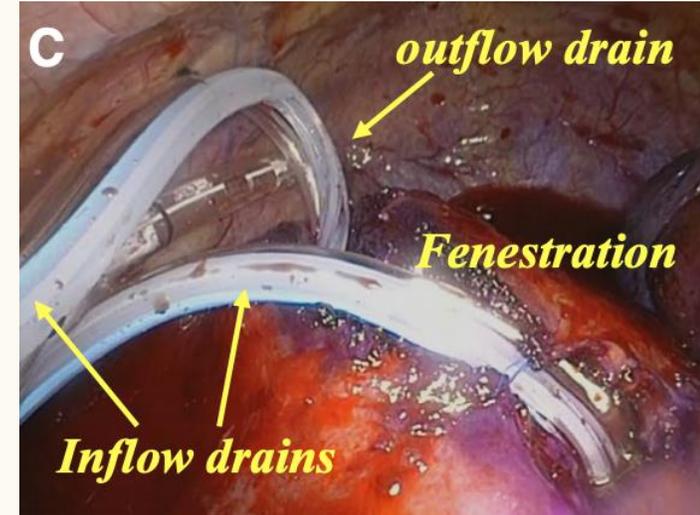
1. *Tabla adaptada de Graft infection. Capítulo 47, Rutherford, Cirugía Vascul ar y Terapia Endovascular, 9ª Edic. ISBN: 9780323427913*
2. *European Society for Vascular Surgery (ESVS) 2020 Clinical Practice Guidelines on the Management of Vascular Graft and Endograft Infections. Eur J Vasc Endovasc Surg (2020) 59, 339e384*



¿Qué hacer entonces...?

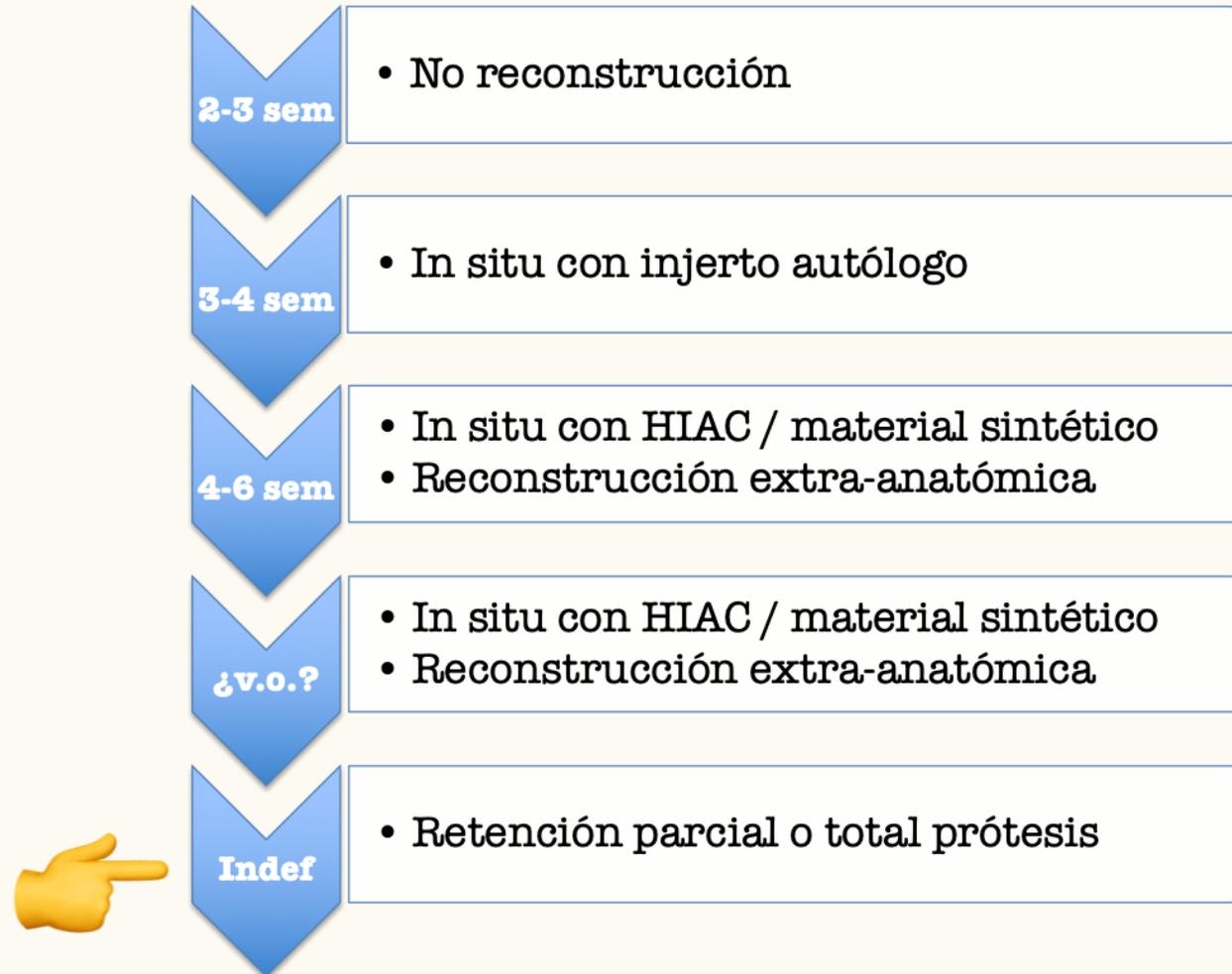
Estrategias Quirúrgicas Alternativas

- Resección parcial
- Desbridamiento amplio
- Cobertura con colgajo muscular, omento
- Curas con sistemas de presión negativa
- Irrigaciones
- “Antibiotic Beads”



