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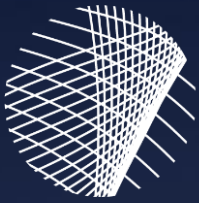


# Arch Branch TEVAR Has Come Of Age: Series Of 70

Tilo Kölbel

German Aortic Center  
Dpt. of Vascular Medicine  
University Heart & Vascular Center  
Hamburg

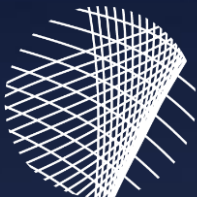
23<sup>RD</sup> INTERNATIONAL EXPERTS SYMPOSIUM  
**CRITICAL ISSUES**  
in aortic endografting **2019**



# Disclosures



- \* Research-grants, travelling, proctoring speaking-fees, IP, royalties with Cook Medical.
- \* Consultant with Philips
- \* Speaking fees from Getinge
- \* IP, Consultant with Terumo Aortic
- \* Shareholder Mokita-Medical GmbH



# Gold Standard for the Arch

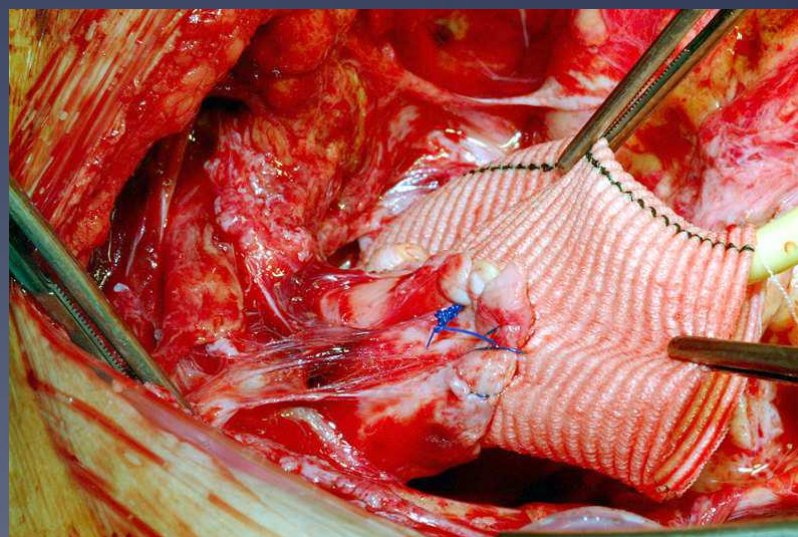
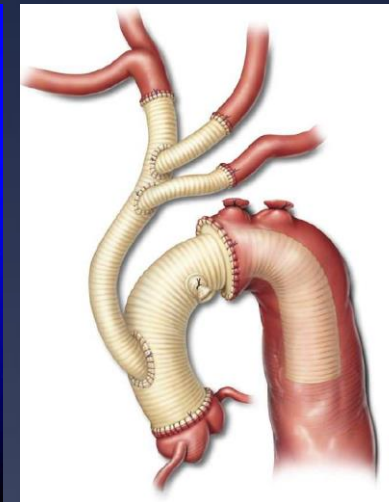
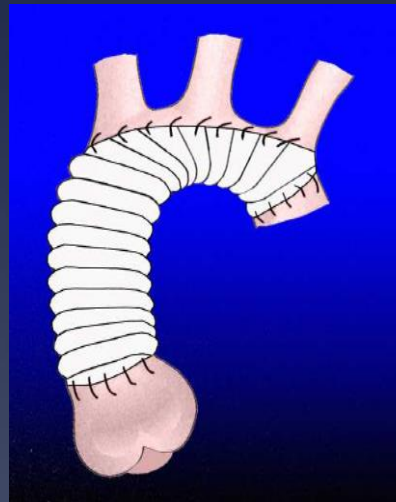


Surgery for the aortic arch:

- \* Open repair
- \* Elephant trunk

Mortality rates 5-15%

Stroke: 4-12%



Minakawa et al. 2010; Ann Thorac Surg 90:72-7

Sundt et al. 2008; Ann Thorac Surg 86:787-96



# Risk Factors for Open Repair



## Multicentre analysis of current strategies and outcomes in open aortic arch surgery: heterogeneity is still an issue

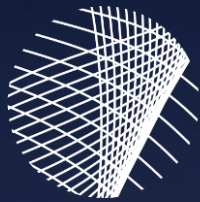
Paul P. Urbanski<sup>a,\*</sup>, Maximilian Luehr<sup>b</sup>, Roberto Di Bartolomeo<sup>c</sup>, Anno Diegeler<sup>a</sup>, Ruggero De Paulis<sup>d</sup>, Giampiero Esposito<sup>e</sup>, Robert S. Bonser<sup>f</sup>, Christian D. Etz<sup>g</sup>, Klaus Kallenbach<sup>h</sup>, Bartosz Rylski<sup>i</sup>, Malakh Lal Shrestha<sup>j</sup>, Konstantinos Tsagakis<sup>k</sup>, Michael Zacher<sup>a</sup> and Andreas Zierer<sup>l</sup>

- \* 11 European centers
- \* 2004-2013, n=1232, age: 64y
- \* Mortality 12%
- \* Dialysis 13%
- \* Stroke 9%
- \* Risk factors:
  - \* Center
  - \* Age
  - \* **Previous surgery**
  - \* Concomittant surgery

Table 6: Multivariable analysis to identify risk factor for 30-day mortality

Variables	Odds Ratio	95% CI		P-value
		Low	High	
Centre B	2.83 <sup>a</sup>	0.54	14.73	0.217
Centre C	6.82 <sup>a</sup>	1.93	24.13	0.003
Centre D	7.28 <sup>a</sup>	1.98	26.82	0.003
Centre E	2.51 <sup>a</sup>	0.63	10.04	0.192
Centre F	14.30 <sup>a</sup>	2.50	81.68	0.003
Centre G	8.30 <sup>a</sup>	2.37	29.04	0.001
Centre H	6.20 <sup>a</sup>	1.30	29.57	0.022
Centre I	6.35 <sup>a</sup>	1.80	22.56	0.004
Centre K	12.57 <sup>a</sup>	3.31	47.70	0.000
Centre L	4.02 <sup>a</sup>	0.62	26.20	0.146
Age	1.05	1.02	1.07	0.000
<u>No of previous surgeries<sup>b</sup></u>	1.21	1.04	1.42	0.016
Concomitant CABG	1.79	1.06	3.04	0.029
Concomitant MVR	2.35	0.75	4.61	0.143





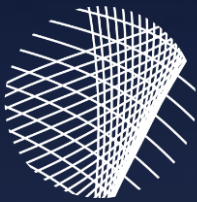
# Reoperation of Aortic Arch



## Editor's Choice — Aortic Re-operation After Replacement of the Proximal Aorta: A Systematic Review and Meta-Analysis

Mario Gaudino <sup>a,\*</sup>, Leonard N. Girardi <sup>a</sup>, Mohamed Rahouma <sup>a</sup>, Jeremy R. Leonard <sup>a</sup>, Antonino Di Franco <sup>a</sup>, Christopher Lau <sup>a</sup>, Neil Mehta <sup>b</sup>, Ahmed Abouarab <sup>a</sup>, Alexandra N. Schwann <sup>a</sup>, Gaetano Scuderi <sup>a</sup>, Michelle Demetres <sup>c</sup>, Richard B. Devereux <sup>b</sup>, Umberto Benedetto <sup>a</sup>, Jonathan W. Weinsaft <sup>b</sup>

- \* 47 centers; 7821 patients
- \* Mean Age 56y
- \* Marfan-syndrome: 649 (8.3%)
- \* Re-do Surgery: 903 (11.5%)
- \* Time to re-operation: 5.2years
- \* **In-hospital mortality 14.3%**  
Risk-factor: dissection
- \* Complications 18.1%

