Infected endografts: Etiology, Diagnosis, Treatment Options and Outcomes

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Disclosures

- No Financial Disclosers

Introduction

- EVAR and TEVAR have become the most common methods to repair abdominal and thoracic aneurysms
- Endograft infection rate is low:
  - All risk factors are not fully known
  - Management strategies are variable

- Staph *aureus* accounts for majority of graft infections
  - Staph *epidermidis or gram- negative bacteria infection rate has increased*
- *Gram-negative infections are virulent produce endotoxins → vessel wall integrity*

Infection	Incidance (%)
Graft Implant Site	
Descending thoracic aorta/thoracoabdominal	0.5-1.9
Aortoiliac	0.2-1.3
Aortofemoral	0.5-3
Femorofemoral	1.3-3.6
Axillofemoral	5-8
Femoropopliteal	0.9-4.6
Femorotibial	2-3.4
Carotid patch	0.25-0.5
Carotid-subclavian	0.5-1.2
Axilloaxillary	1-4
Endovascular Device	
Aortic stent-graft	0.1-1.2
Peripheral stent	<0.1

Rutherford's 9th edition, Chapter 47

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Temporal Classification of Graft Infection

- ***Early graft infection*** is related to infection of the prosthetic graft at perioperative period (0-4 months)
  - Synchronous infection
  - Hospital acquired bacteremia
  - Sepsis, fever, advanced wound infection
  - Treatment of aortoenteric fistula
- ***Late infections*** are due to graft colonization by low virulent bacteria

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Diagnosis of Endograft Infection

- Clinical diagnosis is difficult because in most cases symptoms are varied and non-specific
- Blood cultures is positive in **minority** of cases
  - The most definitive diagnosis is cultures obtained from material

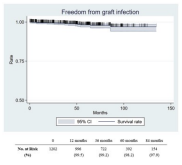
→ ***Diagnosis depends on radiographic findings***

- Functional WBC
- ^{18}F-fluoro-D-deoxyglucose position emission tomography (FDG-PET)
- FDG PET (CT)
- WBC with or without single photon emission computed tomography with lose dose CT (WBC (SPECT/CT))

Identification of Risk Factors to Develop Endograft Infection Can Prevent Infection

Factors that were associated w endograft
Concomitant coil embolization of hypo
Higher endoleaks and type II
Sac enlargement
More than 2 secondary procedures

Factors that were NOT associated w endograft infection:
- **None of patient's comorbidities or gender**
- **Graft material or type of grafts**
- **Type of access –Open vs. percutaneous**



Risk factors and treatment outcomes for stent graft infection after endovascular aortic aneurysm repair
Kota Shukuzawa, MD, Takao Ohki, MD, PhD, Koji Maeda, MD, PhD, and Yuji Kanaoka, MD, PhD, Tokyo, Japan

Journal of Vascular Surgery
Volume 70, Issue 1, July 2019, Pages 181-192

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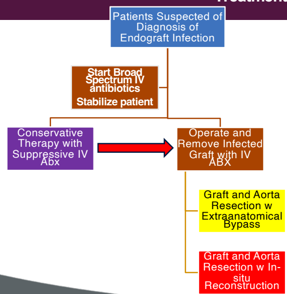
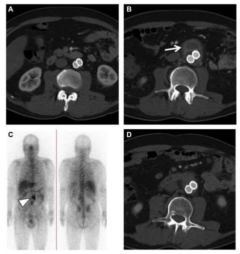
Treatment of Aortic Endograft infection





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Operative Methods: Extra-anatomic Bypass and Explanation

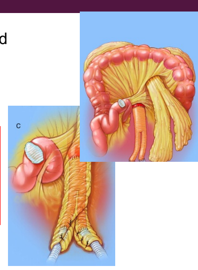
- Extra-anatomic bypass
  - Ax-bifem bypass graft
  - Explanation of infected endograft and aortic debridement

Operative Methods: In-situ Reconstruction

- Explanation of infected endograft and revascularization by
  - NAIS procedure
  - Homograft
  - Rifampin-soaked endograft

Cryopreserved arterial allografts for in situ reconstruction of abdominal aortic native or secondary graft infection

Sabrina Ben Ahmed, MD,[a,b] Adrien Louvancourt, MD,[a] Guillaume Daniel, MD,[a,b] Pierre Combe, MD,[a] Ambroise Duprey, MD, PhD,[b,c] Jean-Noël Albertini, MD, PhD,[b,c] Jean-Pierre Favre, MD, PhD,[b,c] and Eugenio Rosset, MD, PhD,[b,d] *Clermont-Ferrand and Saint-Etienne, France*



J Vasc Surg 2018;67:468-77.   Volume 53, Issue 1, January 2011, Pages 99-107.e7

(J Vasc Surg 2016;63:332-40.)

