Contemporary Management of Aorto-Enteric Fistulas

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Disclosures

None

Historical primer: Astley Cooper

- Pioneering British surgeon of the 19th century (Cooper's ligament, disease, fascia)
- First person to ligate the aorta (Cooper's procedure, 1817)
- First to describe an aorto-enteric fistula: "*rare, but life-threatening complication of aneurysmal aorta*" (1829)

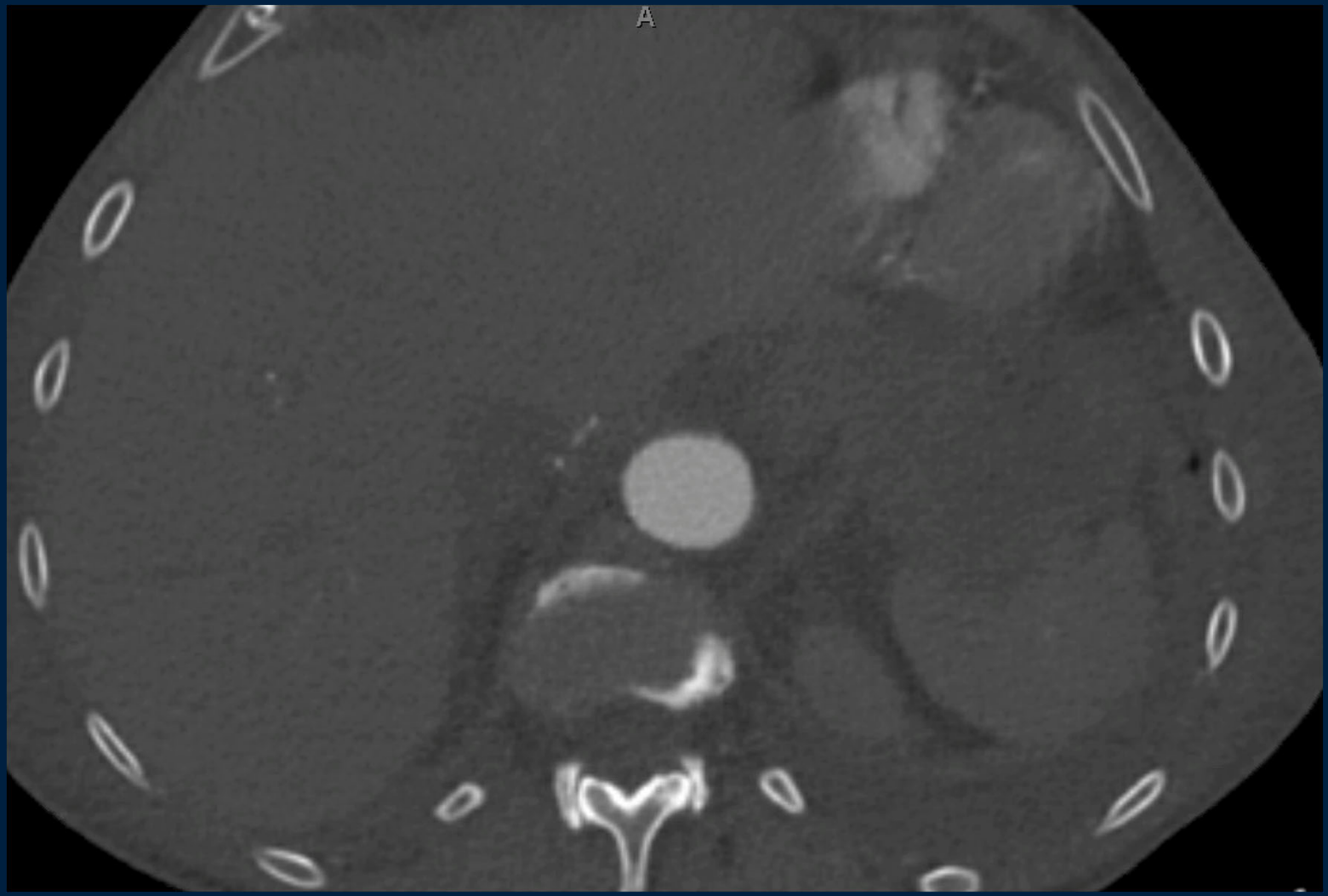
Sir Astley Cooper (1768-1841)

Case presentation: Ms. J

- 75 yo female with a PMHx of atrial fibrillation, HFpEF, ovarian cancer (TAHBSO), aorto-bi-iliac repair for an aortic and common iliac artery aneurysm (2018)
- Retired and lives with husband, exercises weekly
- Presented to community hospital with hypotension and GI bleed (Hb 60s, BRBPR)
- Underwent colonoscopy (negative) and then urgent CT scan