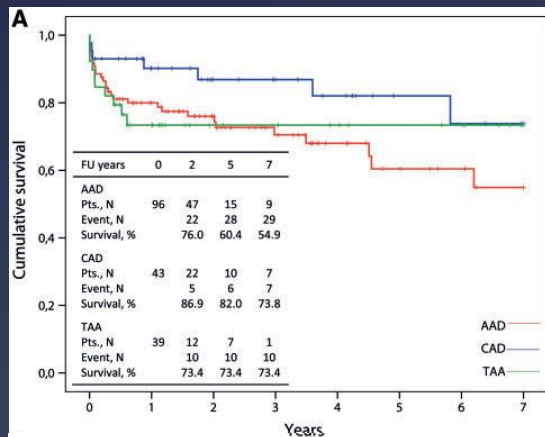


# Contemporary FET-Results



## Long-term experience with the E-vita Open hybrid graft in complex thoracic aortic disease†

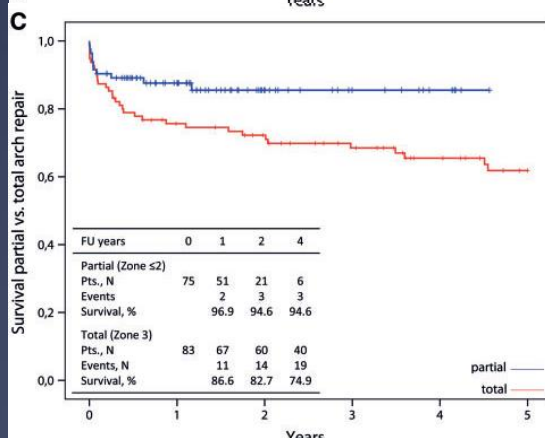
Heinz Jakob<sup>a,\*</sup>, Daniel Dohle<sup>a</sup>, Jaroslav Benedik<sup>a</sup>, Rolf Alexander Jánosi<sup>b</sup>, Thomas Schlosser<sup>c</sup>, Daniel Wendt<sup>a</sup>, Matthias Thielmann<sup>a</sup>, Raimund Erbel<sup>b</sup> and Konstantinos Tsagakis<sup>a</sup>



\* 2005-2015; single center; n=178

\* Age 59y, 54% TAAD

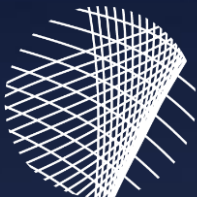
\* 30d mortality 10%  
(No difference between acute and elective)



\* Stroke 10%

\* SCI 6%

\* Hemofiltration 32%

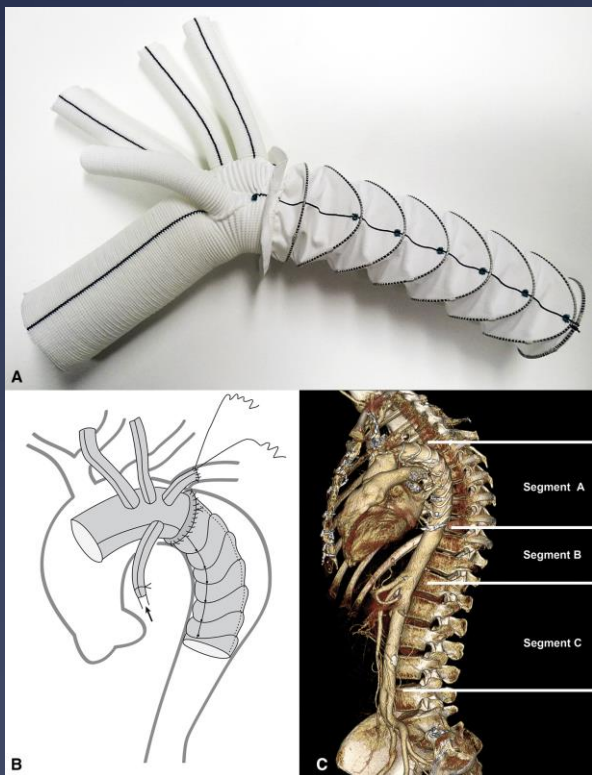


# Contemporary FET-Results

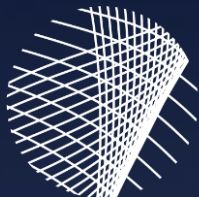


## Total aortic arch replacement with a novel 4-branched frozen elephant trunk prosthesis: Single-center results of the first 100 patients

