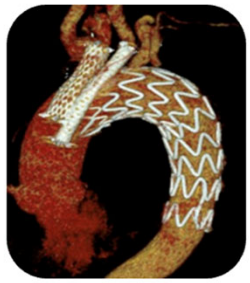
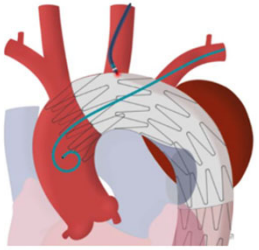
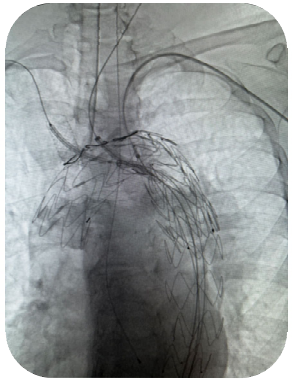
Winnipeg vascular and Endovascular Symposium
April 25th 2026

Endovascular arch repairs in emergencies



William Fortin
MD, MSc, FRCSC
Vascular and endovascular surgery
Hôpital du Sacré-Cœur de Montréal

WVES

THE CANADIAN SOCIETY FOR VASCULAR SURGERY

HSCM

Conflicts of Interest

- Consultant – Medtronic
- Consultant/Proctor – WL Gore & Associates

Background

Endo-arch history

- Endovascular aortic repair has gained significant traction over the past two decades for descending thoracic repair
- Endovascular arch repair remains fairly new

Tim Chuter
USA

~ 2003 –
First single-branch cases

2009 –
First multi-branch total arch case

Cherrie Abraham
Montreal, Canada

2014 –
First case series
Arch grafts

Background

Guidelines summary

- Endovascular arch repair has no strong literature

  **** Elective >>> urgent cases ****

→ Rarer

→ Literature relies almost only on retrospective data

- ➢ Large centers' monocentric papers
- ➢ Few multicentric papers

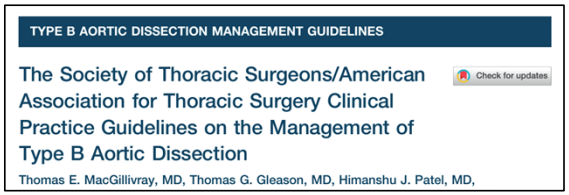
→ We must rely on TEVAR guidelines and clinical expertise

2021 SVS descending guidelines


SOCIETY FOR VASCULAR SURGERY PRACTICE GUIDELINES

Society for Vascular Surgery clinical practice guidelines of thoracic endovascular aortic repair for descending thoracic aortic aneurysms

2022 STS/AATS TBAD guidelines


TYPE B AORTIC DISSECTION MANAGEMENT GUIDELINES

The Society of Thoracic Surgeons/American Association for Thoracic Surgery Clinical Practice Guidelines on the Management of Type B Aortic Dissection

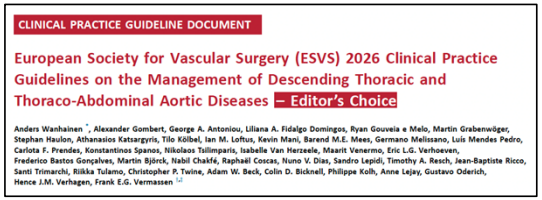
Thomas E. MacGillivray, MD, Thomas G. Gleason, MD, Himanshu J. Patel, MD,

2025 ESVS aTEVAR consensus


ESVS CONSENSUS STATEMENT

Editor's Choice – European Society for Vascular Surgery (ESVS) 2025 Clinical Practice Consensus Statement on Ascending Thoracic Endovascular Aortic Repair

2026 ESVS descending guidelines


CLINICAL PRACTICE GUIDELINE DOCUMENT

European Society for Vascular Surgery (ESVS) 2026 Clinical Practice Guidelines on the Management of Descending Thoracic and Thoraco-Abdominal Aortic Diseases – Editor's Choice

Background

Endo-arch vs TEVAR

- Where endovascular arch repair **resembles** from descending aortic repair

→ Landing zones

>20-mm or healthy aorta for proximal and distal seal *
Straight (non-conical) aortic segment
< 42-mm of diameter

**To be adapted to every patient – compound risk to go higher vs inadequate seal*

→ Some similar options

- Tubular and single-branched grafts (distal arch)

Background

Endo-arch vs TEVAR

- Where endovascular arch repair **differs** from descending aortic repair

  → Rarer

  → Systematic involvement of supra-aortic vessels

  - ➢ Continuous supra-aortic perfusion to consider
  - ➢ ↑ Anatomical (planning) and procedural complexity
  - ➢ ↑ Stroke risk

  → > 30% present as semi-emergencies or emergencies

  * Probably underevaluated in literature


Multicenter Study > Eur J Vasc Endovasc Surg. 2016 Jun;51(6):791-800.
doi: 10.1016/j.ejvs.2016.02.006. Epub 2016 Apr 20.