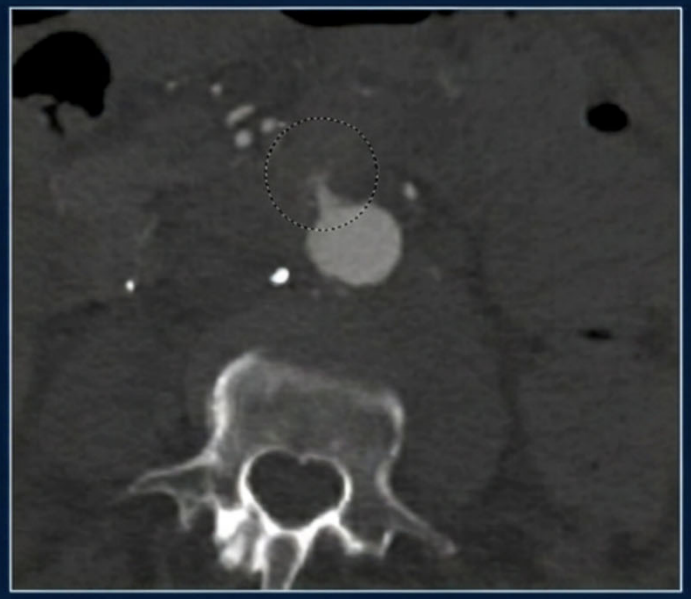
VGH UBC hospital foundation

CT:



Case presentation: Ms. J

- CTA: 6x7mm pseudoaneurysm at previous ABF repair site with adjacent contrast extravasation in D3
- Transferred to Vancouver General Hospital
  - Pressor support
  - Resuscitated with blood, FFP, platelets
- Permissive hypotension



Ms. J; axial cut, PSA with contrast extravasation into duodenum

What would you do? (POLL Q)

A. Endovascular salvage with stent graft
B. Extra-anatomic reconstruction (ax-bi-fem with aortic ligation)
C. In-line reconstruction (cryo-preserved graft, rifampin soaked Dacron)
D. Neo-aorto-iliac System (NAIS)

What would you do? (Response)

Intra-op imaging:

Successful deployment of Medtronic cuff (25 mm x 45 mm) to temporize bleed

Management of AEF: core principles

Hemorrhage control

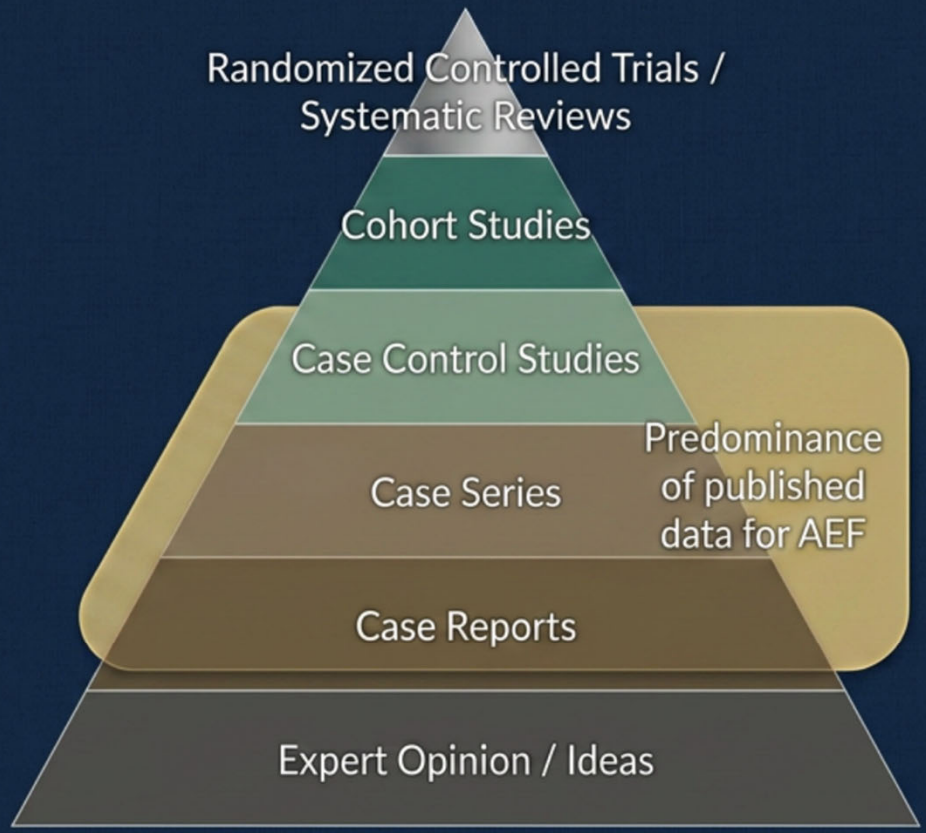
Sepsis control

Maintenance of lower-limb perfusion

Management options for AEF:

Endovascular
- Bridge to definitive repair
- Palliative solution

Open
- Extra-anatomic
- In-line reconstruction
  - Rifampin-soaked Dacron
  - Bovine pericardium
  - Cryo-preserved graft
  - NAIS



Bridge to definitive repair: is it effective?

