

THE 26TH INTERNATIONAL EXPERTS SYMPOSIUM

CRITICAL ISSUES

IN AORTIC ENDOGRAFTING

MARCH 21 & 22 2024

COPENHAGEN/MALMÖ
SCANDIC TRIANGELN, MALMÖ
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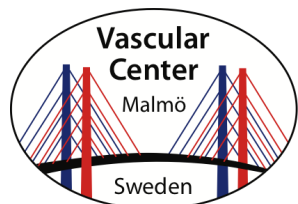
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CRITICAL ISSUES
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When and how to choose Inner, outer branches or fenestrations

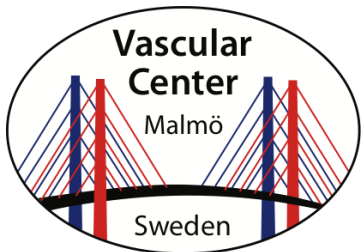
Angelos Karelis, MD, PhD, FEBVS

Consultant Vascular Surgeon

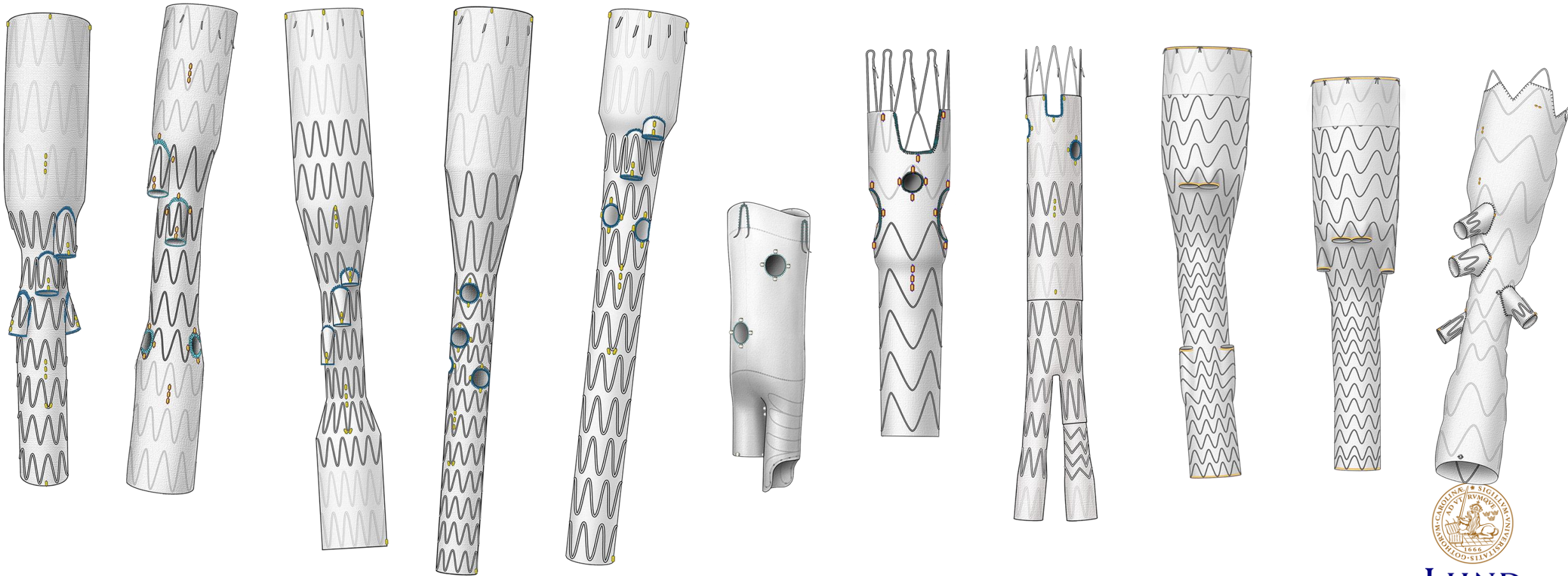


Disclosures / Conflict of Interest

- Research grants
 - Cook Medical
 - Gore



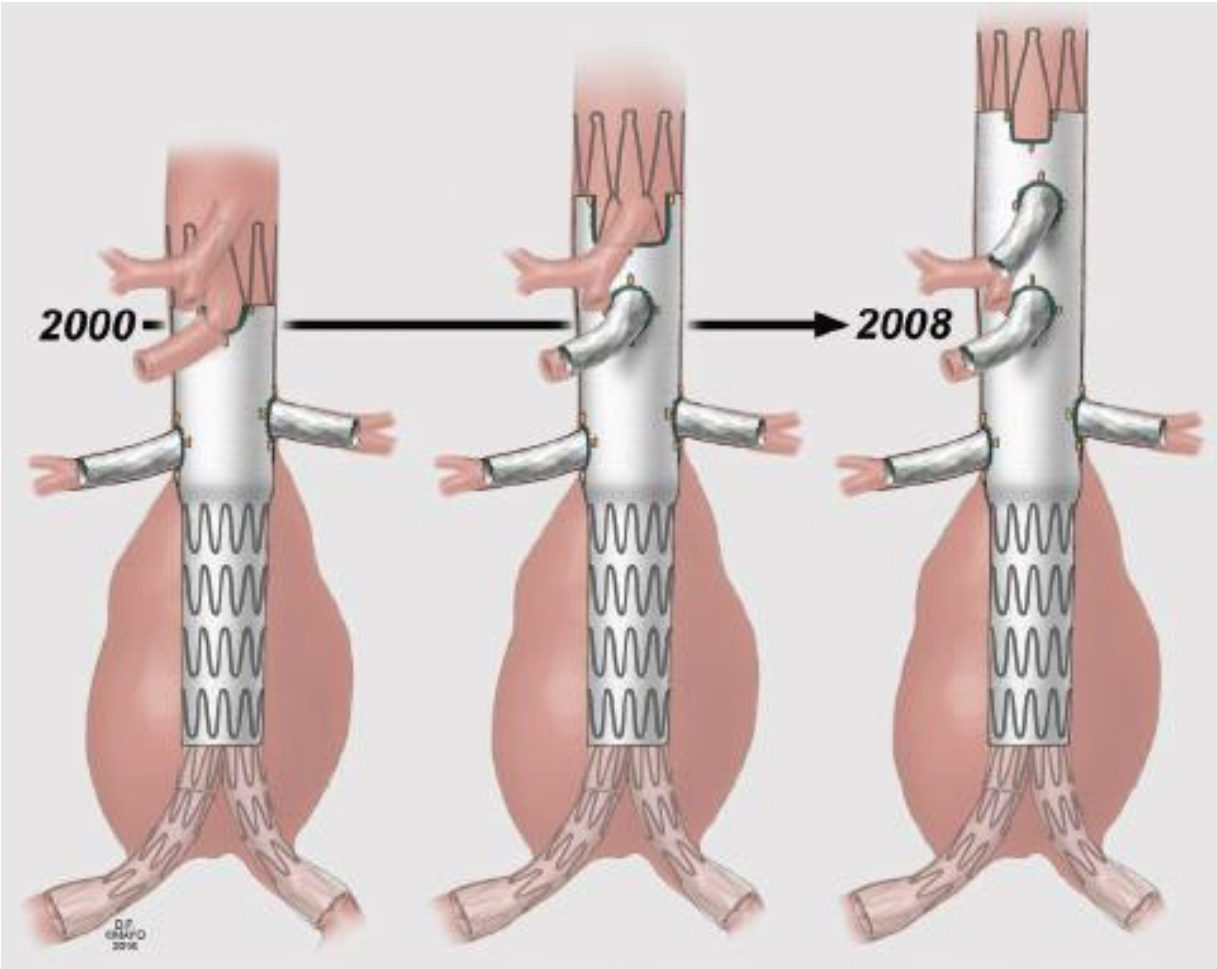
Alternatives for Complex EVAR



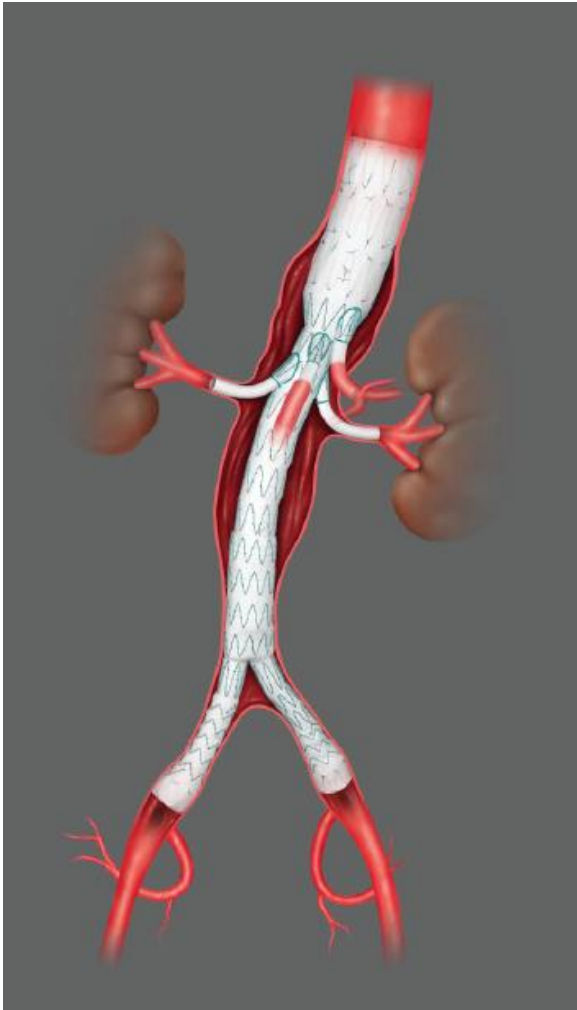
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in Oderich et al, Springer 2017

Moving sealing zone proximally



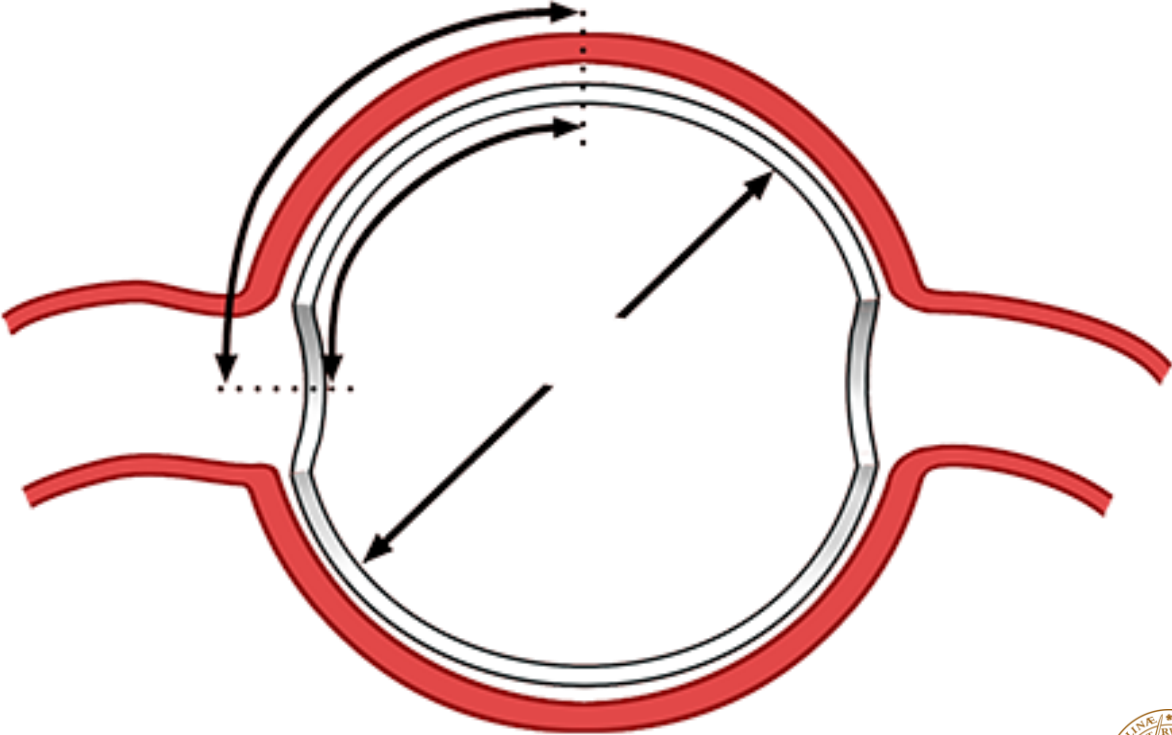
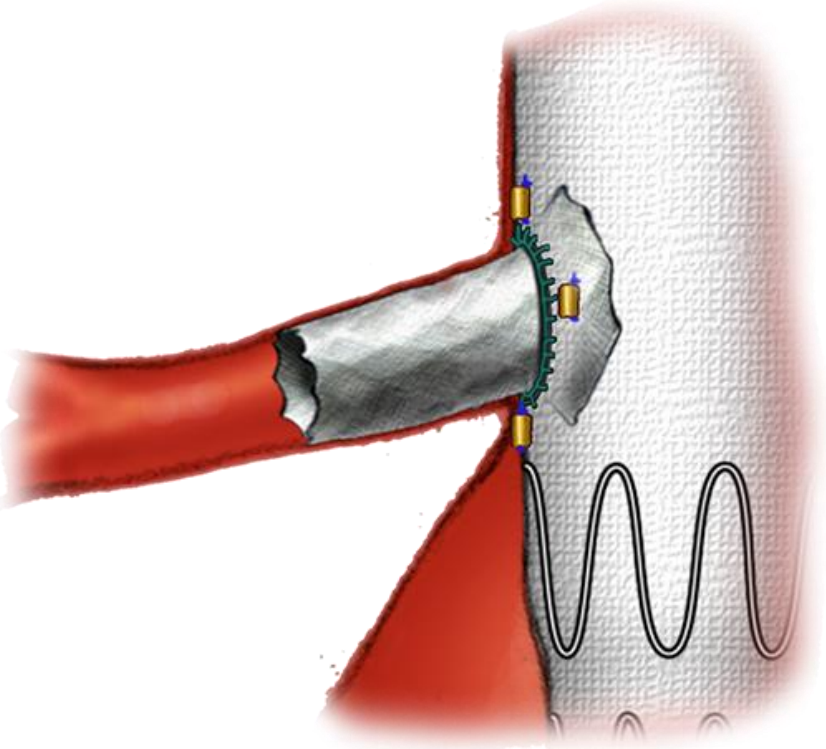
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Fenestrated Endografts (FEVAR)