Thoracic Endovascular Aortic Repair of Aortic Arch Pathologies with the Conformable Thoracic Aortic Graft: Early and 2 year Results from a European Multicentre Registry

D Böckler [1], J Brunkwall [2], P R Taylor [3], N Mangialardi [4], J Hüsing [5], T Larzon [6]; CTAG registry investigators

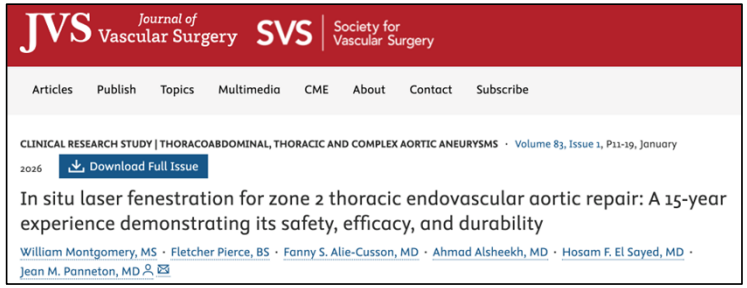
Background

Endo-arch vs TEVAR

- Pathologies that need urgent or semi-urgent care

JVS 2025 laser-fen Zone 2

- 81 patients, 92% urgent/emergent
- 24% rupture
  - ~ 50% TBAD /IMH
  - 16% BTAI
  - 11% TAA

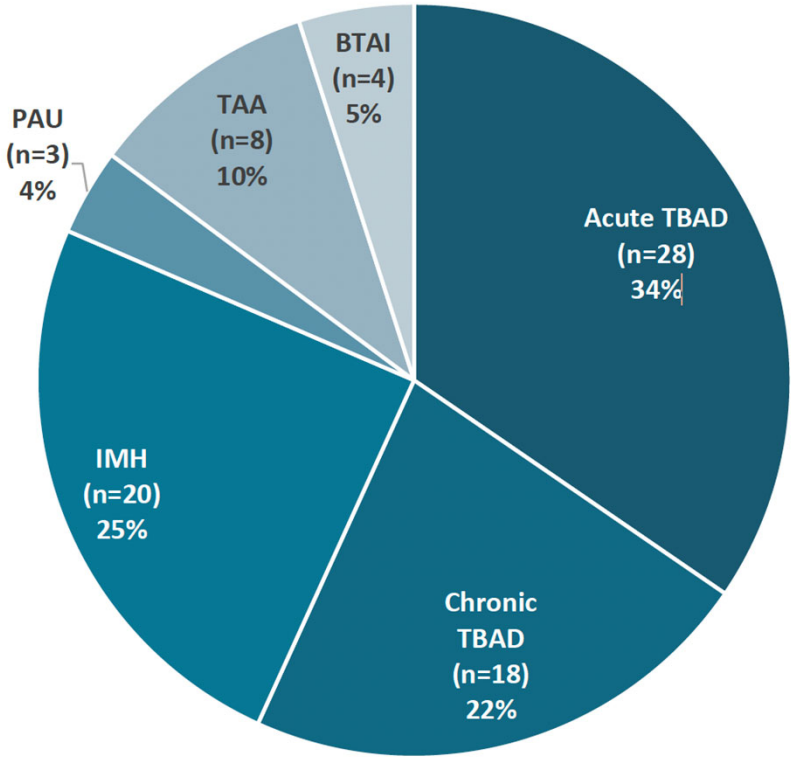


Montgomery Panneton et al.
JVS 2025

Background

Endo-arch vs TEVAR

Overall indications for repair (zone 2)




JVS Journal of Vascular Surgery SVS Society for Vascular Surgery

Articles Publish Topics Multimedia CME About Contact Subscribe

CLINICAL RESEARCH STUDY | THORACOABDOMINAL, THORACIC AND COMPLEX AORTIC ANEURYSMS · Volume 83, Issue 1, P11-19, January 2026 Download Full Issue

In situ laser fenestration for zone 2 thoracic endovascular aortic repair: A 15-year experience demonstrating its safety, efficacy, and durability

William Montgomery, MS · Fletcher Pierce, BS · Fanny S. Alie-Cusson, MD · Ahmad Alsheekh, MD · Hosam F. El Sayed, MD · Jean M. Panneton, MD

Montgomery Panneton et al.
JVS 2025

→ Over-representation of TBAD/IMH in zone 2 series/distal arch
  - ➢ Rarely adequate landing in zone 3

Background

Endo-arch vs TEVAR

- Emergency arch repairs in zones 1 or 0 ?