- Not a novel concept; several descriptions in the literature.
- The key question is whether endovascular salvage staged with open repair yields better outcomes.
- Currently, there are no head-to-head comparisons.
- But what DO we know?

Temporizing stent graft for aortoenteric fistula with massive gastrointestinal hemorrhage

Patel RM, et al. | Sage Journals, Vol 32, Issue 2, 2022

SAGE

Endovascular Management of Bleeding Aortoenteric Fistula May be Feasible as a Definitive Repair

Kuldeep Singh · Mina Guerges · Amy Rost · ... · Ritu Aparajita · Jonathan Schor · Jonathan Deitch ... Show more

Emergent endovascular treatment of a bleeding recurrent aortoenteric fistula as a "bridge" to definitive surgical repair

Enrico Maria Marone, MD · Doniele Mascia, MD · Andrea Kohlberg, MD · Yamume Tshombo, MD · Robert

Affiliations & Notes · Article Info

JVS

Secondary aortoenteric fistula successfully treated with staged endovascular repair and duodenal resection without graft removal

Marco Maria Lirici, Simone Maria Tierno, Rocco Giudice, Carlo Cos
Maria Giovanna Graziani & Gabriele Pogany

Open repair: unstable presentation associated with poor outcomes

Shock (p<0.01) and pre-operative transfusion (p<0.01) use of suprarenal aortic clamping during aortoenteric fistula repair (P = .03) associated with higher 30 day mortality

Septic shock ($P < .001$), emergency operation ($P = .003$), emergency allograft replacement ($P = .0075$), surgical complication ($P = .003$) or medical complication ($P < .0001$), and need for repeat operation ($P = .04$)

Stent as a definitive solution?

Controversial, but there are those who advocate for it under certain circumstances

- Limited life expectancy or malignancy
- Patients too frail to tolerate aortic cross-clamping
- Low clinical, lab, or imaging burden of infection
- Primary AEF less likely to become reinfected

Journal of Vascular Surgery
Volume 49, Issue 3, March 2009, Pages 782-789
Outcome after endovascular stent graft repair of aortoenteric fistula: A systematic review

George A. Antoni
Andreos Georgio
MSc, PhD, EBSQu

EEREVISR
Journal of Vascular Surgery
Volume 34, Issue 6, December 2001, Pages 1055-1059

Clinical Reseorch Studies
Endovascular repair of bleeding aortoenteric fistulas: A 5-year experience *, **

Presenied ot the Tvienty-fifth Annuol Meeting of the Southern Assosiotion for Vascular Surgery, Rio Grandv, Puerto Rico, Jan 24-27,

James A.
Morin ME

ELEEVIER
Europeon Journal of Vascular and Endovascular Surgery
Volume 41, Tssue 5, Moy 2011, Pages 625-634

Open or Endovascular Repair of Aortoenteric Fistulas? A Multicentre Comparative Study

S K. Kakkos [a], [illegible], D N. Antoniadis [h], C.M. Kionoris [a], K O. Papazoglou [d], A D. Giannoukos [i], M.I. Mutsogkos [j], T. Kotsis [k], K. Dervisis [l], T. Gerosimidis [e], L A. Trolakis [e], C.D; Liapis [f]

Review

Editor's Choice – Management of Secondary Aorto-enteric and Other Abdominal Arterio-enteric Fistulas: A Review and Pooled Data Analysis

S.K. Kakkos [a b], C.D. Bicknell [b], I.A. Tsolakis [b], D. Bergqvist [c] the Hellenic Co-operative Group on Aortic Surgery [d]

European Journal of Vascular and Endovascular Surgery

Volume 52, Issue 6, December 2016, Pages 770-786

European Journal of Vascular & Endovascular Surgery

esvs Journal

UBC

European registry review and pooled data analysis aimed at studying the relative effectiveness of open and endovascular techniques for AEF management

» 216 publications and 823 patients:

- Open surgery (N=823)
- Endovascular (N=98)
- Staged endovascular to open surgery (N=13)

Effectiveness of endovascular:

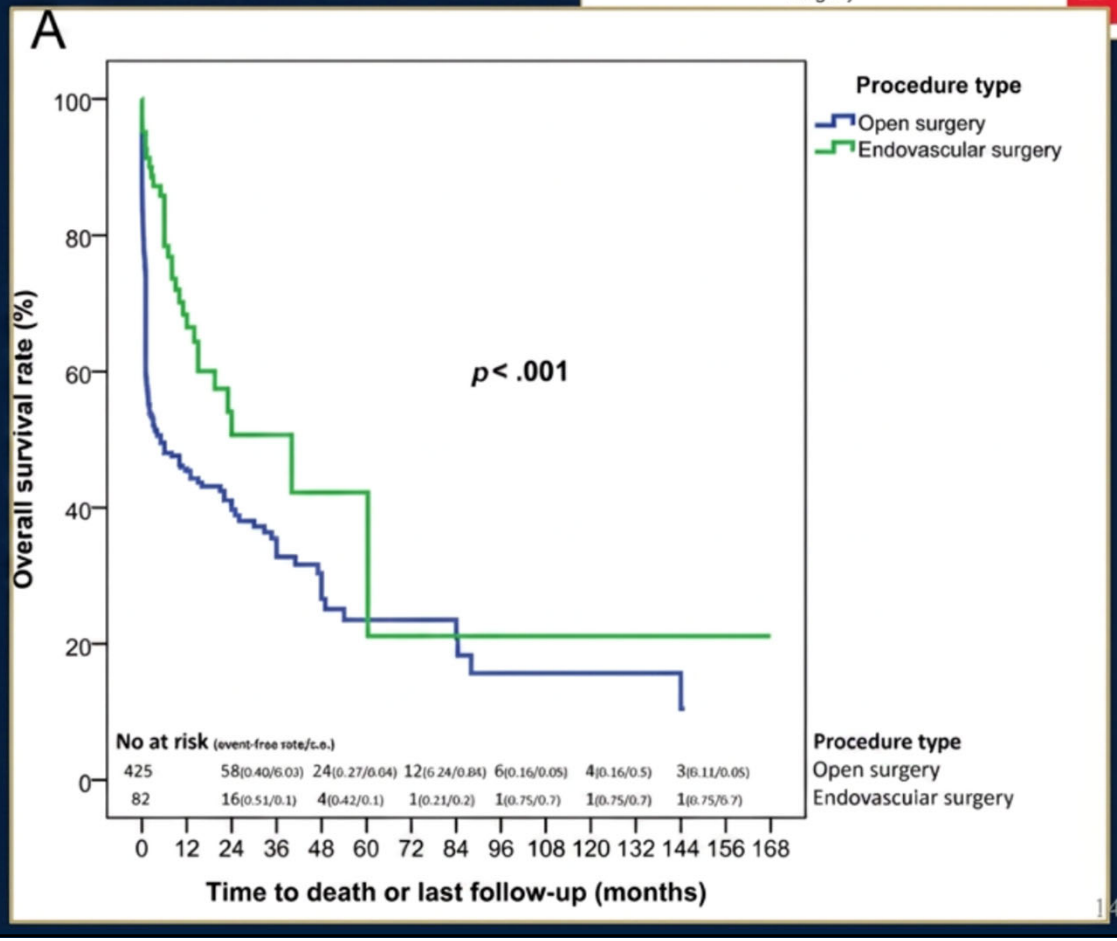
- ➔ Endo associated with significantly reduced in-hospital mortality (7.1% vs 33.9%), survival curves meet at 2 year mark (51% vs 40%)
- ➔ Endo associated with high sepsis recurrence (42% vs. 19%, at 2 years)
- ➔ Staged repair was shown to have excellent results (N=13), 0% mortality

Endo associated with early survival benefit, quickly lost during long-term follow-up due to recurrent sepsis.

Review

Editor's Choice – Management of Secondary Aorto-enteric and Other Abdominal Arterio-enteric Fistulas: A Review and Pooled Data Analysis

European Journal of Vascular and Endovascular Surgery



Back to Ms J…

- Did well post endovascular temporization, but declined open surgery at index admission
- Discharged and back to functional independence at home
- Found to have recurrence of abdominal symptoms and sepsis 8 months after
- Now keen on definitive surgery

75 year old female:

- Atrial fibrillation
- HFpEF
- Ovarian cancer (TAH-BSO)
- Smoker
- Aorto-bi-iliac repair for an aortic and common iliac artery aneurysm (2018)

What would you do (POLL)

A) Extra-anatomic reconstruction (ax-bi-fem with aortic ligation)

B) In-line reconstruction (cryo-preserved graft)

C) In-line reconstruction (Rifampin soaked Dacron)

D) Neo-aorto-iliac System (NAIS)

What would you do? (Response)

Open reconstruction of AEF:

	In-situ	Extra-anatomic
Advantages	Excellent patency rates	Avoid grafting in ++ contamination
	Antegrade flow to pelvis	Lower physiologic burden
Disadvantages	Increased clamp time/blood loss	Risk of stump-blowout (24% in O'Hara series, n=8)
	Higher physiologic burden	5-year patency low (65%, Bacourt et al)

Caveat!!!