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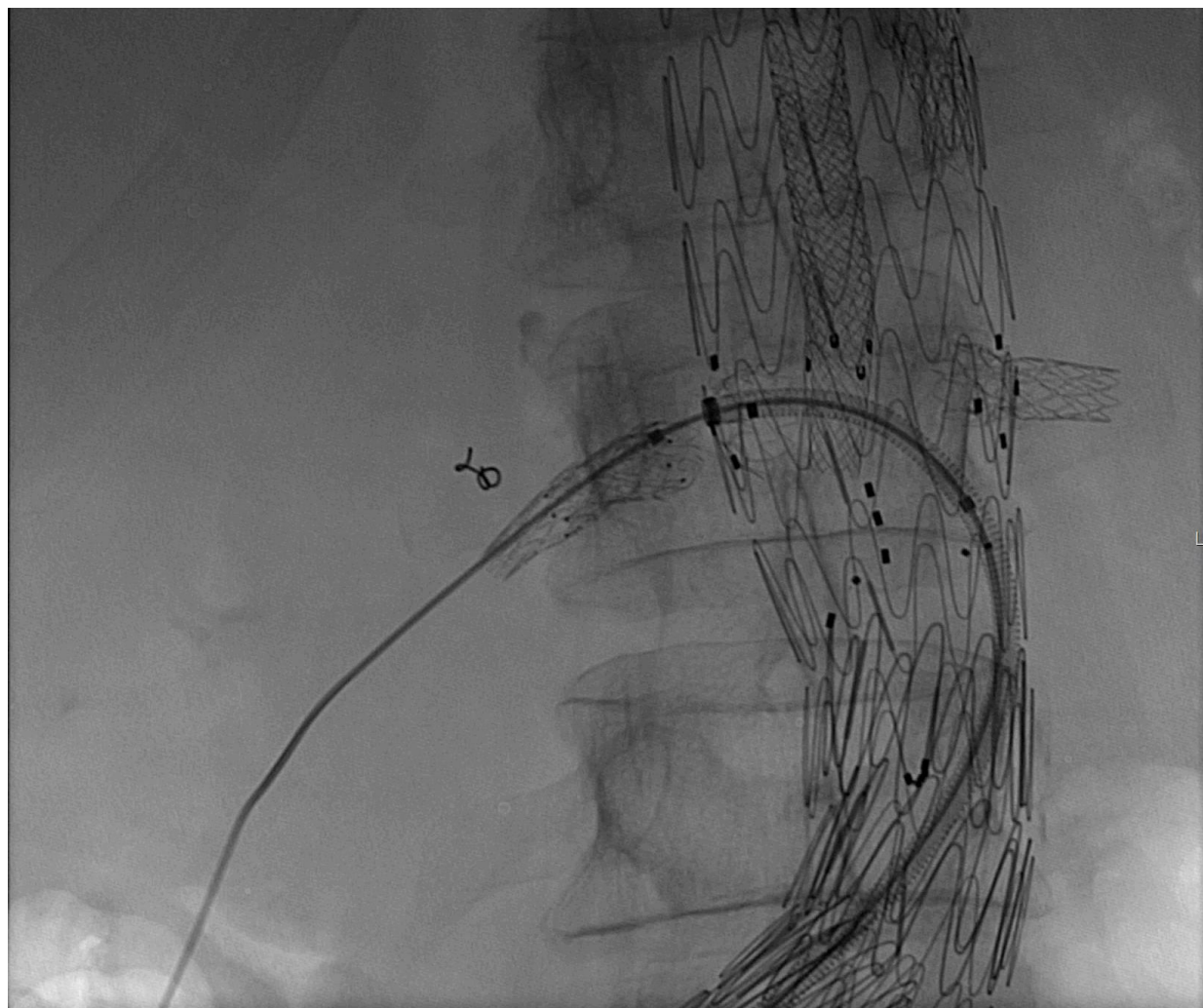
in Oderich et al, Springer 2017

Fenestrated Endografts (FEVAR)

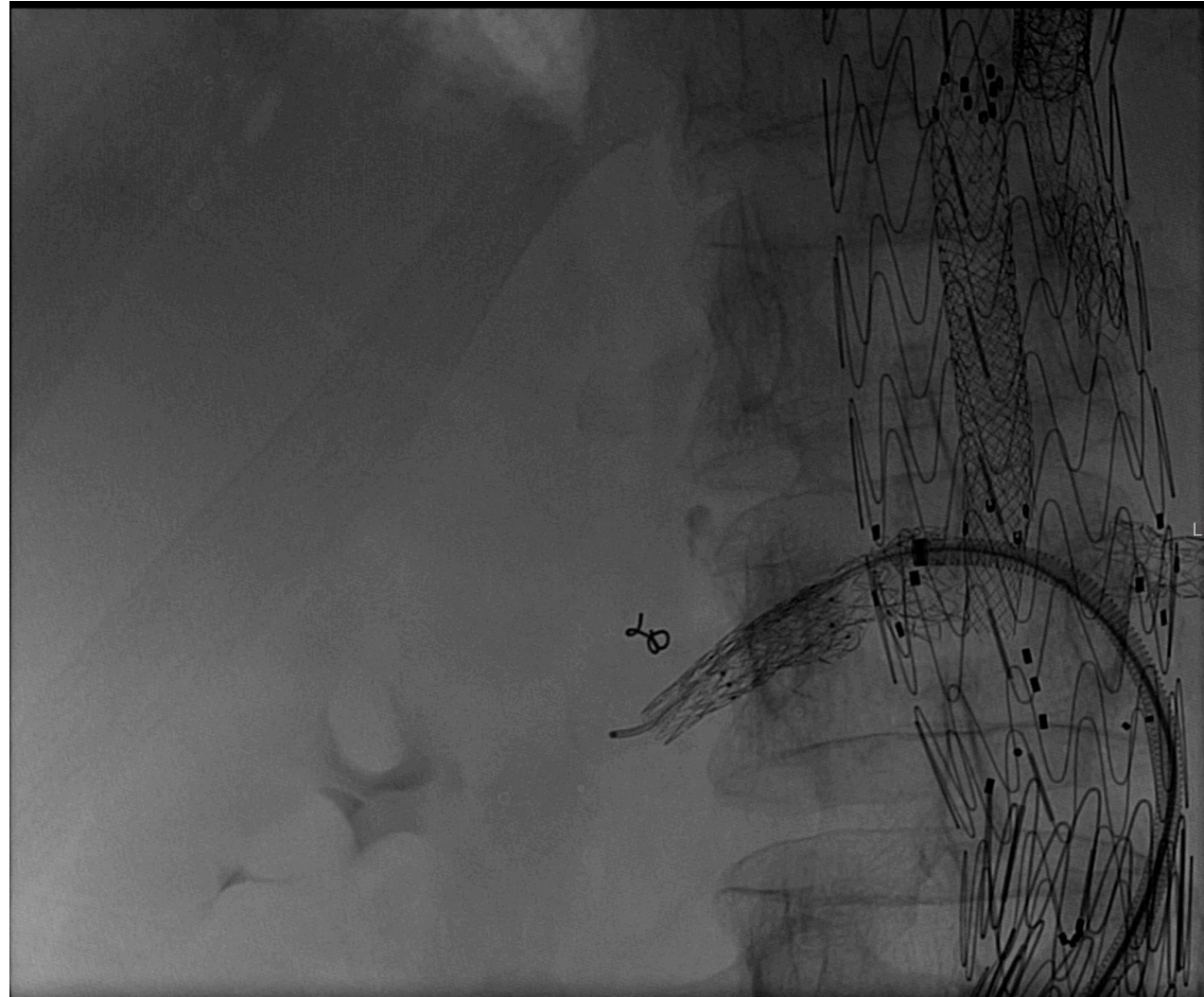
- Custom made design
- Challenging in very angulated aorta
 - Difficult planning the fenestrations' location
 - Difficult graft deployment
 - » Longitudinal & Rotational control
- Long gap from fenestration to vessel
 - Instability of bridging covered stents



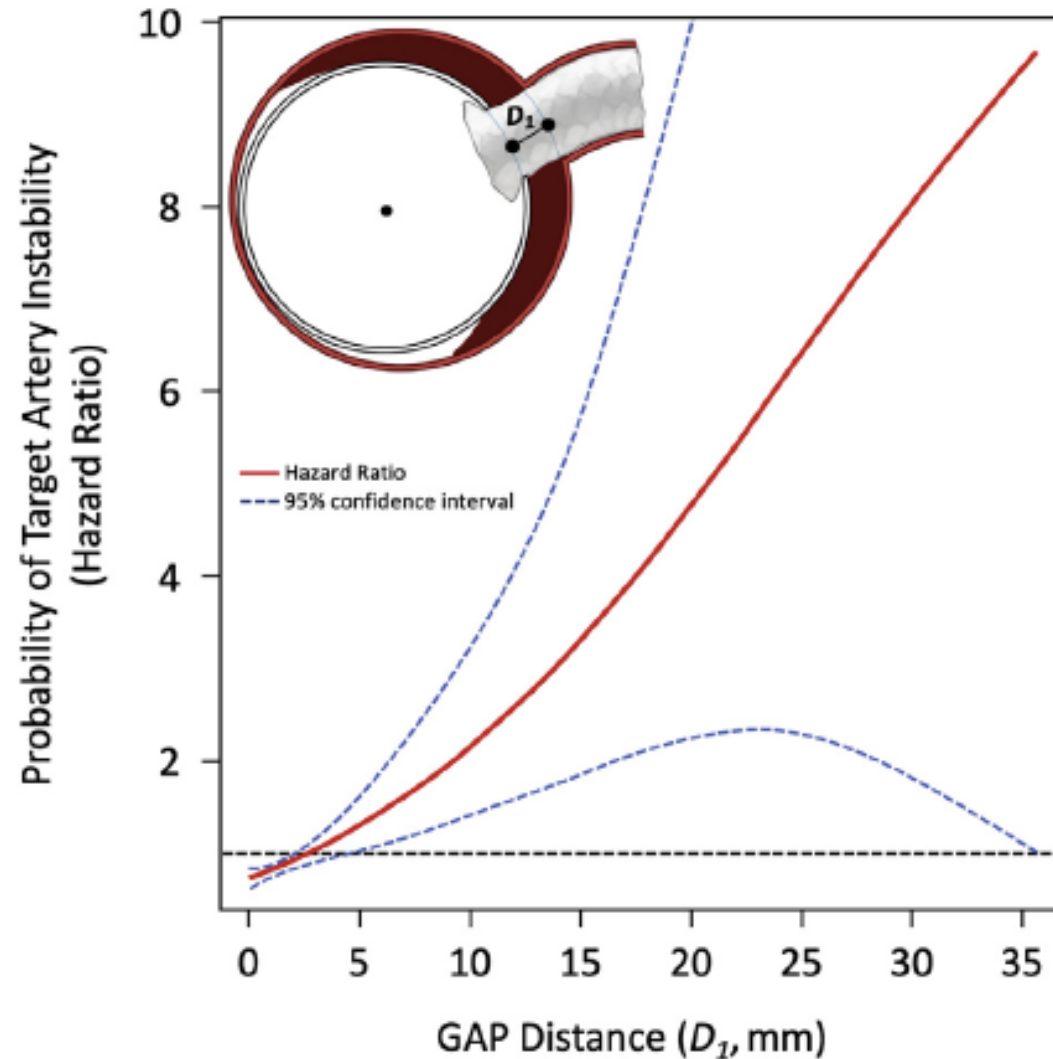
Long distance Fenestration-to-Target Vessel



Long distance Fenestration-to-Target Vessel



Long distance Fenestration-to-Target Vessel

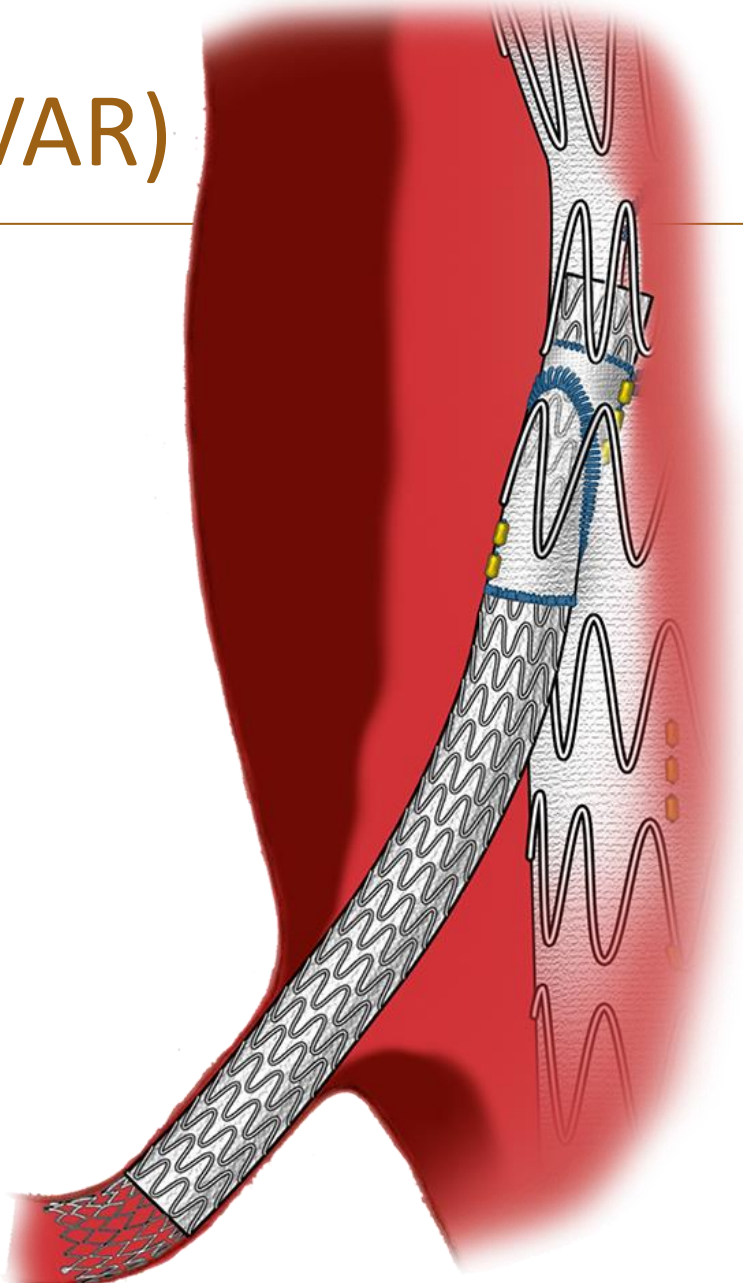


Fenestrated Endografts (FEVAR)

- Custom made design
- Challenging in very angulated aorta
- Long gap from fenestration to vessel
- Graft not completely deployed until all target vessels are catheterized
 - Prolonged leg ischemia
- Off-the-shelf availability?