Treatment and outcomes of aortic endograft infection

Matthew R. Smeds, MD,[a] Audra A. Duncan, MD,[b] Michael P. Harlander-Locke, MPH,[c] Peter F. Lawrence, MD,[d] Sean Lyden, MD,[e] Javariah Fatima, MD,[f] and Mark K. Eskandari, MD,[g] on behalf of the Vascular Low-Frequency Disease Consortium, *Little Rock, Ark; Rochester, Minn; Bradenton and Gainesville, Fla; Los Angeles, Calif; Cleveland, Ohio; and Chicago, Ill*

- Medical management:
  - Broad Spectrum antibiotics
  - More common among TEVAR group
  - 80% mortality for TEVAR, 50% mortality for EVAR in this group*

Endograft Infection After Endovascular Abdominal Aortic Aneurysm Repair: A Systematic Review and Meta-analysis

Christos Argyriou, MD, PhD, George S. Georgiadis, MD, PhD, Miltos K. Lazarides, MD, PhD, FEBVS, more...

First Published July 31, 2017 | Research Article | Find in PubMed | Check for updates

https://doi.org/10.1177/1526602817722018

- Pooled overall mortality 45.7% for operative vs. 58.6% for the conservative group

Risk factors and treatment outcomes for stent graft infection after endovascular aortic aneurysm repair

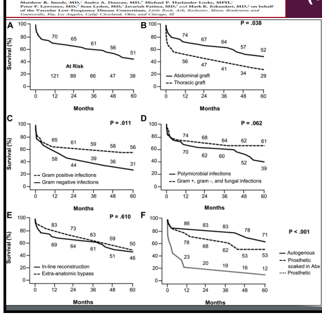
Kota Shukuzawa, MD, Takao Ohki, MD, PhD, Koji Maeda, MD, PhD, and Yuji Kanaoka, MD, PhD, *Tokyo, Japan*

- 80% of 15 patients were treated conservatively
- 16.7% in-hospital mortality
- If no AEF, treat conservatively

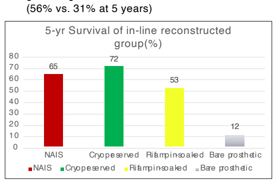
. (J Vasc Surg 2016;63:332-40.)

Treatment and outcomes of aortic endograft infection

Matthew R. Smeds, MD,[a] Audra A. Duncan, MD,[b] Michael P. Harlander-Locke, MPH,[c] Peter F. Lawrence, MD,[d] Sean Lyden, MD,[e] Javariah Fatima, MD,[f] and Mark K. Eskandari, MD,[g] on behalf of the Vascular Low-Frequency Disease Consortium, *Little Rock, Ark; Rochester, Minn; Bradenton and Gainesville, Fla; Los Angeles, Calif; Cleveland, Ohio; and Chicago, Ill*



- 30-d mortality was 11%, 5-yr survival was 51%
- Survival was worse in patients w gram-negative infections (56% vs. 31% at 5 years)



Case For Partial Excision

- **Early diagnosis of infection:**
- If the infection is detected early and appears localized to a specific area of the endograft.
- **Patient factors:**

In situations where a patient's overall health may not tolerate a more extensive surgical procedure.

Important considerations:

- **Imaging evaluation:**

Thorough imaging studies like CT scans are crucial to accurately assess the extent of infection and determine if partial excision is appropriate.

- **Multidisciplinary approach:**

Management of infected endografts usually requires collaboration between vascular surgeons, infectious disease specialists, and radiologists.

Eur J Vasc Endovasc Surg (2020) 59, 339–384

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

Nabil Chakfé, Holger Diener, Anne Lejay, Ojan Assadian, Xavier Berard, Jocelyne Caillon, Inge Fourneau, Andor W.J.M. Glaudemans, Igor Koncar, Jes Lindholt, Germano Melissano, Ben R. Saleem, Eric Senneville, Riemer H.J.A. Slart, Zoltan Szeberin, Maarit Venermo, Frank Vermassen, Thomas R. Wyss

ESVS Guidelines Committee, Gert J. de Borst, Frederico Bastos Gonçalves, Stavros K. Kakkos, Philippe Kolh, Riikka Tulamo, Melina Vega de Ceniga

Document Reviewers, Regula S. von Allmen, Jos C. van den Berg, E. Sebastian Debus, Mark J.W. Koelemay, Jose P. Linares-Palomino, Gregory L. Moneta, Jean-Baptiste Ricco, Anders Wanhainen

Recommendation 41

Partial excision of infected an aortic vascular graft/endograft may be considered when infection is documented as limited and the remaining material is well incorporated.

Class	Level	References
IIb	C	Mirzaie *et al.* (2007),[163] Simmons *et al.* (2017),[186] Phang *et al.* (2019)[187]

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Conclusions

1. Rate of endograft infection is low but leads to very high mortality rates
   - ***Best to avoid endografts with synchronous infection***
     - ***Endograft for AEF***
2. ***Radiographic Diagnosis***
   WBC scintigraphy or FDG PET scan if CTA is equivocal
3. ***Operative vs. Medical management:*** If patient can tolerate it, it is best to remove the infected endograft
   1. All AEF should be treated operatively
   2. If gram negative cultures, treatment should be extra-anatomic bypass and excision

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