- Data regarding stump blowout rates and long-term patency stem from graft infection literature (which includes, but is not specific to AEF).
- Does AEF cohort survive long enough to realize these outcomes?
- Paucity of data regarding outcomes of AEF as a distinct subgroup.

Aorto-enteric fistula ≠ Aortic graft infection

In-situ vs extra-anatomic: summary of the evidence

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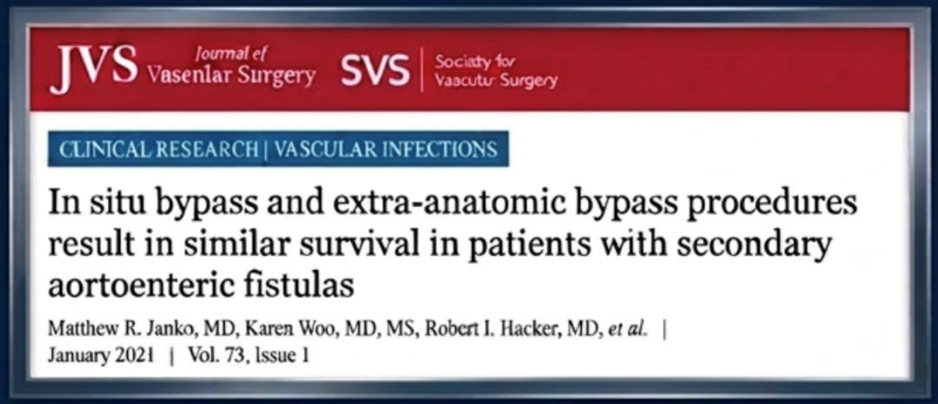

JVS Journal of Vascular Surgery | SVS Society for Vascular Surgery

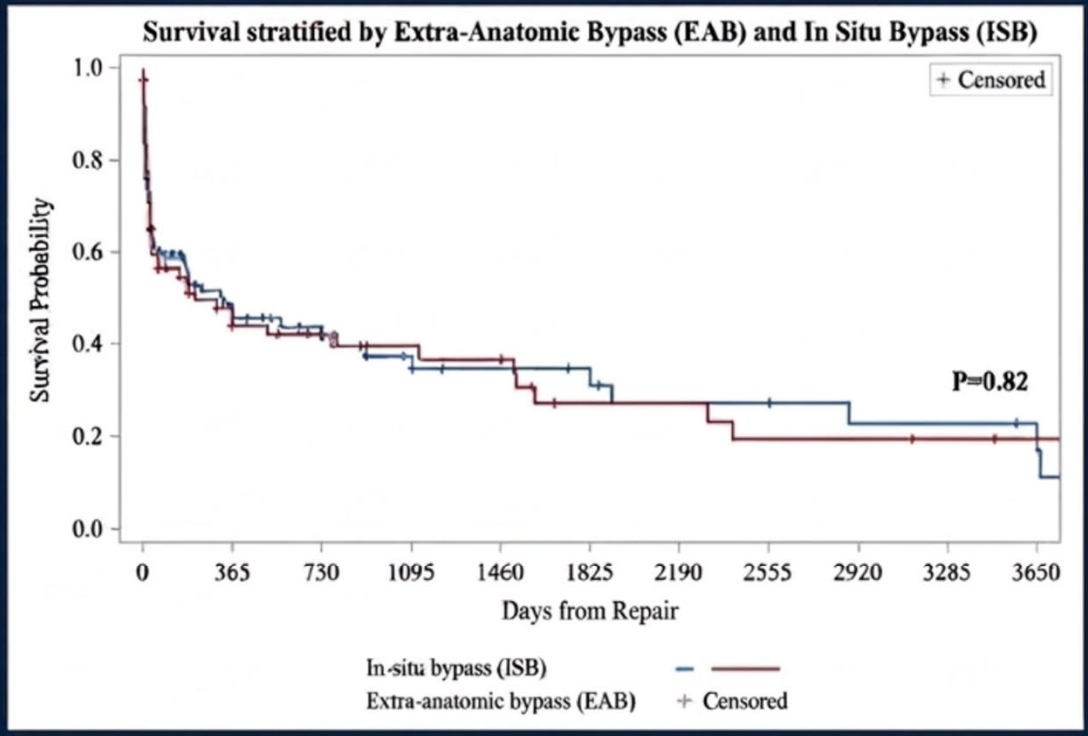
CLINICAL RESEARCH | VASCULAR INFECTIONS

In situ bypass and extra-anatomic bypass procedures result in similar survival in patients with secondary aortoenteric fistulas