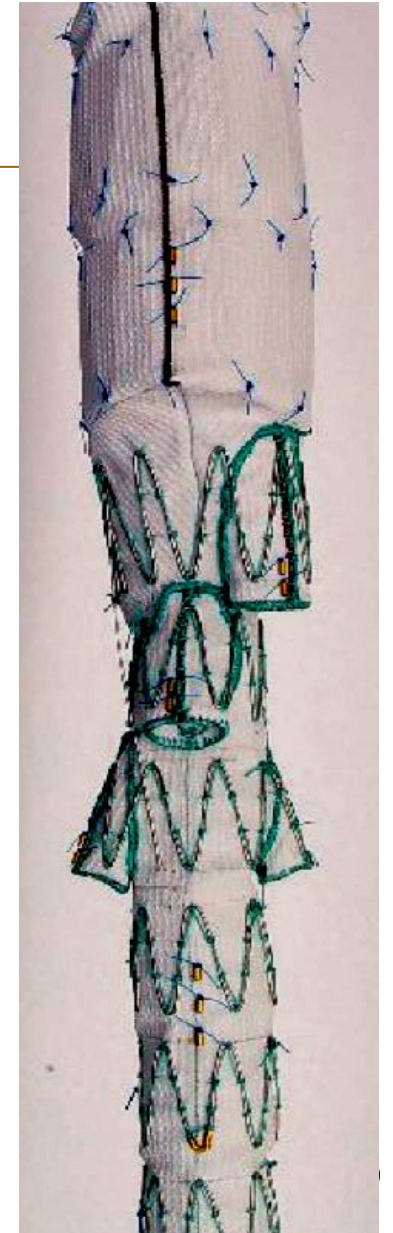
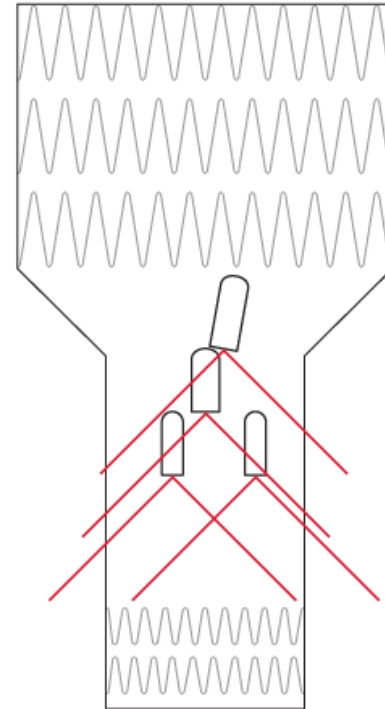
Branched Endografts (BEVAR)



Branched Endografts (BEVAR)

- Requires “reasonable” delivery control
 - Placed $\pm 1.5\text{cm}$ above target vessel
- Immediate deployment of the graft
 - Fast removal of large femoral sheaths
 - Less leg ischemia / reperfusion
- Off-the-shelf stent-graft available

Can be combined with fenestrations
as CMD devices

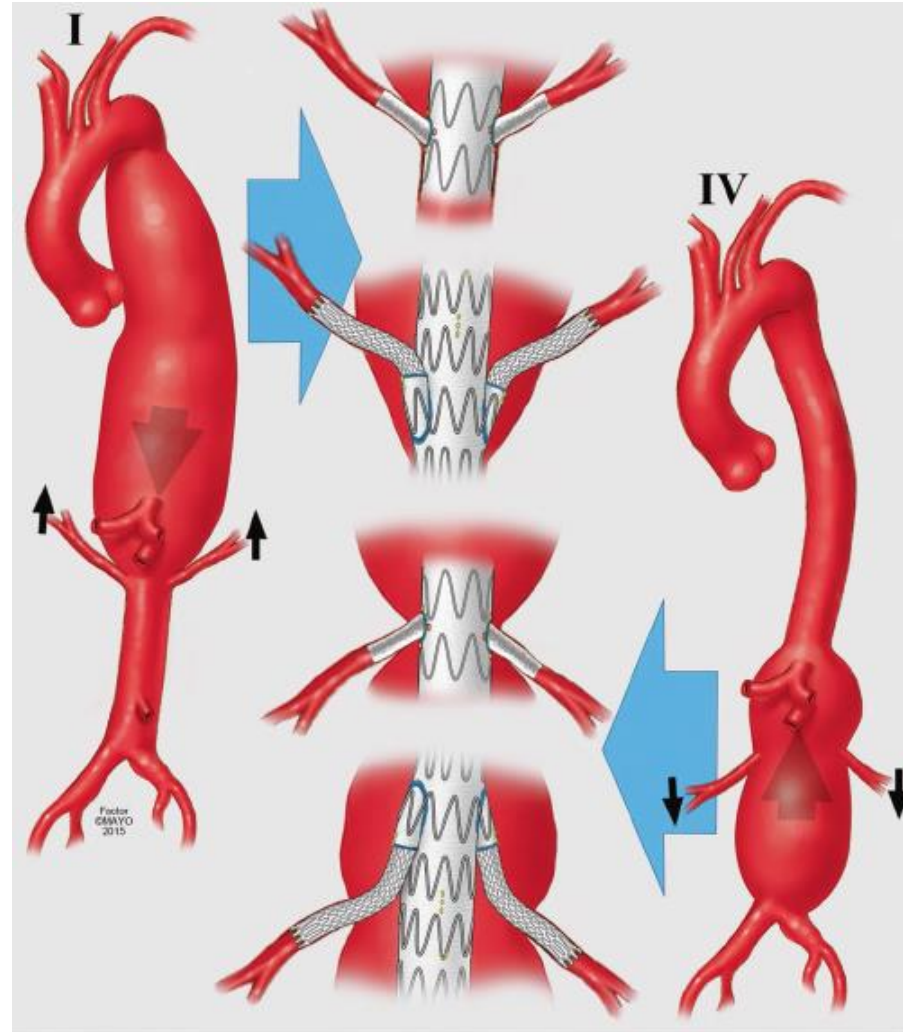


Designing a Complex Endograft?

- Anatomy
 - Target vessels orientation
 - Aorta \emptyset Renovisceral level
- Coverage of the aorta
- Access
 - Cranial / Femoral
- Emergency of the procedure
- Future reinterventions



Orientation of Target Vessels: Branch vs Fen

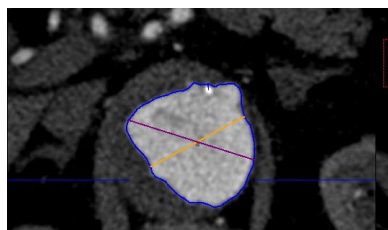


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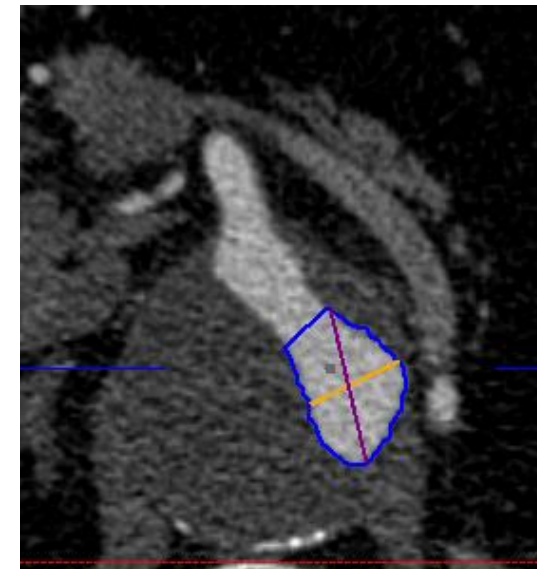
Anatomy Target Vessels: Branch vs Fen

Clearly Branch

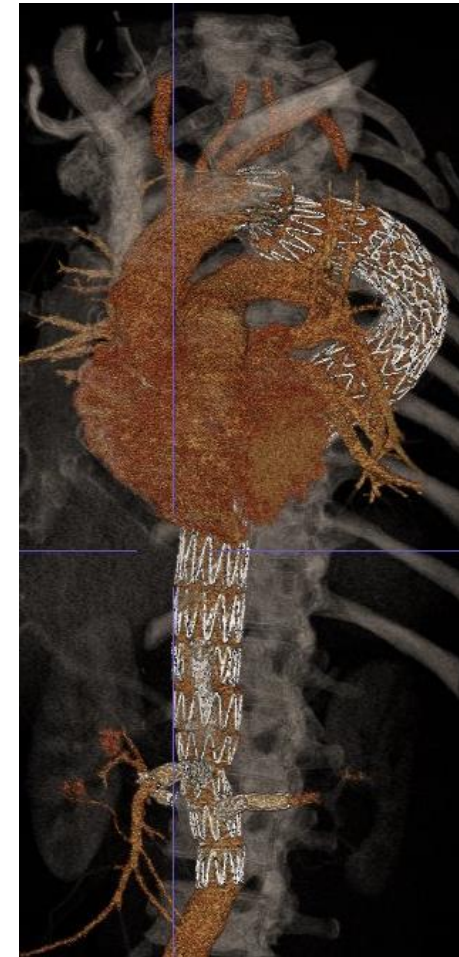
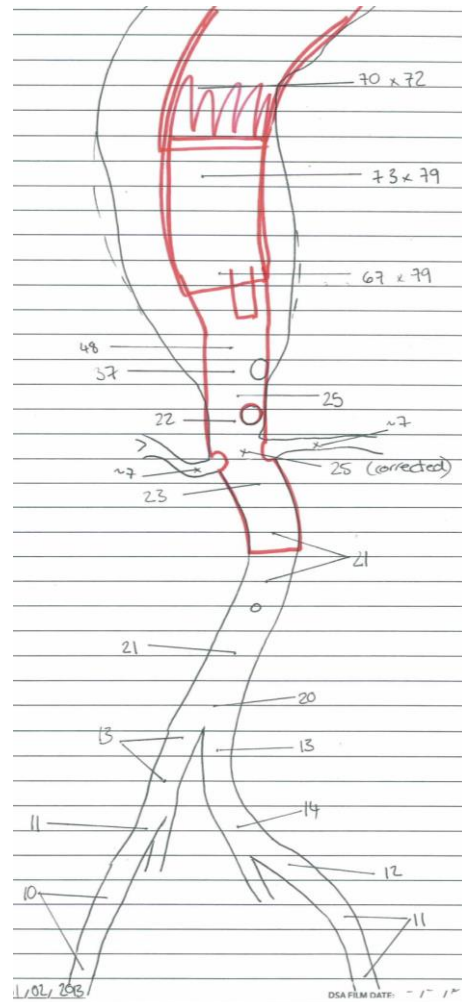
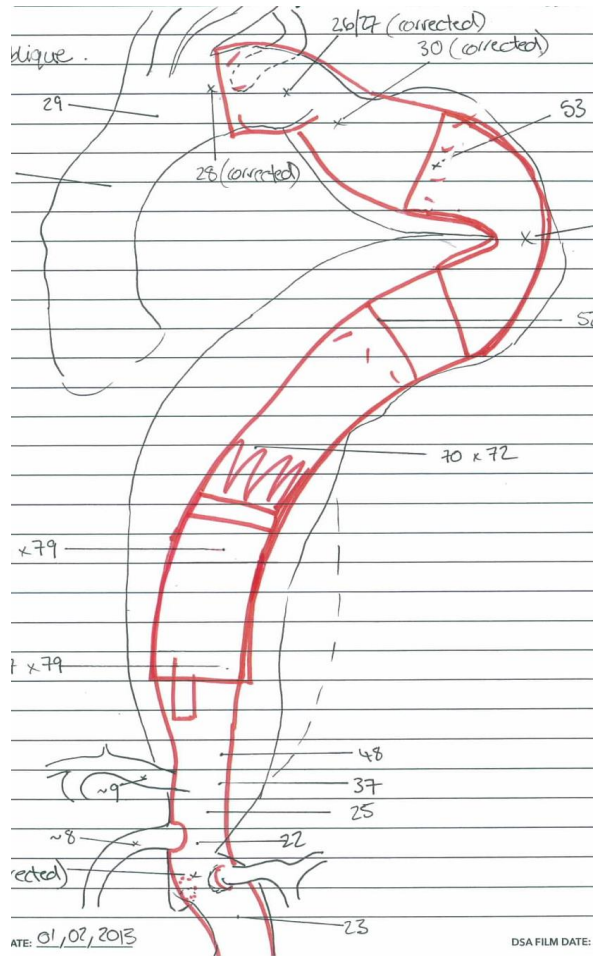