  → Scarce literature

  → Mostly series of elective case

  → Some urgent/emergent cases buried in single-center series

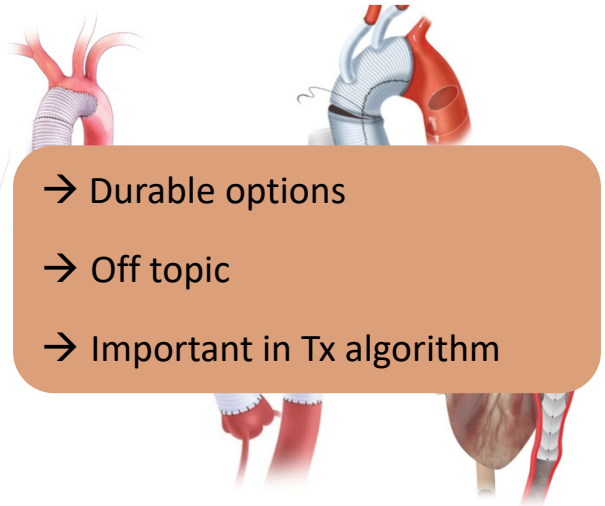
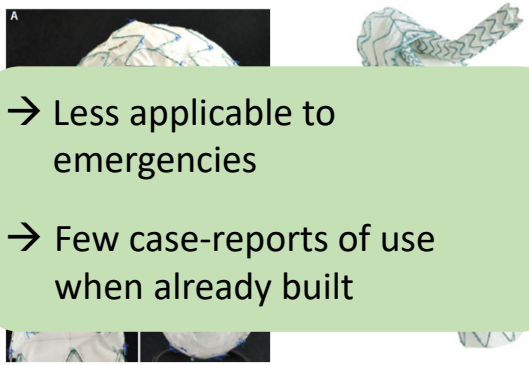
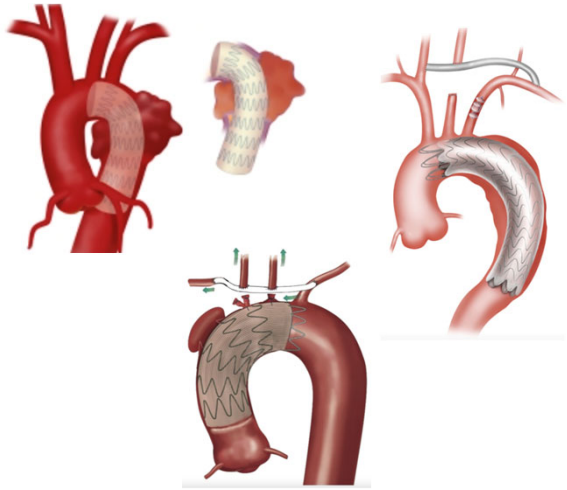
    ➢ Dissections >> ruptures/BTAI/others

Options for emergency arch repair

Options summary

Emergency arch repair

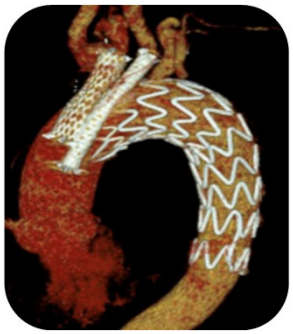
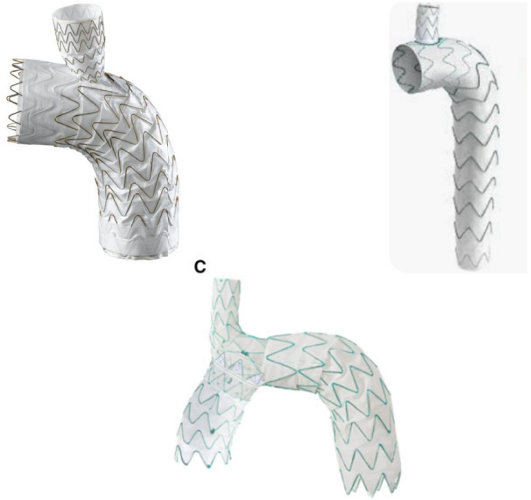
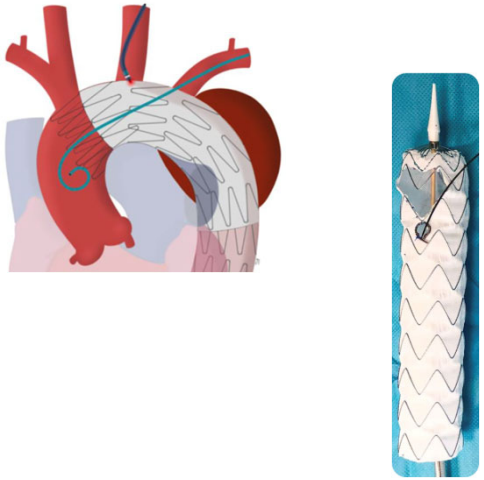
- Specific options for arch repairs in emergencies