1. From Yoneyama F, et al. Preservation of the infected thoracic aortic endograft with thoracoscopic drainage and continuous irrigation. *General Thoracic and Cardiovascular Surgery* (2019) 67: 259-262
2. From Stone PA, et al. Use of antibiotic-loaded polymethylmethacrylate beads for the treatment of extra-cavitary prosthetic graft infection. *J Vasc Surg.* 2006;44:757.

Pautas de duración del tratamiento antibiótico



Pautas de duración del tratamiento antibiótico

Situación	Duración del Tratamiento	
	iv	Oral
Excisión total + Implante vena autóloga	2 sem	4 sem
Excisión total + Prótesis in situ	6 sem	6 sem
Excisión total + Bp extra-anatómico		
Drenaje /Limpieza Qx	6 sem	6-12 meses
Tratamiento Conservador	6 sem	Tto supresivo indef



Pautas de Tratamiento Secuencial

Microorganismo	Tratamiento secuencial
SAMS SCNMS	Linezolid Quinolona + rifampicina Quinolona + cotrimoxazol
SAMR SCNMR <i>Streptococcus</i> sp. <i>Enterococcus</i> sp.	Doxiciclina + rifampicina Cotrimoxazol + rifampicina Cefixima/levofloxacino Amoxicilina clavulánico/Levofloxacino <i>Resistente a penicilina</i> : linezolid
Enterobacterias	Cefixima/ciprofloxacino/cotrimoxazol BLEE: ertapenem ^b
<i>Pseudomonas</i> sp.	Quinolona
Anaerobios ^c	Metronidazol Cefixima/moxifloxacino
<i>Candida</i> sp.	Fluconazol

Pautas de Tratamiento *Staphylococcus* sp.

	3-6 months or post-surgery antibiotic treatment	Life-long suppressive therapy
MSSA	<p><u>Cefazolin</u>▪ 2 g IV q8h or <u>Oxacillin</u> 2 g IV q4h + <u>Rifampin</u> 600 mg IV/PO q24h</p> <p> <u>Dalbavancin</u>▪ 1500 mg IV over 30 minutes once a week* + <u>Rifampin</u> 600 mg IV/PO q24h</p>	<p><u>Amoxicillin-clavulanate</u>▪ 1 g PO q8h or <u>Cephalexin</u>▪ 1g PO q8h or <u>Trimethoprim/Sulfamethoxazole</u>▪ 2 tablets PO q12h or <u>Clindamycin</u> 450 mg PO q8h</p>
MRSA	<p><u>Vancomycin</u>▪ loading dose of 25-30 mg/kg then 15-20 mg/kg IV q8-12h + <u>Rifampin</u> 600 mg IV/PO q24h</p> <p><u>Daptomycin</u>▪ 6 mg/kg IV q24h + <u>Rifampin</u> 600 mg IV/PO q24h</p> <p> <u>Dalbavancin</u>▪ 1500 mg IV over 30 minutes once a week* + <u>Rifampin</u> 600 mg IV/PO q24h</p>	<p><u>Minocycline</u> 100 mg PO q12h or <u>Doxycycline</u> 100 mg PO q12h or <u>Trimethoprim/Sulfamethoxazole</u>▪ 2 tablets PO q12h</p>

Pautas de Tratamiento Grampositivos-R

I	Linezolid / Tedizolid	Toxicidad Monitorización?
II	Dalbavancina ± Rifampicina	Potente actividad <i>in vitro</i> Vida media muy larga Escasos efectos adversos Poca experiencia en tratamientos muy prolongados. ¿Dosis?: 1500 mg/sem x2, inicialmente ¿Intervalos de administración? ¿Monitorización? → a partir 3 ^a -5 ^a semana
III	Oritavancina ± Rifampicina	No experiencia

1. *Antibiotics* 2022, 11, 996. <https://doi.org/10.3390/antibiotics11080996>

2. *AAC* (2022), 66 (6); 10.1128/aac.02614-20. *New Perspectives on Antimicrobial Agents: Long-Acting Lipoglycopeptides.*

Los riesgos del tratamiento supresivo...