Clearly Fenestration

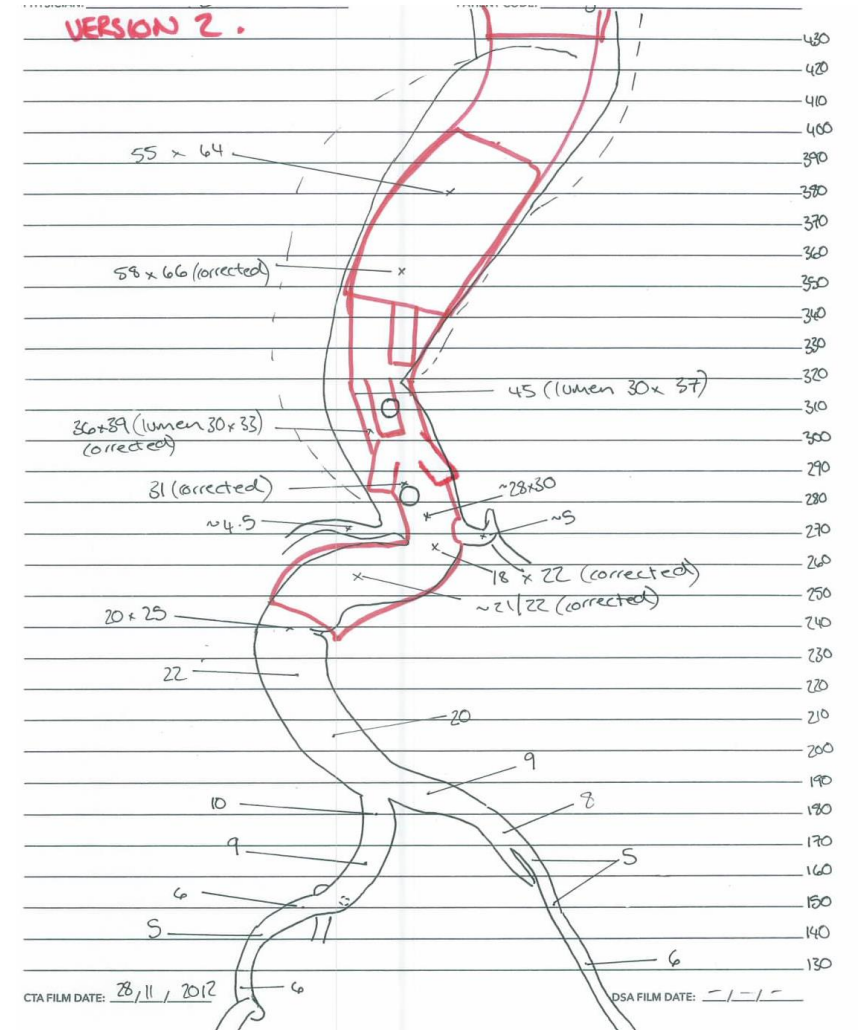
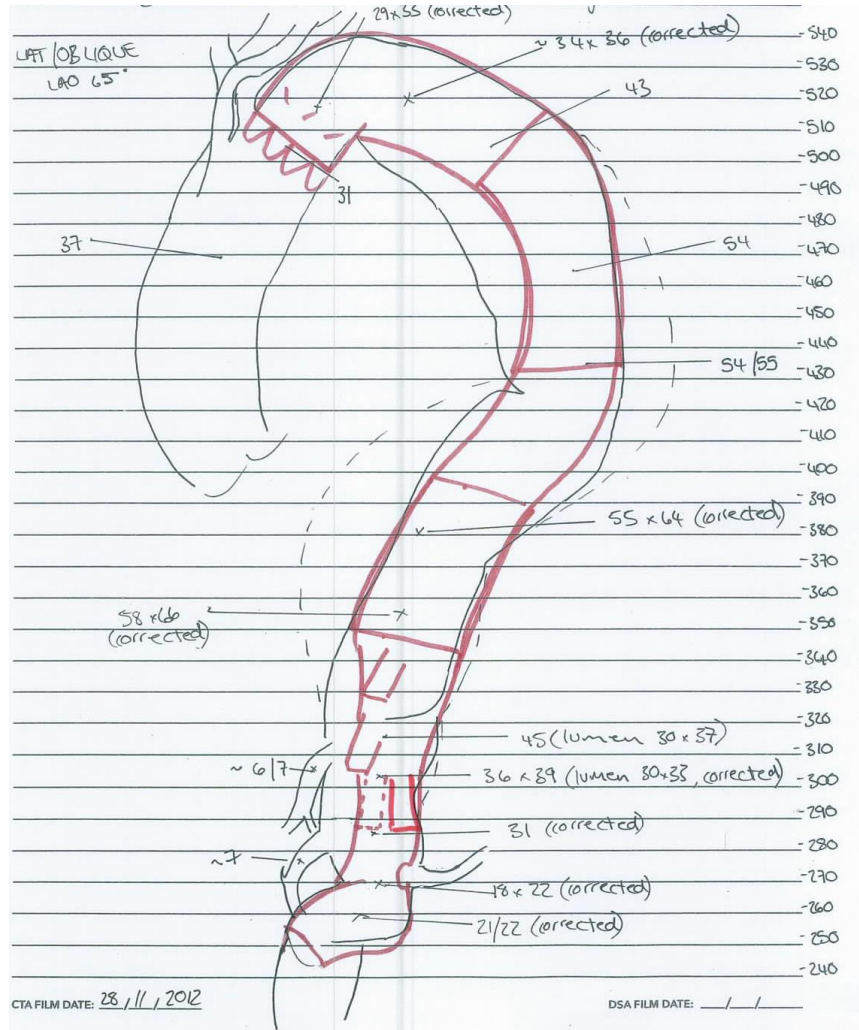
Clearly In-between



Think Mix



Think Mix



Access

- Iliac/Femoral
 - Good bilat
 - Poor unilateral
 - Poor bilat

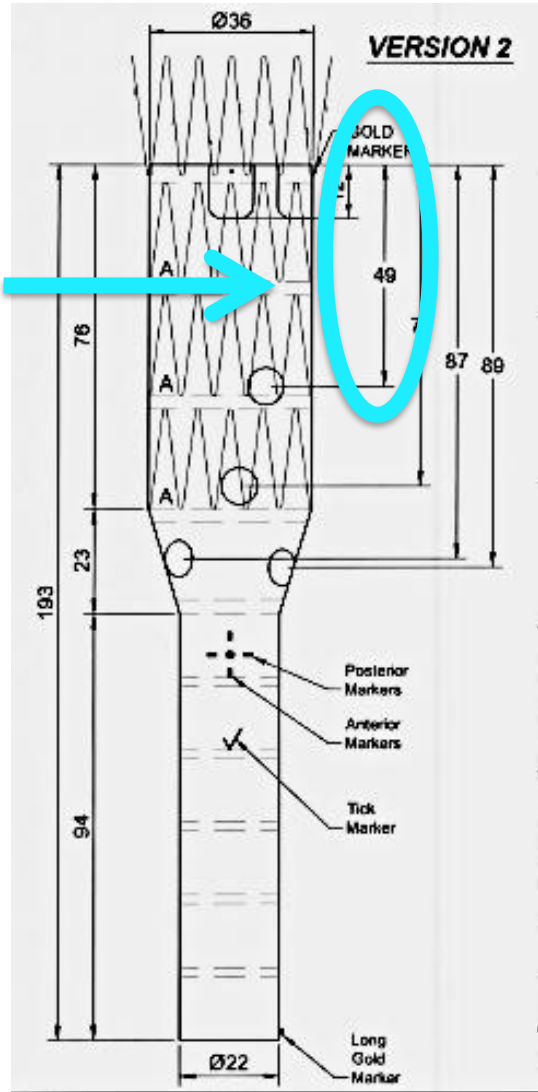
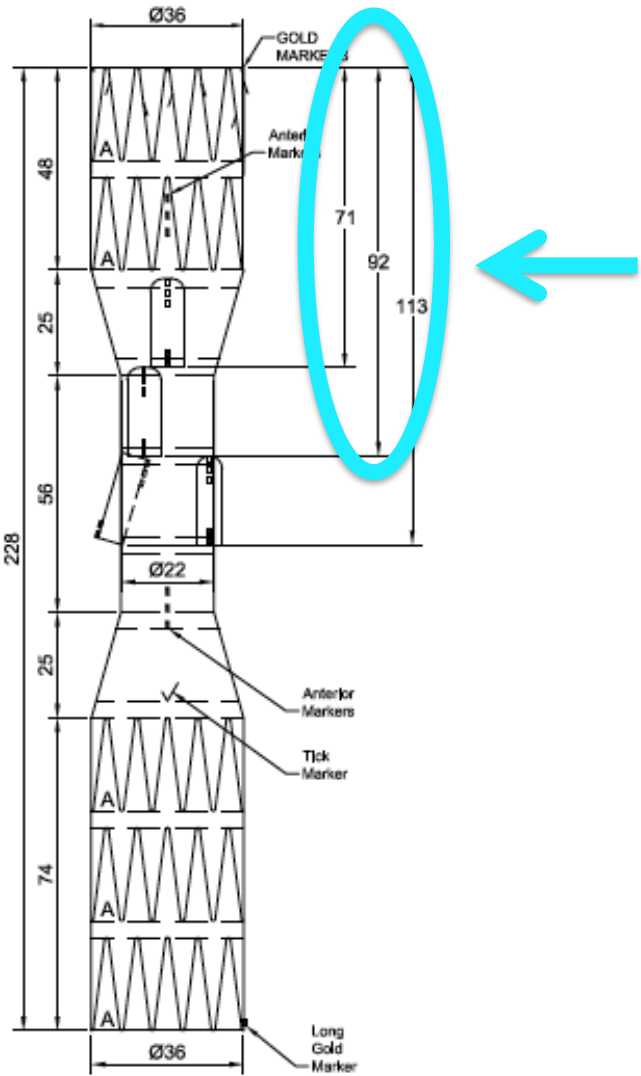
Branch Fenest