Open/Hybrid	Custom-made Endovascular	Tubular endo/Hybrid extra-anatomic
 → Durable options → Off topic → Important in Tx algorithm	 → Less applicable to emergencies → Few case-reports of use when already built	
→ Hemiarch/Arch repair, Elephant trunk/FET, …	Cook Zenith Arch, Bolton Relay Plus Branch, Najuta, Inoue, Cratos…	TEVAR +/- extra-anatomic bypasses

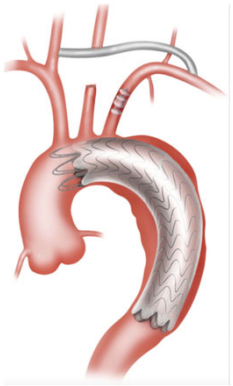
Options summary

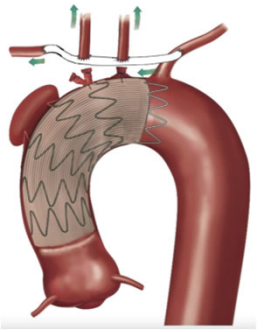
Emergency arch repair

- Specific options for arch repairs in emergencies

Parallel stenting	Off-the-shelf branched devices	Laser/radiofrequencies/PMEGs
		
→ Chimney/Snorkel + TEVAR	TBE, Nexus, Castor…	Laser-Fen, Back-Table modification

TEVAR + debranching





PROS

→ Widely available
- ➢ Any tubular graft

→ Applicable to all zones
- *** One vessel needed or >1 arch debranching

→ Reliable cerebral perfusion

CONS

→ Cumulative time to cure lesion (bypasses + endo)

→ Cumulative risk of open surgery + TEVAR

→ Not applicable to total arch
- * Or needs sternotomy for debranching

→ Extra-anatomic bypass issues
- * Esophagus compression, skin erosion
- * Durability

TEVAR + debranching

Original Article

Page 1 of 10

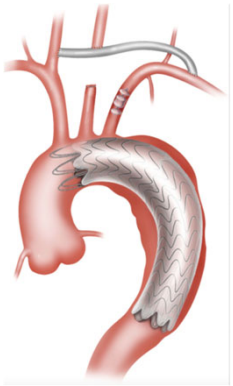
Debranching with thoracic endovascular aortic repair for treating aortic arch lesions: a retrospective single-center experience

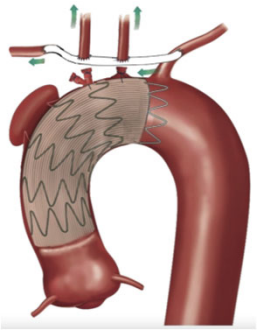
Bin He[1#], Xia Zheng[1#], Qijian Zhao[1,2#], Jianbin Zhang[1], Jie Chen[1], Zhidong Ye[1]

[1]Department of Cardiovascular Surgery, China-Japan Friendship Hospital, Beijing, China; [2]Department of Vascular Surgery, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China

Contributions: (I) Conception and design: B He, Z Ye; (II) Administrative support: B He, X Zheng, Q Zhao; (III) Provision of study materials or patients: B He, X Zheng, Q Zhao; (IV) Collection and assembly of data: J Zhang, J Chen; (V) Data analysis and interpretation: B He, X Zheng, Q Zhao; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

He et al. 2026
J Thor Dis





→ 41 patients
- Landing: 20% Zone 0, 29% Zone 1, 51% Zone 2
- Only 17% urgent (residual type A)

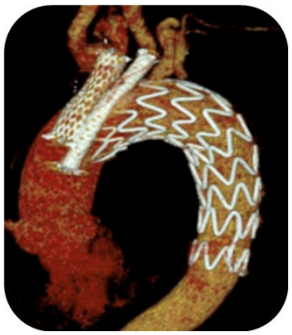
→ 100% technical success, 5% type 1 EL

→ FU 5 –y :
- 85% survival
- 13% bypass occlusions (4/5 axillary)

→ Zone 0 landings were after ascending debranching for TAAD

→ 4 Axillary bypass failures
- Out of 13 (31%)

TEVAR + parallel stenting



PROS

→ Fast coverage of lesion

→ Widely available
- ➢ Any tubular graft

→ Applicable to all zones, including total arch
- ➢ Upper access through at least 1 carotid