- Eficacia?
- Efectos adversos
- Aparición de resistencias

Seguimiento

Supuesto	Tratamiento IV	Tratamiento VO	Seguimiento	Comentarios
Explante parcial	4-6 sem (al menos 10-14 días)	Indefinido (meses)	Mensual x3 y aplazar progresivamente Prot C React TC (endoprótesis) PET-TC SPECT-TC?	Valorar suspender tratamiento, a partir de 6m - 1 año?
Retención prótesis	≤ 2 sem	Tratamiento supresivo	Mensual x3 y aplazar progresivamente Prot C React TC (endoprótesis) PET-TC SPECT-TC?	Valorar suspender tratamiento, a partir del 2º-3º año?



Gammagrafía (SPECT-TC)	PET-TC
<ul style="list-style-type: none">• High sensitivity and specificity• SPECT/CT improve accuracy• Able to discriminate, also in early phases after surgery• Well standardized acquisition protocols and interpretation criteria	<ul style="list-style-type: none">• High sensitivity. Low specificity• High-quality images• High false positive rate in early phases after surgery (< 4 months)• No standardized interpretation criteria
<ul style="list-style-type: none">• Poor availability and medium costs• Often requires late acquisitions (20 h p.i.)• Blood manipulation. Requires sterile facilities and trained personnel	<ul style="list-style-type: none">• Widely available• Short length of the exam (2–3 h)• Does not need blood manipulation



¿Deberíamos suspender los antibióticos antes de una prueba de MN? ¿Cuánto tiempo antes?



En las guías y consenso de expertos: discontinuar ≥ 2 sem (Recomendación débil)

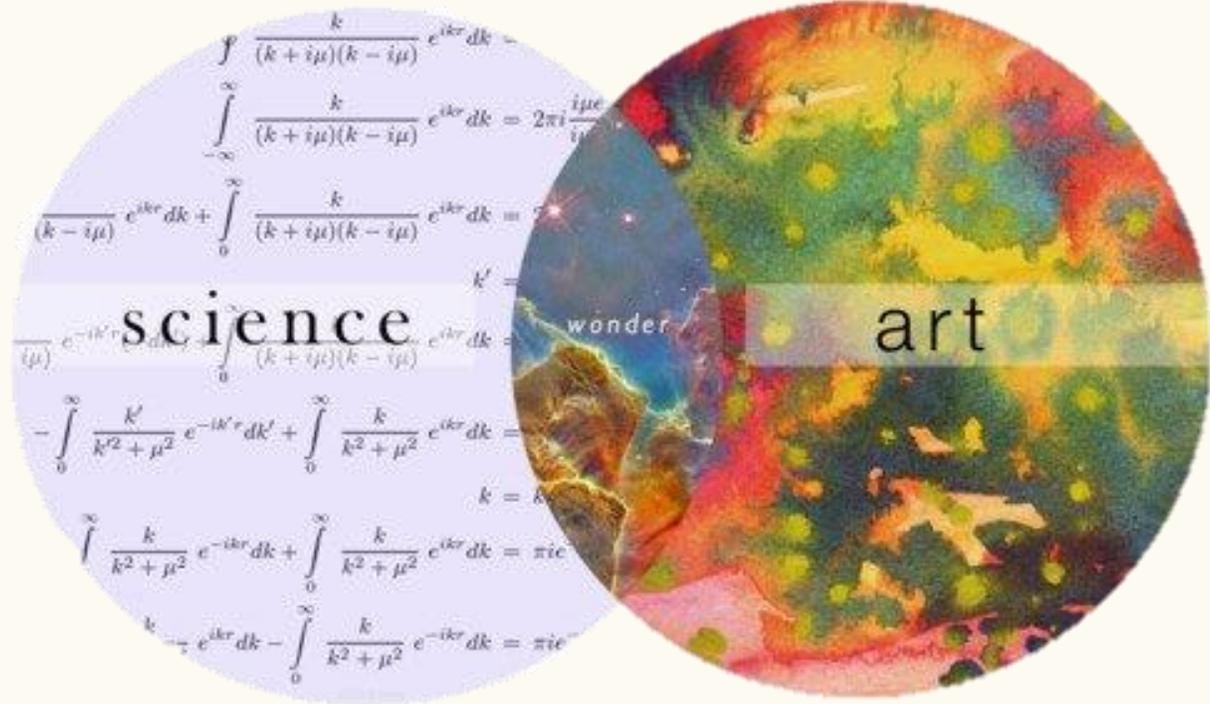
Husmann et al. (4) → descenso progresivo de SUVmax y detección de infecc residual no se ve afectada por AB



- ¿Tipo de antibiótico? ¿Duración previa?
- ¿Papel de la imagen en diferentes escenarios?

1. *European Journal of Nuclear Medicine and Molecular Imaging (2022) 49:3430–3451. [Guidelines EANM]*
2. *J Vasc Surg. (2020) 72(6):2174–2185.e2. [Meta-analysis]*
3. *Eur J Vasc Endo-vasc Surg. (2019) 57(2):292–301. [Meta-analysis]*
4. *The role of FDG PET/CT in therapy control of aortic graft infection. Eur J Nucl Med Mol Imaging. 2018;45(11):1987–97. [VASGRA Cohort Study]*

Medicina =





Se necesitan nuevos estudios...



¡GRACIAS!

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