Longer intraoperative leg ischemia

- Axillary
 - Poor arch / supraaortic ✓

Coverage of the aorta



Anatomy of aorta / target vessel

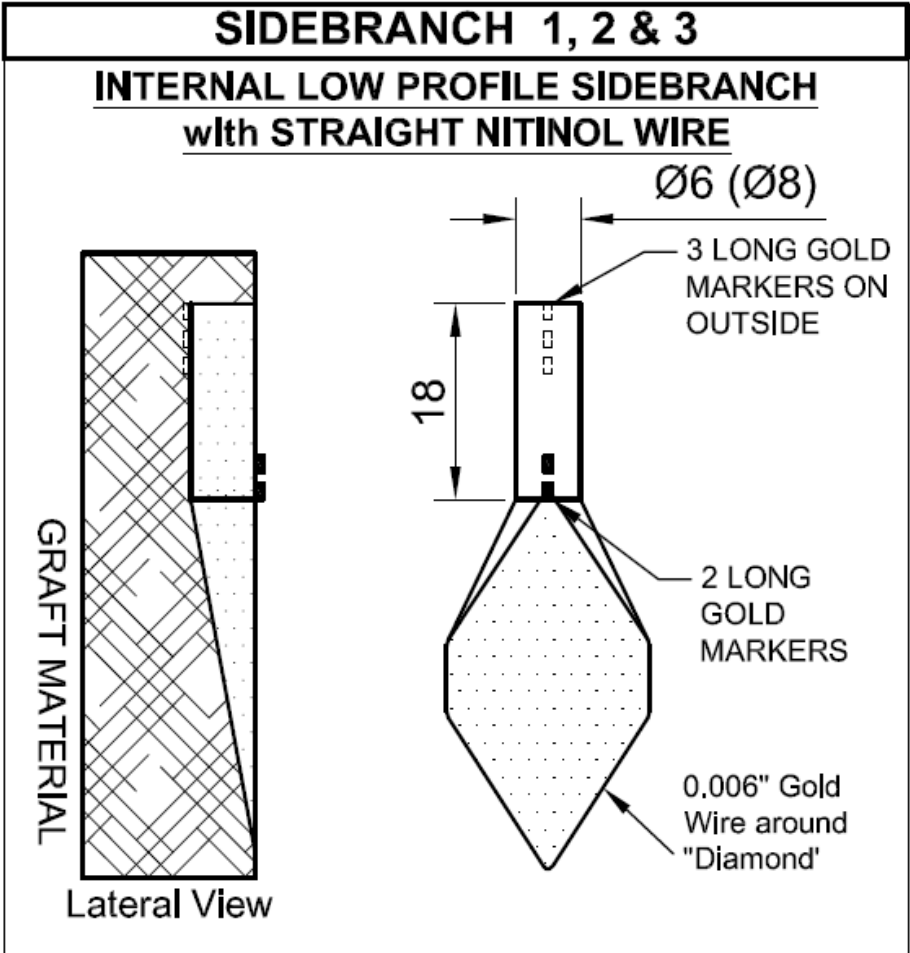
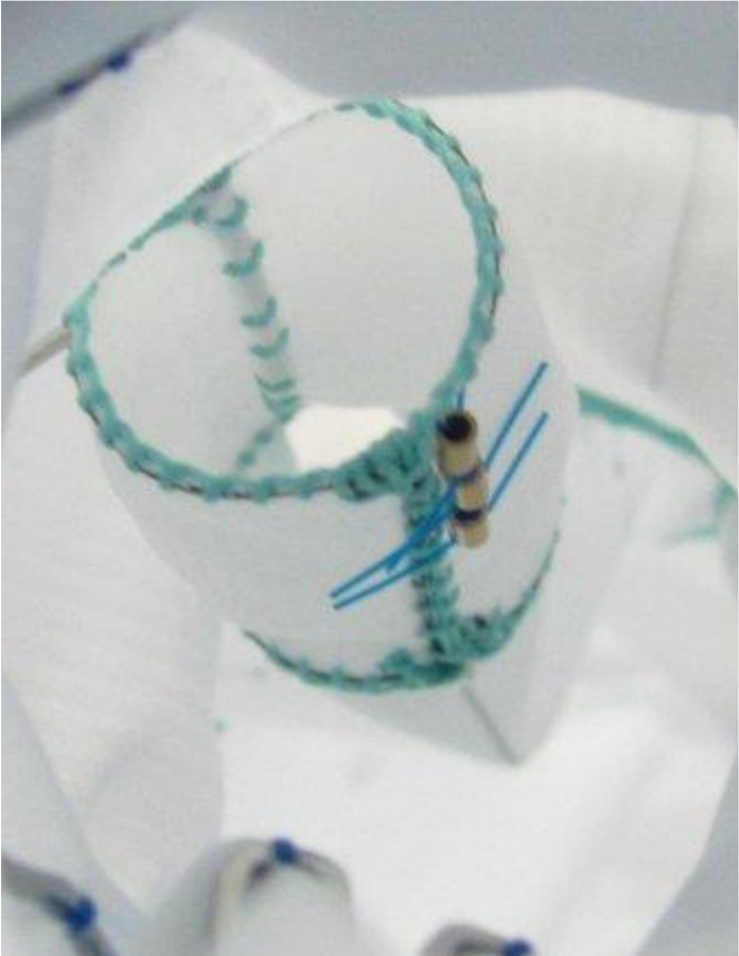
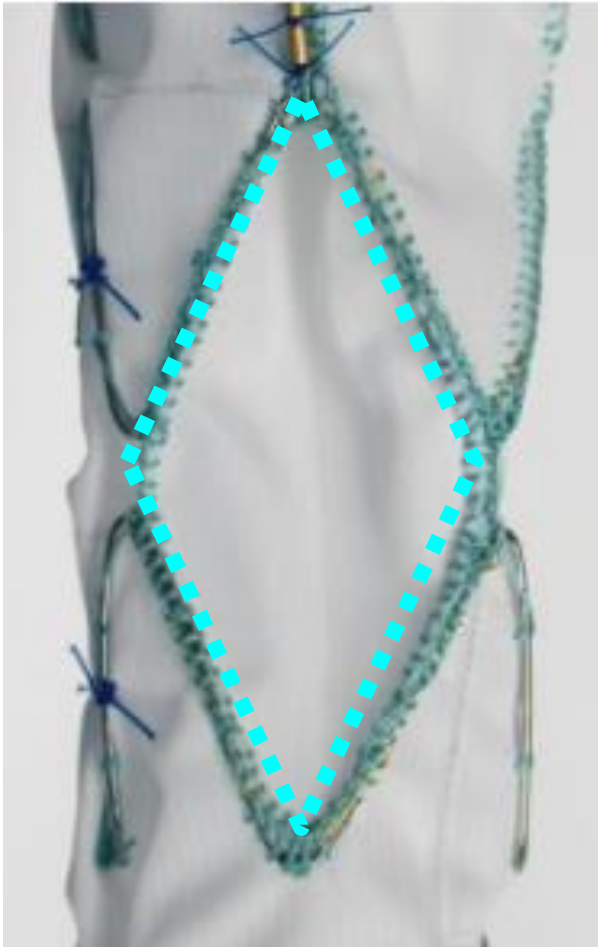
	<u>BEVAR</u>	<u>FEVAR</u>
• Aortic lumen diameter	>	<
• Orientation of the target vessel	Caudal	Liberal w/ limits
• Tortuosity of the visceral segment	Ok	No
• Coverage of the aorta	>	<

Anatomy of aorta / target vessel

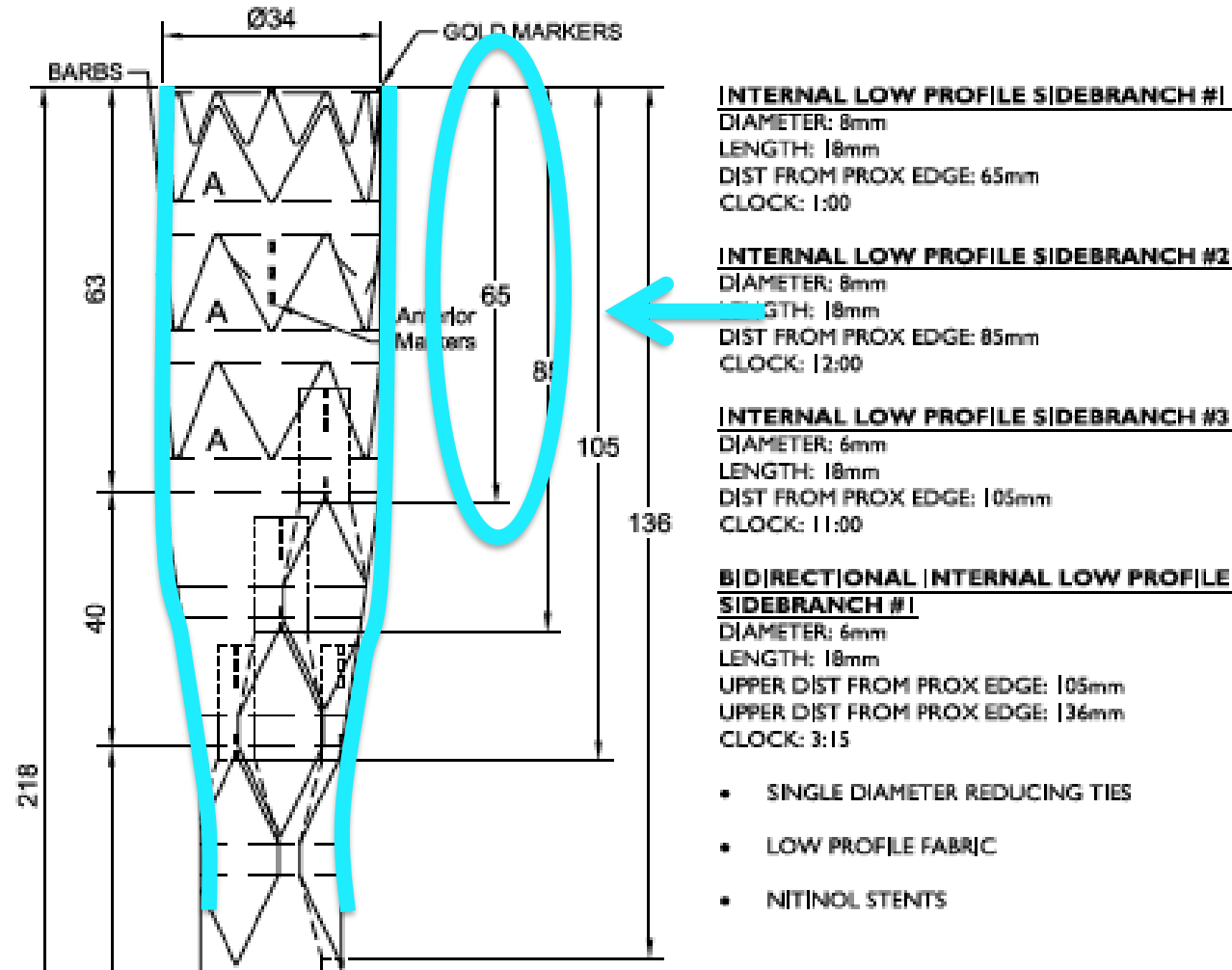
	<u>BEVAR</u>	<u>iBEVAR</u>	<u>FEVAR</u>
• Aortic lumen diameter	>		<
• Orientation of the target vessel	Caudal		Liberal w/ limits
• Tortuosity of the visceral segment	Ok		No
• Coverage of the aorta	>		<



Inner Branches (iBEVAR)



Aortic Coverage – Inner Branches (iBEVAR)



Anatomy of aorta / target vessel

	<u>BEVAR</u>	<u>iBEVAR</u>	<u>FEVAR</u>
• Aortic lumen diameter	>	<	<
• Orientation of the target vessel	Caudal	Caudal	Liberal w/ limits
• Tortuosity of the visceral segment	Ok	Ok	No
• Coverage of the aorta	>	±	<

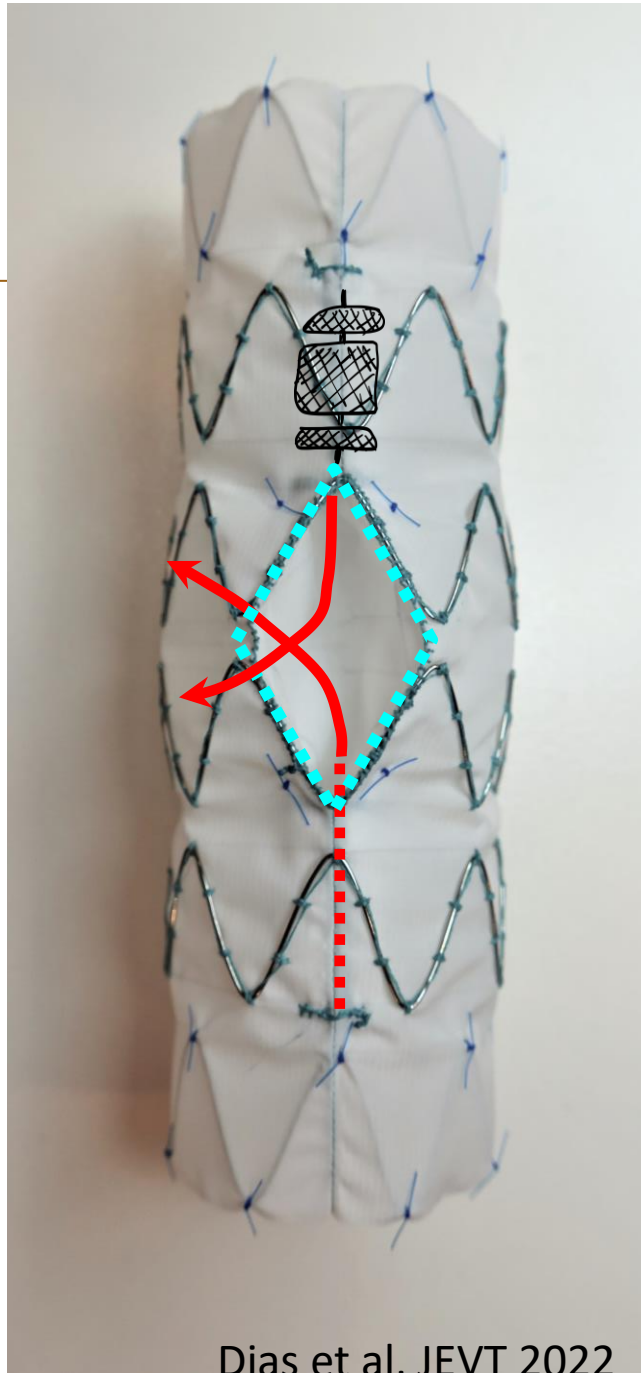
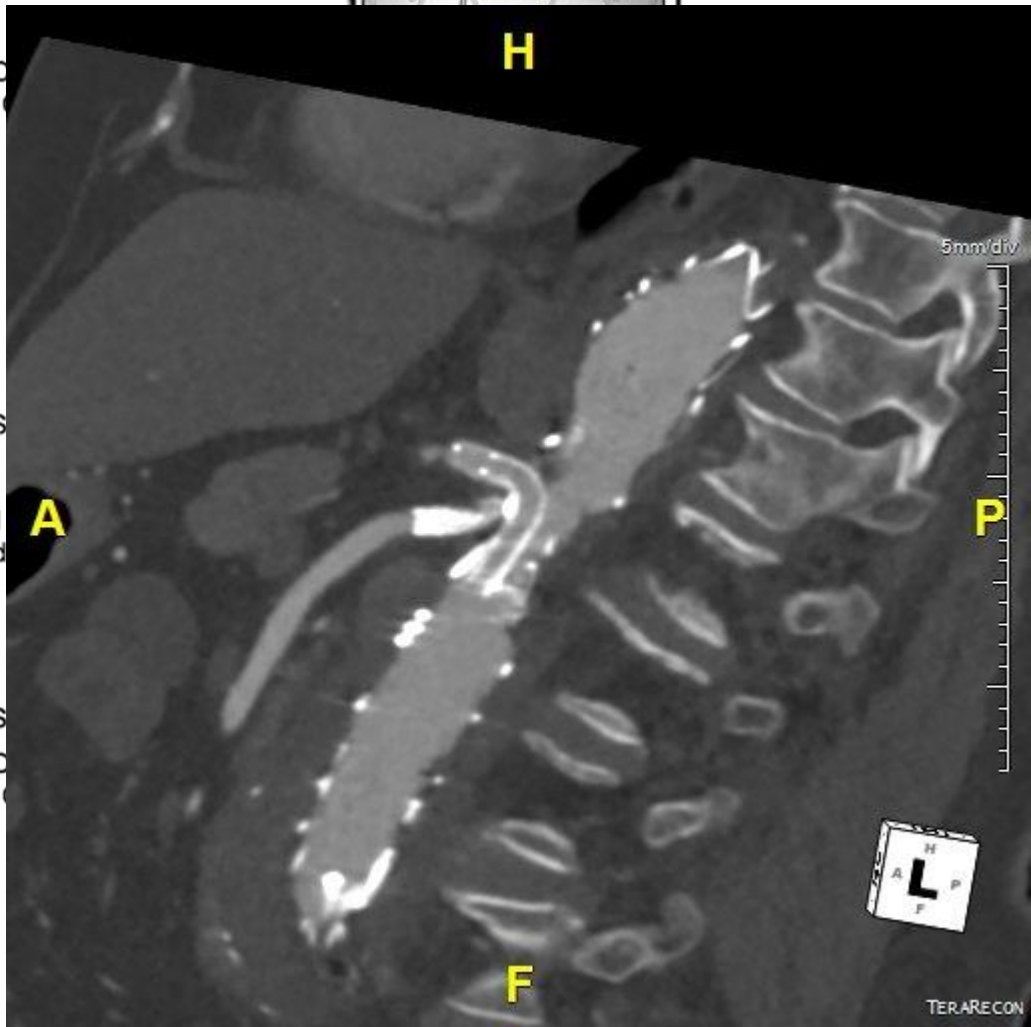
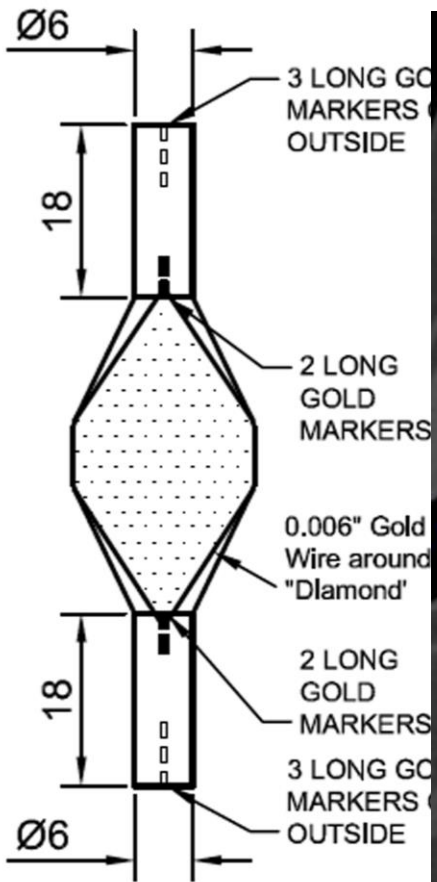