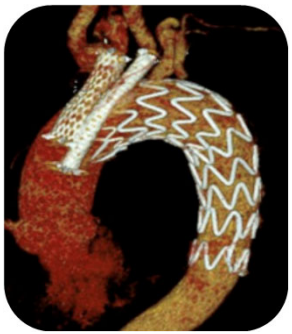
→ Flexible option as bailout

CONS

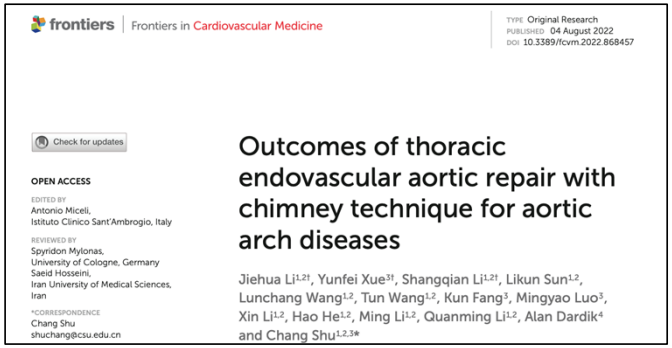
→ Durability concerns
- ➢ Endoleaks +++ through gutters
- ➢ Stent compression or malapposition

→ Stroke risk
- ➢ Arch manipulations
- ➢ Carotid access

TEVAR + parallel stenting



→ 345 patients, 2/3 dissections, Zones 0-2
→ 30-day stroke 2.6%, mortality 1.2%
→ **11% 1a endoleaks**
  - **20% for 2-3 chimneys**



frontiers | Frontiers in Cardiovascular Medicine

TYPE Original Research
PUBLISHED 04 August 2022
DOI 10.3389/fcvm.2022.868457

Check for updates

OPEN ACCESS

EDITED BY
Antonio Miceli,
Istituto Clinico Sant'Ambrogio, Italy

REVIEWED BY
Spyridon Mylonas,
University of Cologne, Germany
Saeid Hosseini,
Iran University of Medical Sciences, Iran

*CORRESPONDENCE
Chang Shu
shuchang@csu.edu.cn

Outcomes of thoracic endovascular aortic repair with chimney technique for aortic arch diseases

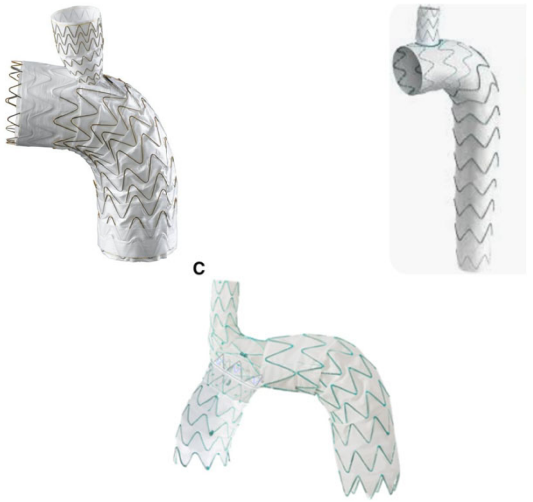
Jiehua Li[1,2†], Yunfei Xue[3†], Shangqian Li[1,2†], Likun Sun[1,2], Lunchang Wang[1,2], Tun Wang[1,2], Kun Fang[3], Mingyao Luo[3], Xin Li[1,2], Hao He[1,2], Ming Li[1,2], Quanming Li[1,2], Alan Dardik[4] and Chang Shu[1,2,3*]

Li et al 2022
Frontiers CVM

→ Similar to the Ch-EVAR literature (PERICLES, …)

Parallel stenting
Decent option as bail-out
Not as durable in time

Off-the-shelf branched devices



PROS

→ Anatomical preservation
- ➢ Zone 2

→ Positioning control
- ➢ Pre-can. Wire assist

→ Less operator-dependant
- ➢ TBE/Castor compared to Chimneys/PMEG/Laser
- ➢ Straightforward technique

* Wire control and branch can. has learning curve

→ Good early outcomes

CONS

→ Not as easily available in all sizes for now

→ Anatomical limits
- ➢ Coverage before branch
- ➢ Less applicable to all emergencies – curvatures, diameter changes, …

→ Zones 0-1 landings need debranching
- ➢ Compound risk Chx/stent

→ NEXUS – higher learning curve

Off-the-shelf branched devices

C

77 patients Zones 0-1, **elective**

→ Zones 91% Zone 0, 9% Zone 1

- 5% failure

→ 30-day outcomes

- 4% death
- 8% stroke
- 6% type 1/3 endoleaks

JVS Journal of Vascular Surgery | SVS Society for Vascular Surgery

Articles Publish Topics Multimedia CME About Contact Subscribe

CLINICAL RESEARCH STUDIES | AORTIC ARCH REPAIR · Volume 82, Issue 5, P1591-1600.E4, November 2025 · Open Access Download Full Issue