Matthew R. Janko, MD, Karen Woo, MD, MS, Robert I. Hacker, MD, *et al.* |
January 2021 | Vol. 73, Issue 1

Janko *et al.* conducted a large multi-center retrospective study across the USA, comparing the outcomes of Extra-Anatomic Bypass (EAB) versus In Situ Bypass (ISB). Key conclusions were:

- After repair, <50% of SAEF patients survive 10 months
- No difference between EAB vs ISB



Survival stratified by extra-anatomic bypass (*EAB*) and *in situ* bypass (*ISB*).

In-situ vs extra-anatomic: summary of the evidence

- For those with AGI (in general) EAB associated with less intra-operative hemorrhage, lower patency, higher amputation rates

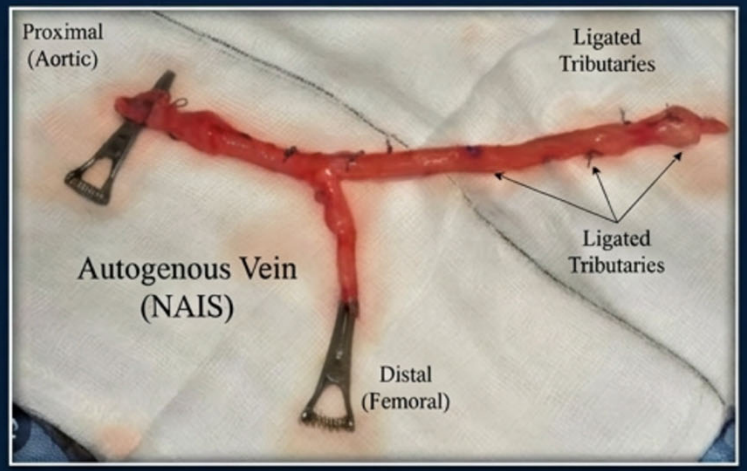
- Without enteric involvement median survival is 6 years for aortic graft infections, with enteric involvement is less than 11 months

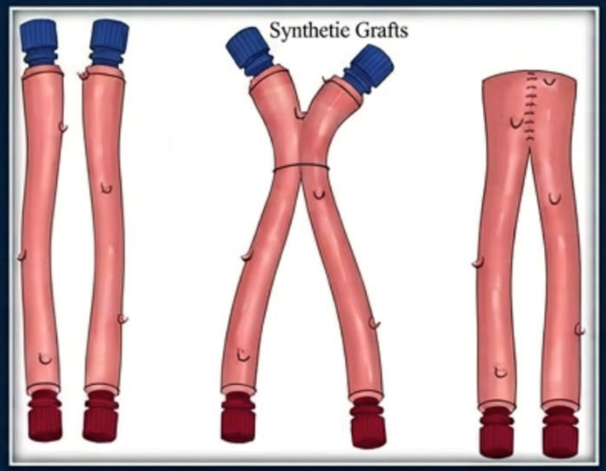
Management options for AEF:

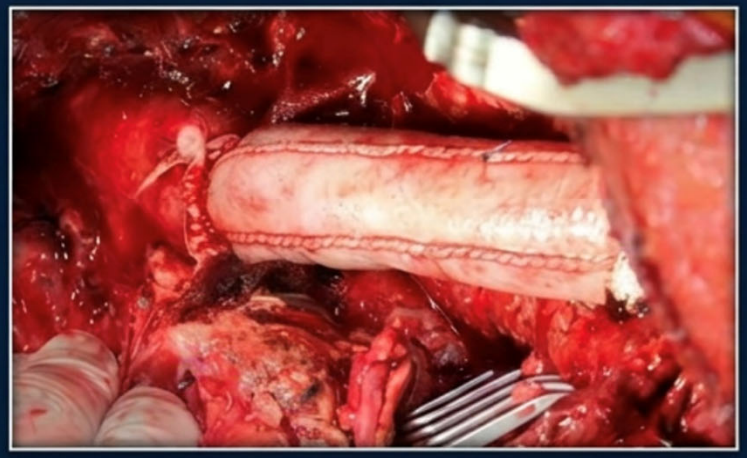
Endovascular
- Bridge to definitive repair
- Palliative solution