Anatomy of aorta / target vessel

	<u>BEVAR</u>	<u>iBEVAR</u>	<u>FEVAR</u>
• Aortic lumen diameter	>	<	<
• Orientation of the target vessel	Caudal	Caudal	Liberal w/ limits
• Tortuosity of the visceral segment	Ok	Ok	No
• Coverage of the aorta	>	±	<



Inner Branches (iBEVAR)



Anatomy of aorta / target vessel

	<u>BEVAR</u>	<u>iBEVAR</u>	<u>FEVAR</u>
• Aortic lumen diameter	>	<	<
• Orientation of the target vessel	Caudal	Caudal	Liberal w/ limits
• Tortuosity of the visceral segment	Ok	Ok	No
• Coverage of the aorta	>	±	<



Anatomy of aorta / target vessel

	<u>BEVAR</u>	<u>iBEVAR</u>	<u>FEVAR</u>
• Aortic lumen diameter	>	<	<
• Orientation of the target vessel	Caudal	Caudal	Liberal w/ limits
• Tortuosity of the visceral segment	Ok	Ok	No
• Coverage of the aorta	>	±	<



Anatomy of aorta / target vessel

- Aortic lumen diameter
- Orientation of the target vessel
- Tortuosity of the visceral segment
- Coverage of the aorta

BEVAR

>

Caudal

iBEVAR

<

±

FEVAR

No

<

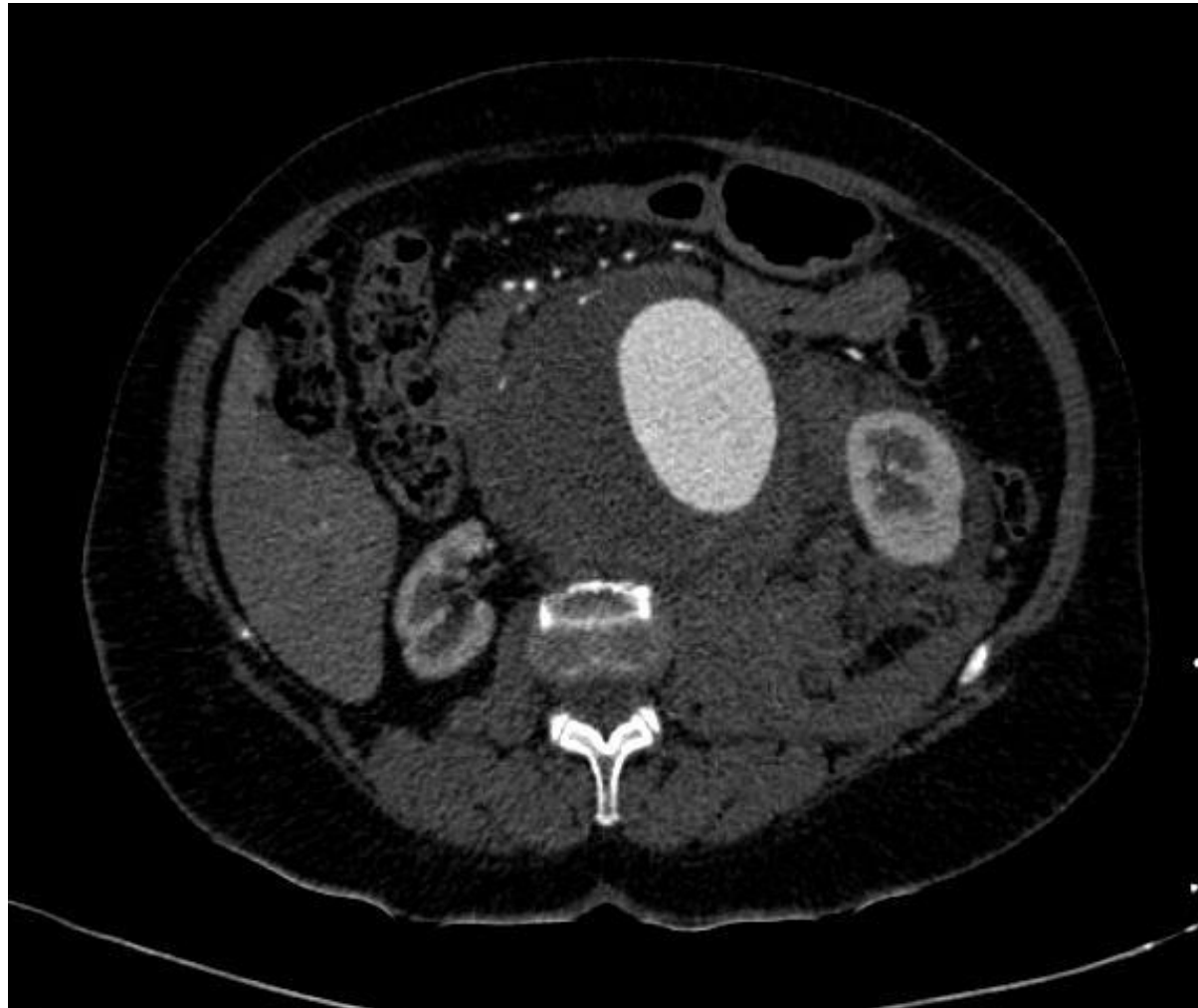
All configurations are needed to fit the different anatomies



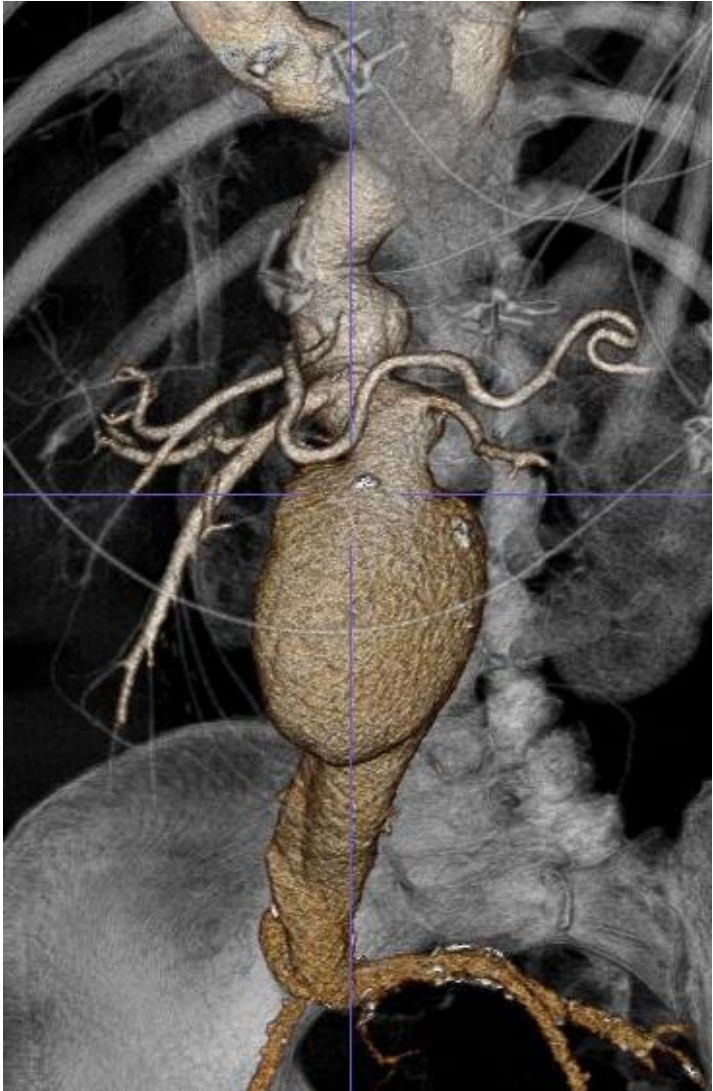
Fenestration, Branch or Mix?

- Anatomy
 - of the target vessels
 - of the aorta at the renovisceral level
- Coverage of the aorta
- Access
 - Cranial / Femoral
- Emergency of the procedure
- Future reinterventions

Emergency of the Procedure

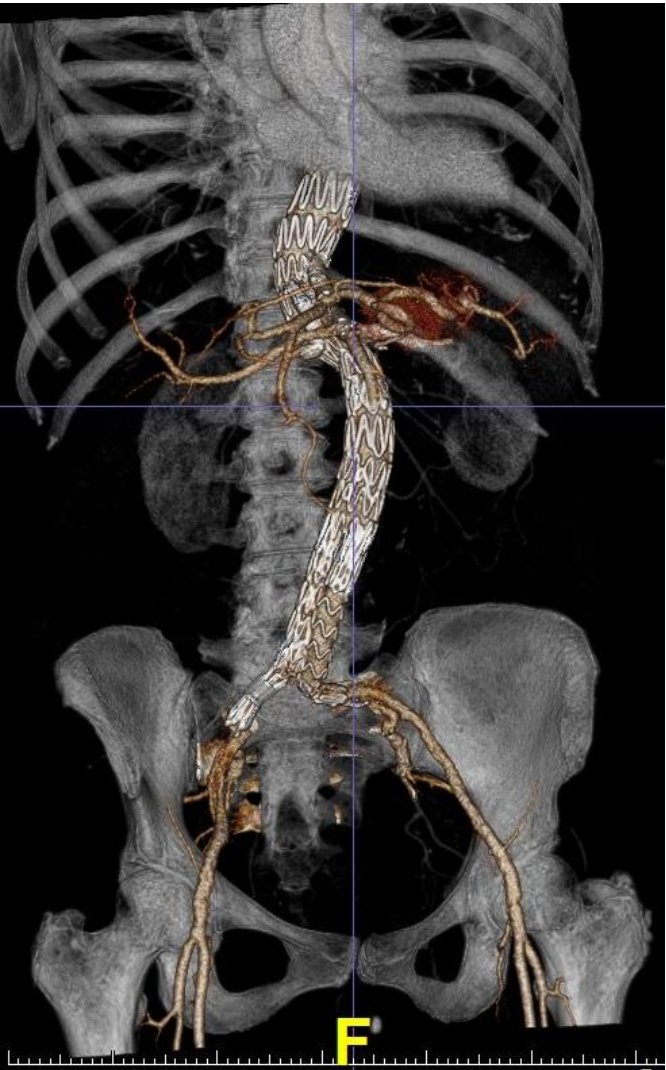
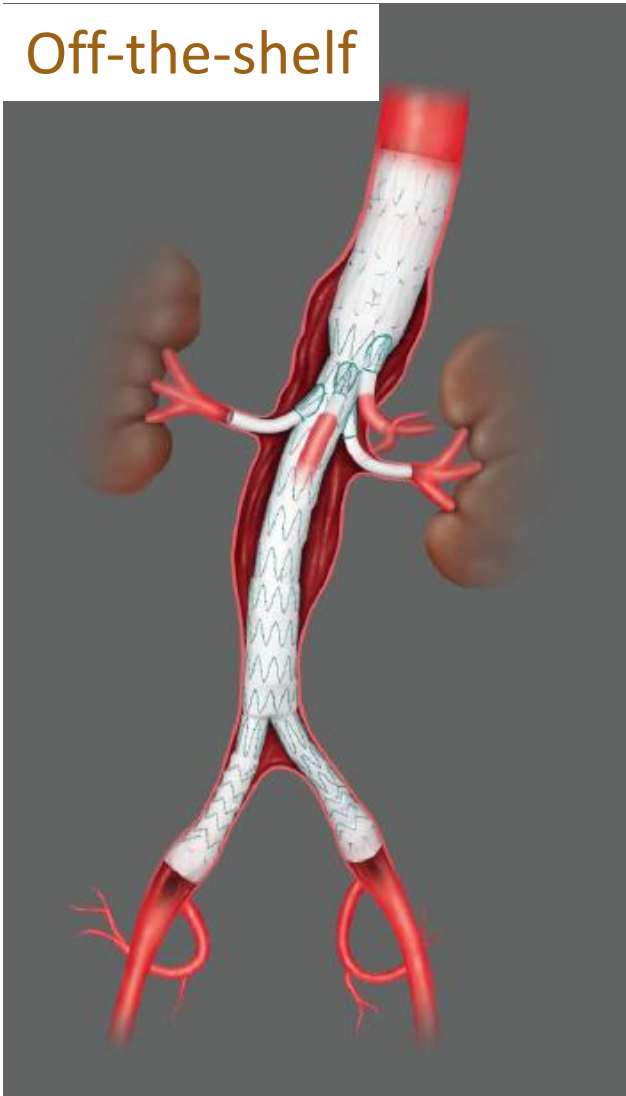