Early outcomes of endovascular repair of aortic arch lesions in zone o/1 with a thoracic branched endoprosthesis

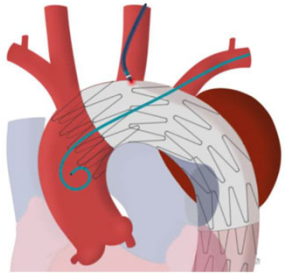
Matthew P. Sweet, MD, MS [a] · Ali Azizzadeh, MD [b] · Gustavo S. Oderich, MD [c] · ... · Shinji Miyamoto, MD, PhD [g] · Himanshu J. Patel, MD [h] · Michael D. Dake, MD [i] ... Show more

Off-the-shelf branched devices

Good option, particularly for elective

Honest results, durability TBD

Laser/RF-Fen



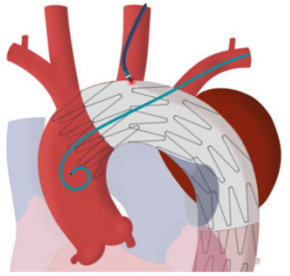
PROS

- → Fast coverage of lesion
  - ➢ No need to modify graft pre-coverage
- → Widely available
  - ➢ Any tubular * non-PTFE * graft
- → Fully endovascular, better seal
- → Applicable to all zones, including total arch
- → Anatomical preservation

CONS

- → Operator-dependant
- → Cerebral protection
  - ➢ Gas bubbles
  - ➢ Initial vessel coverage
  - ➢ Procedural urgency to reinstate cerebral flow
  - ➢ Left carotid access
  - ➢ Arch manipulations
- → Zones 0-1 landing complexity
- → Concerns over type 3c EL
  - ➢ Mitigated with recent Zone 2 results
- → Requires laser, Fenestration diameter restriction ≤ 8mm

Laser/RF-Fen



247 patients retro meta-analysis, Zones 0-2 landings, most elective
Landing Zones 0 (19%), 1 (15%), 2 (66%)
30-day :
→ 4.5% stroke
→ 3% mortality
→ 1% retrograde TAAD

Systematic Review on In Situ Laser Fenestrated Repair for the Endovascular Management of Aortic Arch Pathologies

by Thomas Le Houérou [1], Petroula Nana [1], Mathieu Pernot [2], Julien Guihaire [1], Antoine Gaudin [1], Erol Lerisson [1], Alessandro Costanzo [1], Dominique Fabre [1] and Stephan Haulon [1,*]

J. Clin. Med. **2023**, *12*(7), 2496; **https://doi.org/10.3390/jcm12072496**

Midterm reinterventions 6% (mostly leaks)

10-years FU (m
→ LSA stent pa
→ Fenestration
*** No type IIIc

Laser-fen

Good results , particularly in Zone 2

Reassuring regarding type IIIc EL

Zone 0-1 long-term and emergencies TBD

Montgomery Panneton et al.
JVS 2025

Back-table PMEG

PROS

- → Widely available
  - ➢ Any tubular
    * unsheathable * graft
- → Applicable to all zones, including total arch
  *Zone 0-1 technique similar
- → Anatomical preservation
- → Fully endovascular
- → Positioning stability/assist
  - ➢ Flow through fens while deploying
  - ➢ Pre-canulated wire

CONS

- → Operator-dependant
- → Cerebral protection
  - ➢ Arch manipulations
  - ➢ Punctured delivery mechanism
- → Pre-planning
- → Risk of pre-canulated wire entanglement and graft misalignment
- → Necessitate bare-metal proximal stents

Back-table PMEG

100 patients, Zone 0, elective
97% Success
30-day :
→ 2% mortality
→ 4% stroke
→ 8% Reintervention
→ 4% retrograde TAAD

2-years FU : no rupture, no SCI, all supra-aortic trunks patent

J Endovasc Ther. 2024 Feb;31(1):89-97. doi: 10.1177/15266028221116747. Epub 2022 Aug 4.