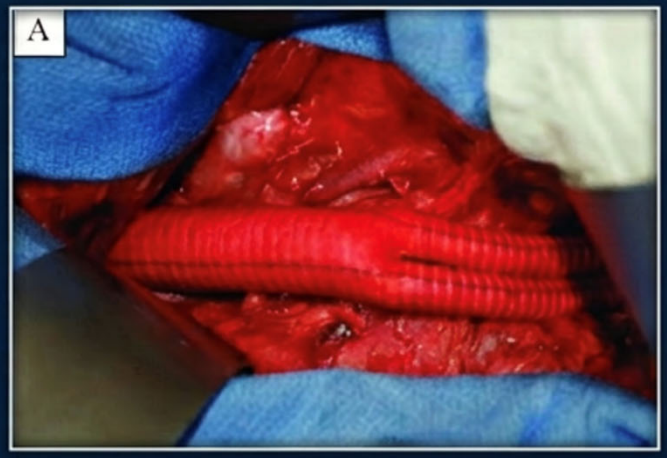
Open
- Extra-anatomic
- In-line reconstruction
  - Rifampin-soaked Dacron
  - Bovine pericardium
  - Cryo-preserved graft
  - NAIS

Choice of conduit









Choice of conduit for in-situ repair: Femoral vein (NAIS)

- ➢ High patency
- Primary patency rates at 1, 5, and 20 years: 93%, 85%, and 83% (Savoie-White et al)
- ➢ Low re-infection
- 3.7% - 7.1% (Savoie-White, Lee)
- ➢ Modest re-intervention rates
- 23% (Savoie-White)

- ➢ Compartment syndrome, VTE (12-15%, Ali et al)
- ➢ Mean OR time ~7-11 hours (Ali et al)

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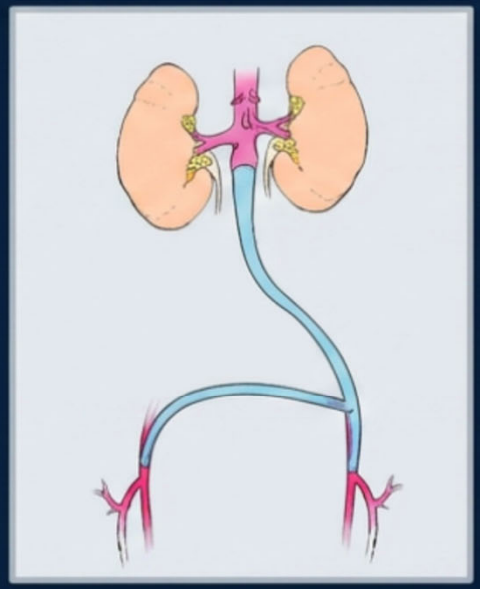
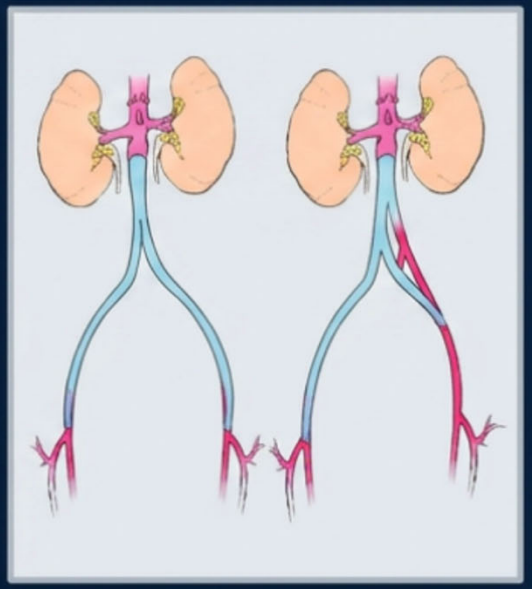
Long-term results of the neo-aorto-iliac system procedure as a compelling choice for the treatment of aortic infections

Félix H. Savoie-White, MD, MSc · Ievgen Gegiia, MD, MSc · Rose Gorak Savard, MD · ... · julien Bernatchez, MD, MMSc · Valérie Gauvin, MD · Pascal Rhéaume, MD ... Show more





Choice of conduit for in-situ repair: cyro-preserved allograft

- ➢ High patency
- • Primary patency rates at 5 years: 80% (Couture et al)
- ➢ Re-infection: 2 - 8.5% (Couture, Weiss)

- ➢ Graft related complications:
- • Weiss: 29% graft related complications (rupture, PSA, occlusion)
- • Couture: 8.5% complete/partial rupture
- • Touma: 19% graft complication rate
- ➢ Availability/price