Emergency of the Procedure

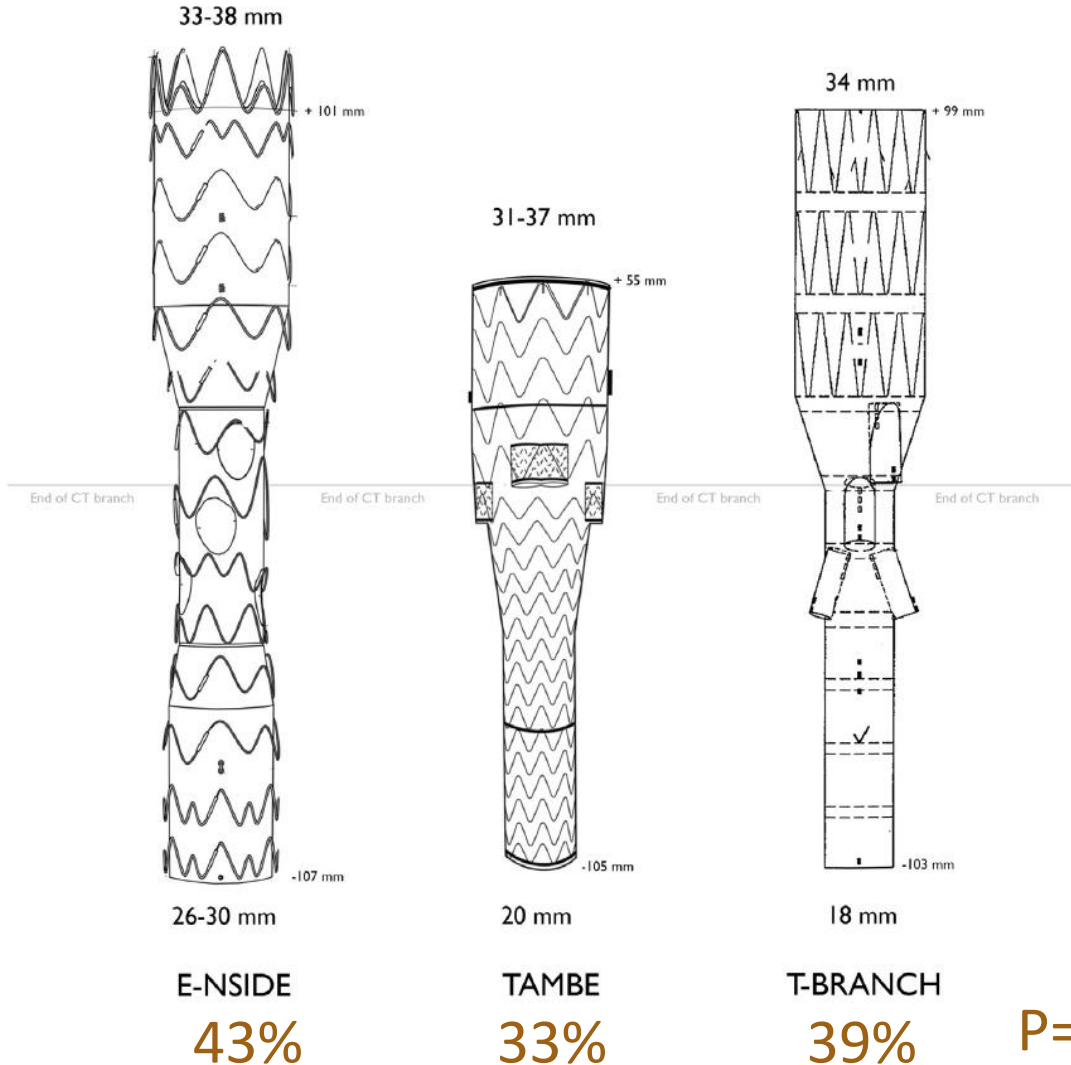


Emergency of the Procedure

Off-the-shelf



Anatomical Feasibility of off-the-shelf BEVAR



P=.271

Comparison of anatomic feasibility of three different multibranch off-the-shelf stent-grafts designed for thoracoabdominal aortic aneurysms

Luca Bertoglio, MD,^a Alessandro Grandi, MD,^a Niccolò Carta, MD,^a Tommaso Cambiaghi, MD,^b Victor Bilman, MD,^c Germano Melissano, MD,^a and Roberto Chiesa, MD,^a Milan, Italy; Houston, Tex; and Rio de Janeiro, Brazil

ABSTRACT

Objective: We compared the theoretical anatomic feasibility of endovascular treatment of thoracoabdominal aortic aneurysms (TAAAs) with three off-the-shelf multibranch stent-grafts: t-Branch (Zenith t-Branch; Cook Medical, Bloomington, Ind), Core Excluder thoracoabdominal branch endoprosthesis (TAMBE; W. L. Gore & Associates, Flagstaff, Ariz), and E-nside (E-nside multibranch stent graft system; Jotec GmbH, Hechingen, Germany).

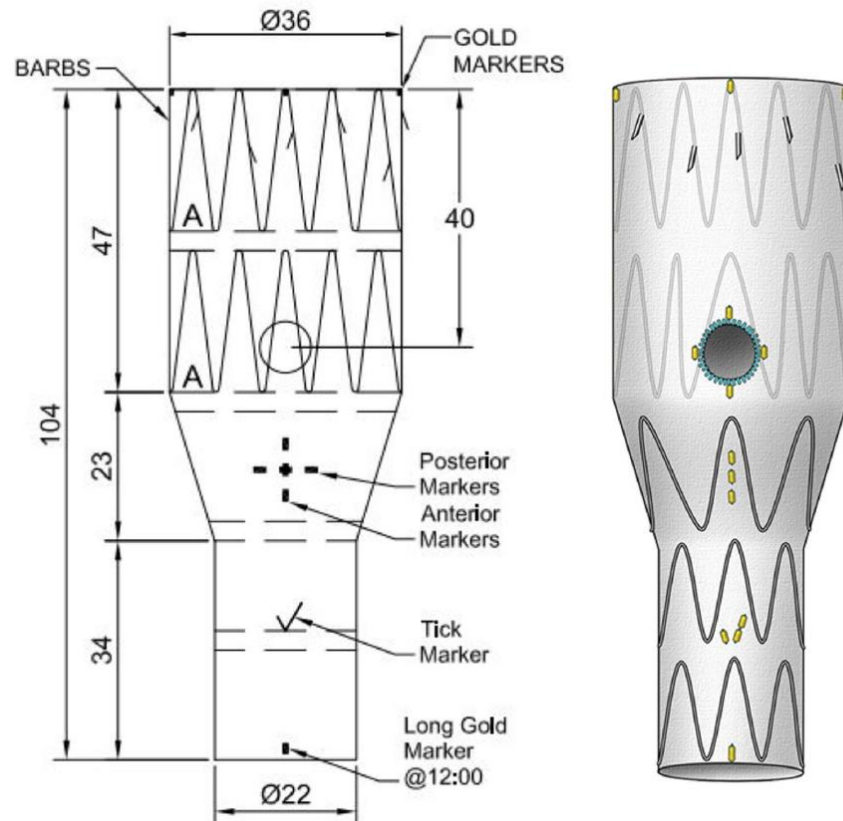
Methods: Computed tomography scans of patients with degenerative TAAAs treated from 2007 to 2019 were reviewed, and the anatomic feasibility of the multibranch stent-grafts was assessed according to the manufacturer's instructions for use. The anatomic factors determining the overall feasibility were divided into access feasibility, aortic feasibility, and visceral vessel feasibility.

Results: Degenerative TAAAs in 268 patients were analyzed. The overall feasibility did not differ significantly (TAMBE, 33%; t-Branch, 39%; E-nside, 43%; $P = .271$). Access, aortic, and visceral vessel feasibility alone excluded 18% to 22%, 35% to 49% and 21% to 26% of the patients respectively. The only significant difference between the devices was in aortic feasibility ($P = .005$), which was more frequently limited by the proximal aortic neck diameter in the TAMBE cohort and the inner visceral aortic diameter in the t-Branch cohort. The overall treatment feasibility using any of the three devices would have been 58%.

Conclusions: The new investigational off-the-shelf multibranch stent-grafts did not significantly improve the theoretical applicability in an extensive cohort of patients with TAAAs. Improvements are warranted to increase their overall feasibility. (J Vasc Surg 2021;74:1472-82.)

Fenestrated Endografts (FEVAR)

- Off-the-shelf availability?



Technical Note

Integration of a Custom-Made Fenestration to Simplify Acute Reno-Visceral In Situ Aortic Repair

JOURNAL OF
ENDOVASCULAR
THERAPY
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Journal of Endovascular Therapy
1-8
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DOI: 10.1177/15266028231208656
www.jevt.org

Sage

Marton Berczeli, MD, PhD^{1,2}, Björn Sonesson, MD, PhD^{1,3},
Angelos Karelis, MD, PhD^{1,3}, Gustavo S. Oderich, MD⁴,
and Nuno V. Dias, MD, PhD^{1,3}

Abstract

Purpose: To illustrate the technique of antegrade in situ laser fenestration (ISLF) on a predesigned custom-manufactured stent-graft with single reinforced fenestration for use in emergency endovascular repair of complex abdominal aortic aneurysms (AAAs).

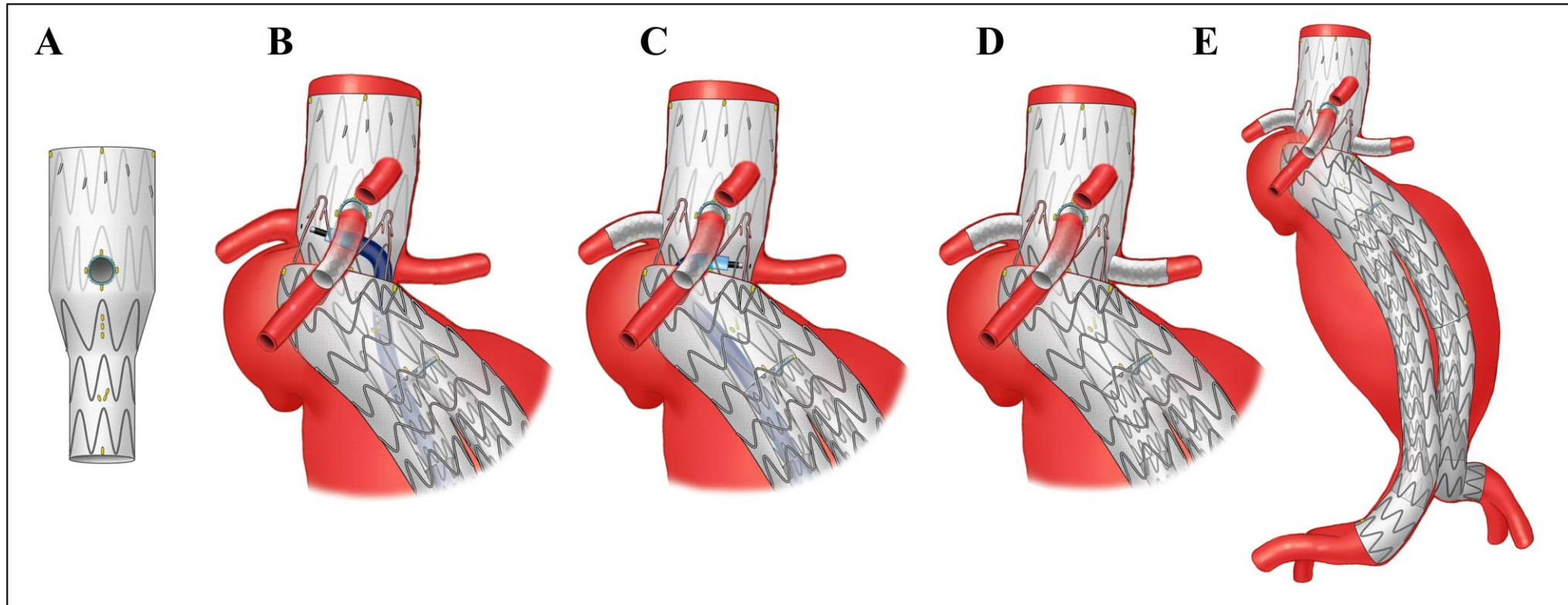
Technique: A short custom-made device (CMD) fenestrated graft was predesigned with a single preloaded 8 mm strut-free fenestration at 12 o'clock position. A modified preloaded system was used to allow unilateral access from the distal port if necessary. After bilateral percutaneous femoral access, the graft was deployed under fusion guidance with the CMD fenestration matching the superior mesenteric artery (SMA) origin and immediately bridged as per standard technique. The laser in situ fenestration and stenting of the renal arteries.