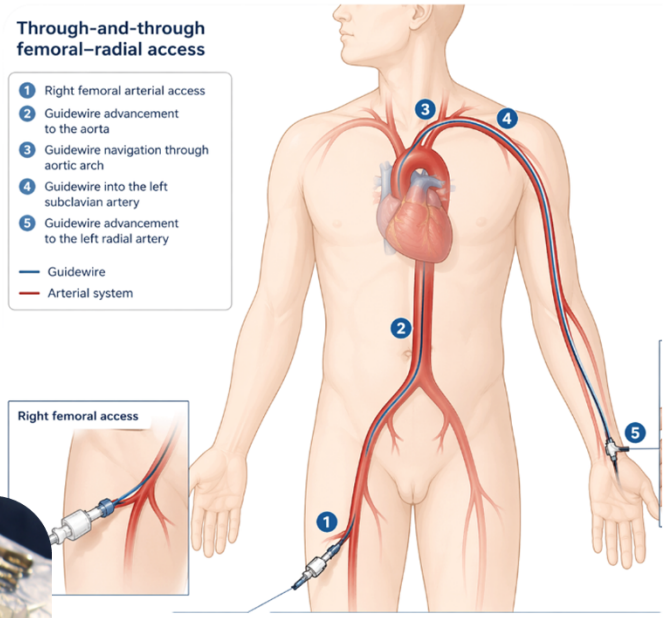
Total Arch Thoracic Endovascular Aortic Repair Using Double Fenestrated Physician-Modified Stent-Grafts: 100 Patients

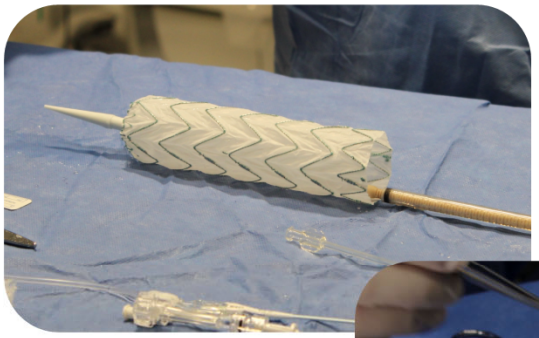
Ludovic Canaud [1], Lucien Chassin-Trubert [1,2], Issam Abouliatim [3], Kheira Hireche [1], Christophe Bacri [1], Pierre Alric [1], Thomas Gandet [1]

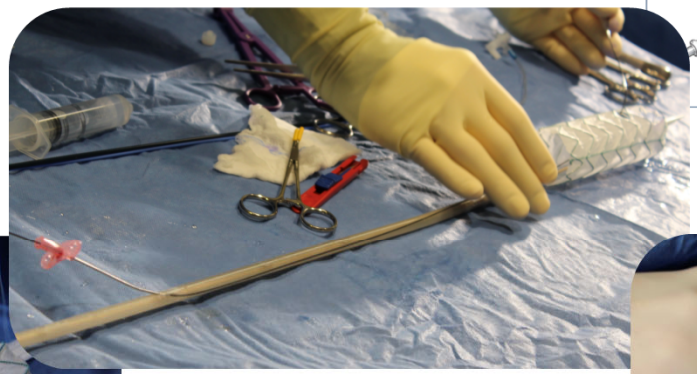
Canaud et al., JET 2024

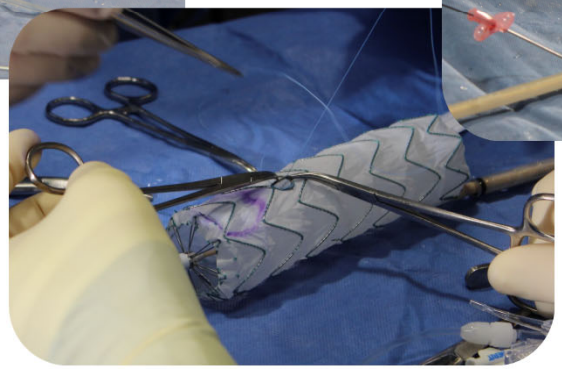
Back-table PMEG
Good results for <u>elective</u> cases
Longer-term and urgent TBD