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Long-term results of cryopreserved allografts in aortoiliac graft infections

Salome Weiss, MD · Bernodette Bochofen · Matthios K. Widmer, MD · Vladimir Makoloski, MD · Jürg Schmidli, MD · Thomas R. Wyss. MD

European Journal of Vascular & Endovascular Surgery | esvs

Short and Mid Term Outcomes of Cryopreserved Abdominal Aortic Allografts Used as a Substitute for Infected Prosthetic Grafts in 200 Patients

Thibault Couture · Julien Goudric · Sophie Tezenos Du Montcel · ... · Mohomed Jarroya · Laurent Chiche · Fabien Koskas ... Show more

European Journal of Vascular & Endovascular Surgery | esvs

In Situ Reconstruction in Native and Prosthetic Aortic Infections Using Cryopreserved Arterial Allografts

J. Touma · F. Cochennec · J. Porisot · A. Fiolaire Legendre · J.-P. Becquemin · P. Desgranges

Choice of conduit for in-situ repair: rifampin soaked Dacron

- ➢ High primary patency rates
- 92% at 5 years: 92% (Couture, Oderich)
- ➢ Low re-infection with RSD + omental wrap + longterm abx – 4% (Oderich et al)

- ➢ Long-term antibiotic suppression

Not recommended for:

- Large abscess/perigraft purulence
- Virulent organisms (MRSA, pseudomonas, rifampin resistant strains)

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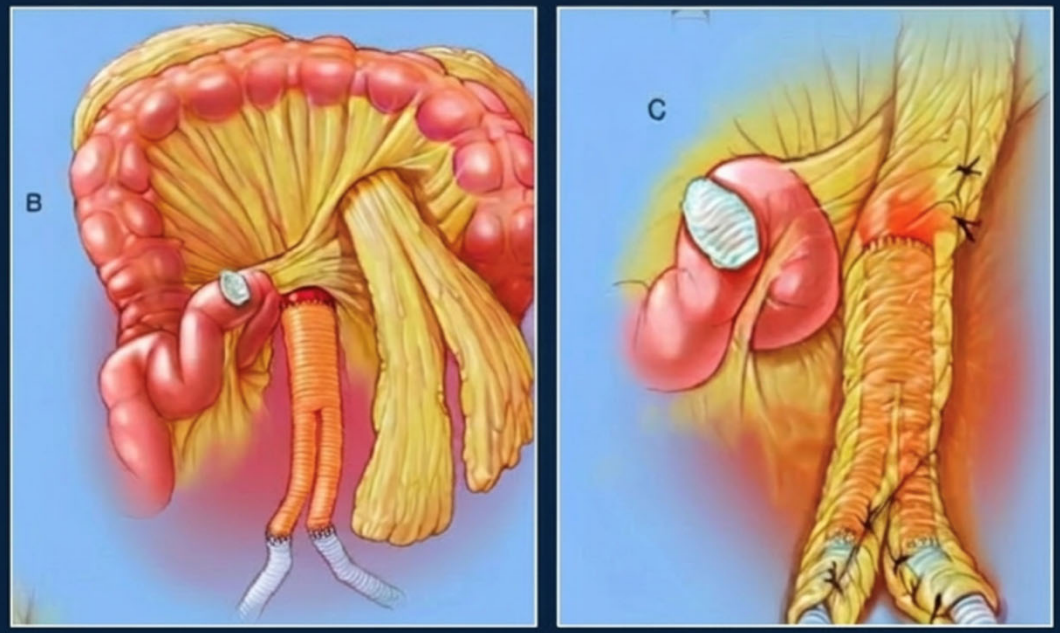
In situ rifampin-sooked grafts with omental coverage and antibiotic suppression are durable with low reinfection rates in potients with aortic graft enteric erosion or fistula

Gustovo S. Oderich, MO · Thomas C. Bower, MD · Jan Hofer, iKN · ... · John W. Wilson, MO · Stephan Cho, MS · Peter Glovicski, MD ... Show more



Back to Ms. J

- Underwent repair with cryopreserved graft and bowel repair with general surgery
- Lengthy post-operative ICU stay, with eventual wean off vent, transfer to ward and discharge to rehab
- Unfortunately passed away from respiratory complications ~2 months post-op

Conclusion: takeaways

- **AEF are distinct from AGI** and represent a highly lethal cohort, with ~ 50% mortality at 1 year despite appropriate therapy
- **Endovascular repair is valuable as a temporizing bridge to open surgery** and may be a definitive option in carefully selected patients
- **Given poor long-term survival**, the patency advantages of autologous reconstructions seen in AGI may offer limited benefit in AEF

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