Conclusions: Single-vessel customized short fenestrated grafts for the SMA and antegrade in situ laser renal fenestrations are technically feasible for repair of acute complex AAAs even after previous infrarenal reconstruction. It could become an off-the-shelf solution to limit aortic coverage and reno-visceral ischemia, even in patients with a narrow aortic diameter at the renal level.

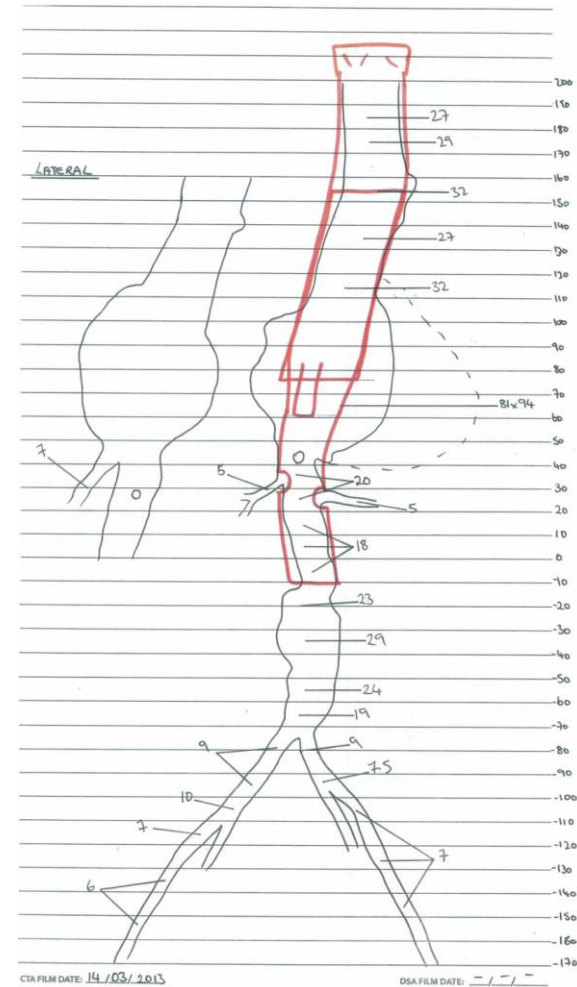
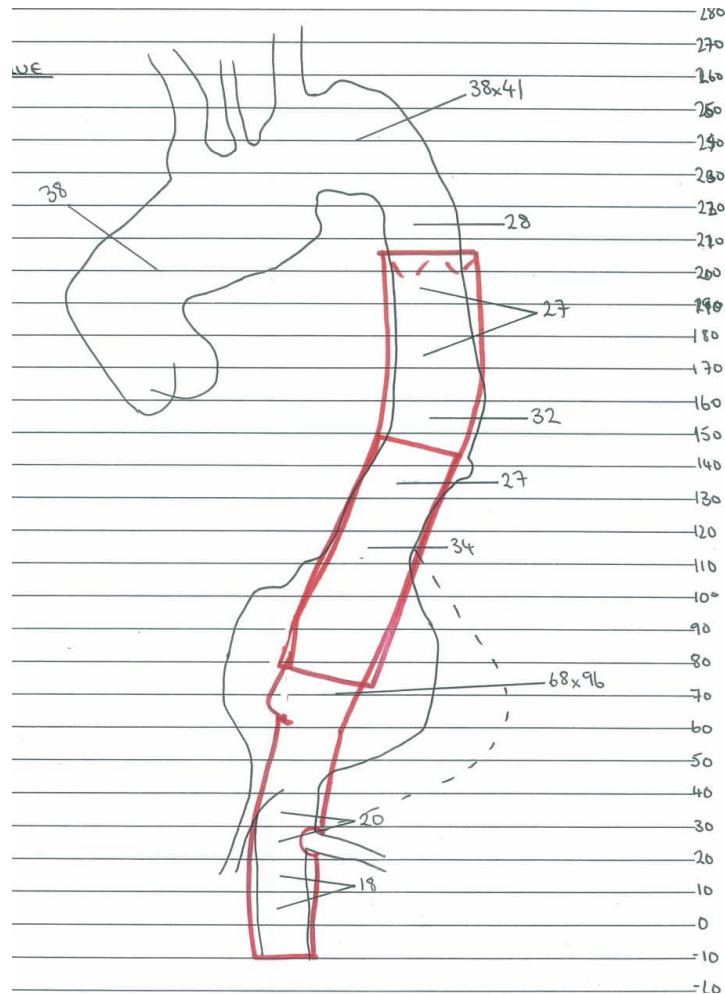
Clinical Impact

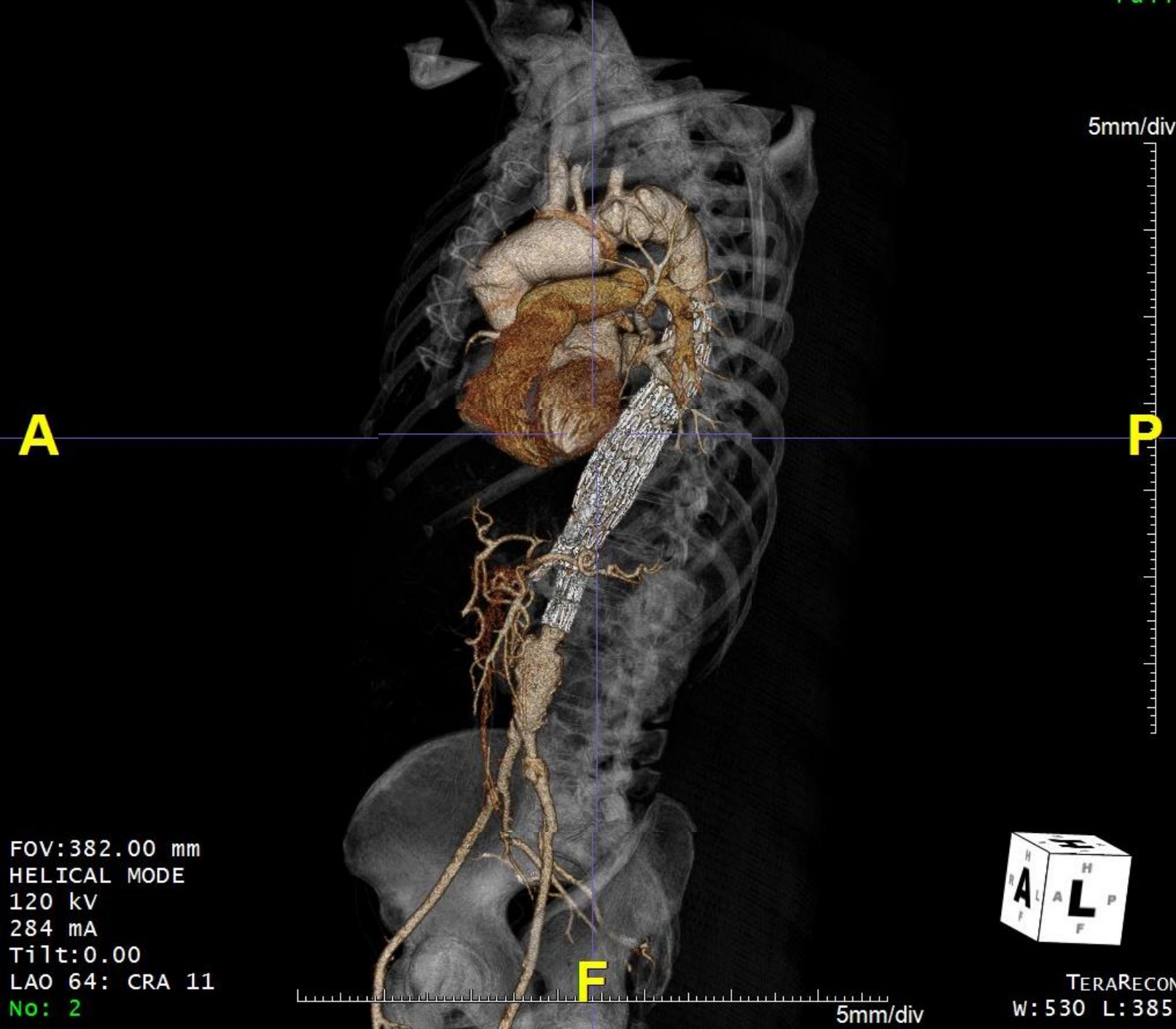
Single-vessel precustomized short fenestrated grafts for the SMA combined with renal artery antegrade ISLF can be a feasible option for the acute repair of patients with complex aneurysms and a narrow aortic diameter at the reno-visceral segment. It may limit aortic coverage and reno-visceral ischemic time and also be applicable after previous infrarenal endovascular aneurysm repair (EVAR).

In-situ FEVAR



Future reinterventions





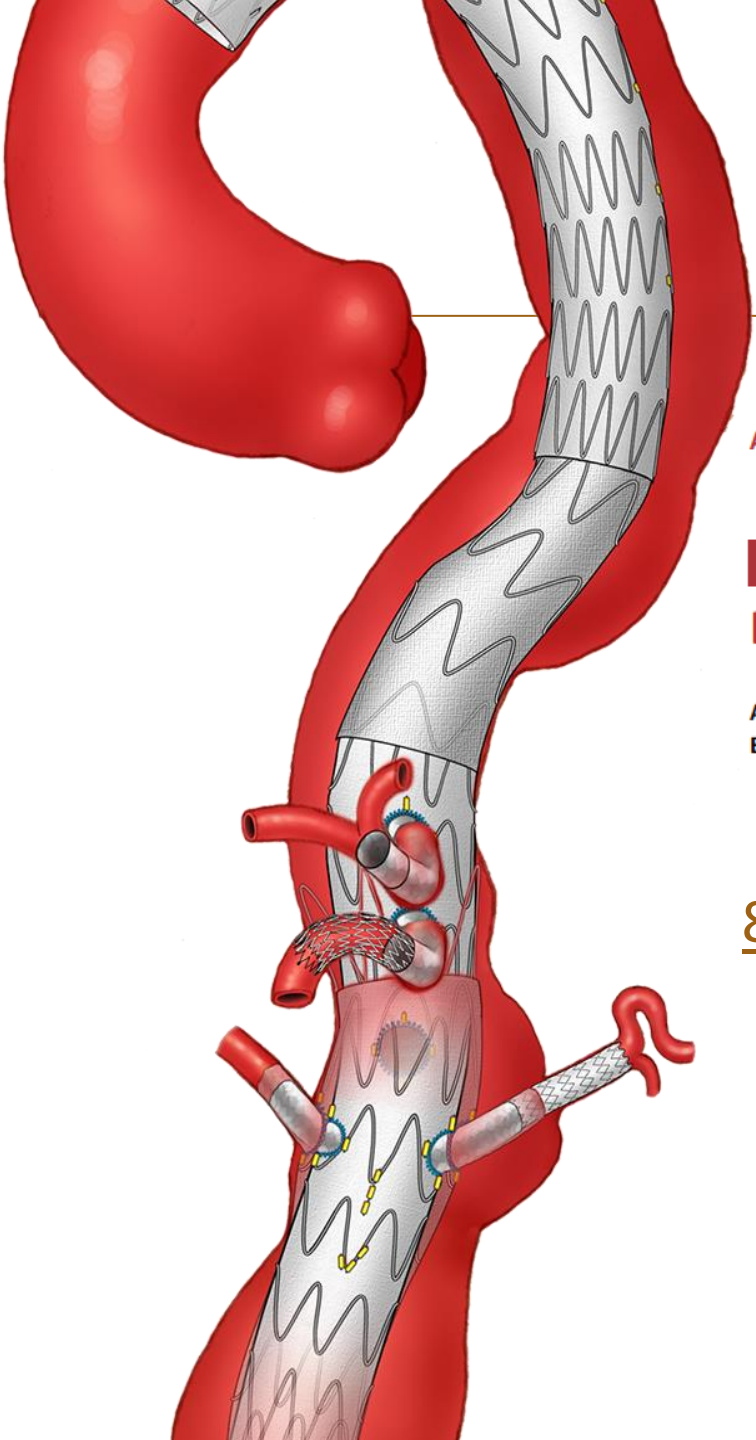
FOV:382.00 mm
HELICAL MODE
120 kV
284 mA
Tilt:0.00
LAO 64: CRA 11
No: 2



TERARECON
W: 530 L: 385



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Multicentre Initiative

Aorta and Major Branches

Eur J Vasc Endovasc Surg (2021) 62, 738–745



Editor's Choice – Multicentre Outcomes of Redo Fenestrated/Branched Endovascular Aneurysm Repair to Rescue Failed Fenestrated Endografts

Angelos Karelis ^{a,*}, Stéphan Haulon ^b, Björn Sonesson ^a, Donald Adam ^c, Tilo Kölbel ^d, Gustavo Oderich ^e, Enrico Cieri ^f, Thomas Mesnard ^g, Eric Verhoeven ^h, Nuno Dias ^a, contributors

8 Centres

- Original FEVARs 2007 – 2018 2805 pts
- F/BEVAR-in- FEVAR 2012 – 2019 18 (0.64%) pts



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Karelis et al, EJVES 2021

Select good sealing zone...



General considerations

- Plan good sealing zones
 - both proximal and distal
- If FEVAR → 4 fens
- If long BEVAR → stage
- Plan to fail → cause it will

Summary: Customize the device to patient's anatomy

Fenestrations and/or Branches are needed to address the different anatomies in complex aortic aneurysms

- Inner branches give an added value in selected cases

In the elective setting, the device needs to fit the anatomy of the patient and not the other way around