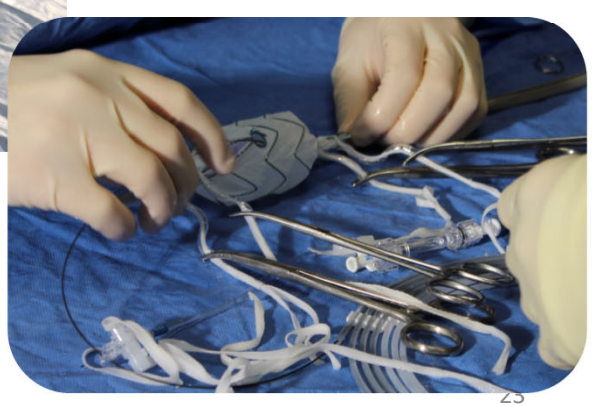
Back-table PMEG





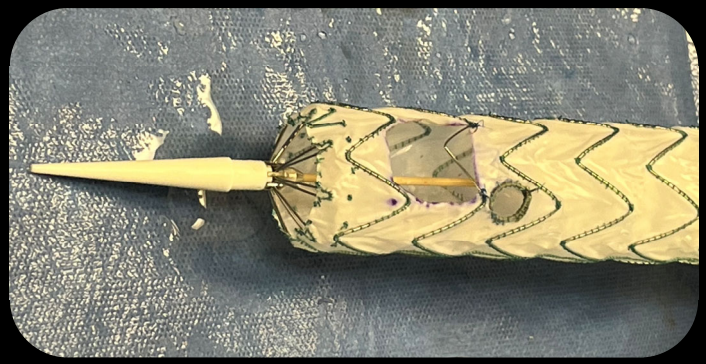






BTAI rupture

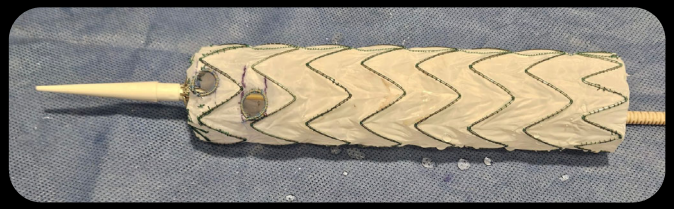
Typical « Canaud » structure



9-months p.o.

Mycotic aneurysm

2-reinforced fens conformation



6-months p.o.

Mycotic ulcer

3-reinforced fens conformation

2-months p.o.

Parenthesis on the risk of stroke and death Arch grafts

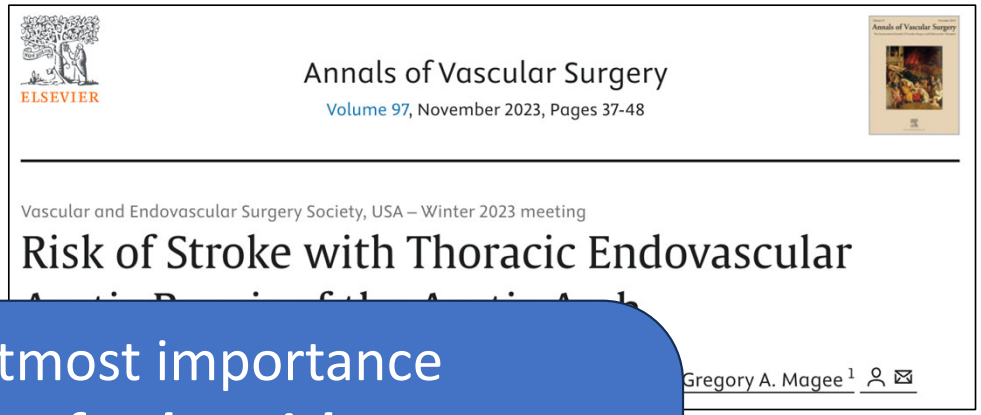
Risk of arch procedures

VQI, 2023, Zones 0-2 TEVAR

→ 4355 cases

→ Stroke
- ➢ Zone 0 :
- ➢ Zone 1 :
- ➢ Zone 2 :

→ In-hospital
- ➢ Zone 0 :
- ➢ Zone 1 : 5
- ➢ Zone 2 : 3%



Zone selection is of utmost importance

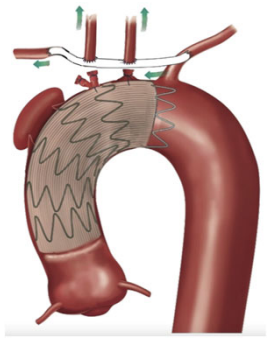
Further coverage = further risk

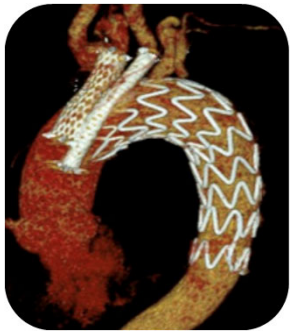
****** To balance with each patient***

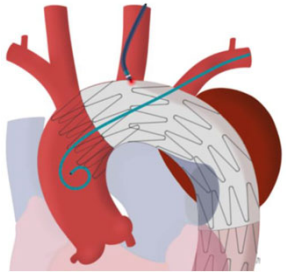
- ➢ ***Anatomy***
- ➢ ***Life expectancy***
- ➢ ***Prior discussions MD-patient***

CONCLUSION

- Emergency endovascular arch repair
  - ➢New frontier with many options
  - ➢Literature growing
  - ➢Choice of technique highly dependant on center expertise and patient selection







Thank you

William Fortin
MD, MSc, FRCSC
Vascular and endovascular surgery
Hôpital du Sacré-Cœur de Montréal