Malakh Shrestha, MBBS, Tim Kaufeld, MD, Erik Beckmann, MD, Felix Fleissner, MD, Julia Umminger, MD, Firas Abd Alhadi, MD, Dietmar Boethig, MD, Heike Krueger, RN, Axel Haverich, MD, and Andreas Martens, MD



- \* Single center; n=100
- \* Age 62y, 37% acute
- \* Perioperative mortality 7%
- \* Stroke 9%
- \* Paraparesis 7%
- \* Dialysis 8%
- \* Recurrent nerve palsy 25%



# Cook Zenith Branched Arch Endograft



## Editor's Choice — Subsequent Results for Arch Aneurysm Repair with Inner Branched Endografts, ☆

R. Spear <sup>a</sup>, S. Haulon <sup>a,\*</sup>, T. Ohki <sup>b</sup>, N. Tsilimparis <sup>c</sup>, Y. Kanaoka <sup>b</sup>, C.P.E. Milne <sup>a</sup>, S. Debus <sup>c</sup>, R. Takizawa <sup>b</sup>, T. Kölbel <sup>c</sup>

<sup>a</sup> Aortic Centre, CHRU Lille, France

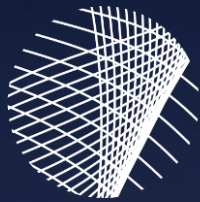
<sup>b</sup> Vascular Surgery, Jikei University, Tokyo, Japan

<sup>c</sup> German Aortic Center, University Heart Center Hamburg, Germany

- \* n = 27; Hamburg, Tokio, Lille
- \* 4/2013- 11/2014
- \* Technical success 27/27
- \* 30d Mortality 0/27
- \* 1y mortality 1/27 (4%)
- \* Stroke/TIA 3/27 (11%)







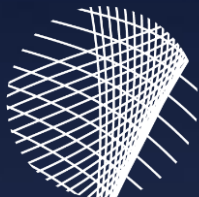
# Cook Branched Arch Endograft



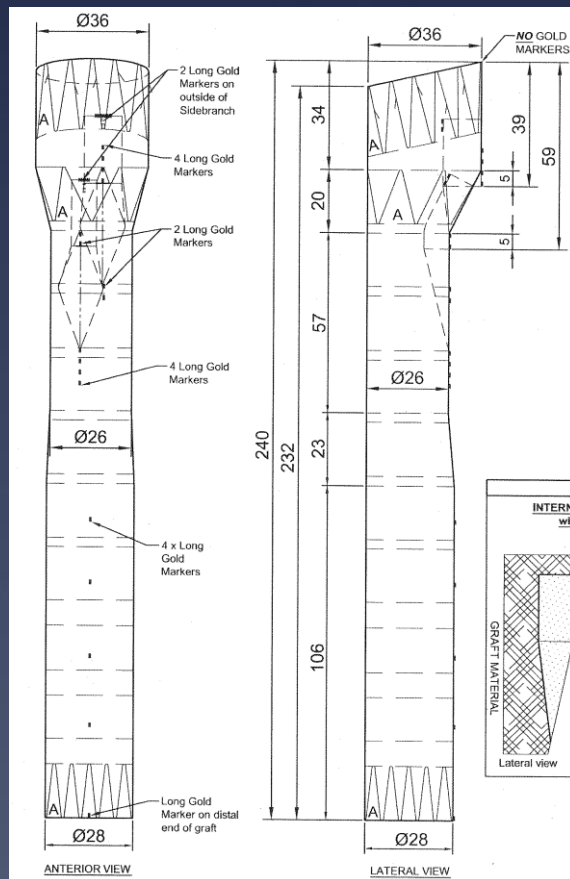
## Hamburg Experience 2012-2018:

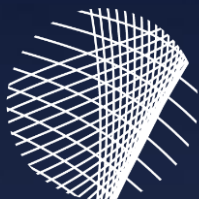
* Cases:	74
* Aneurysm/PAU:	43
* Residual dissection:	29
* Acute Type A:	2
* 30d-Mortality:	4 (5%)
* Clinical stroke:	5 (7%)





# Chronic TAAD-Repair



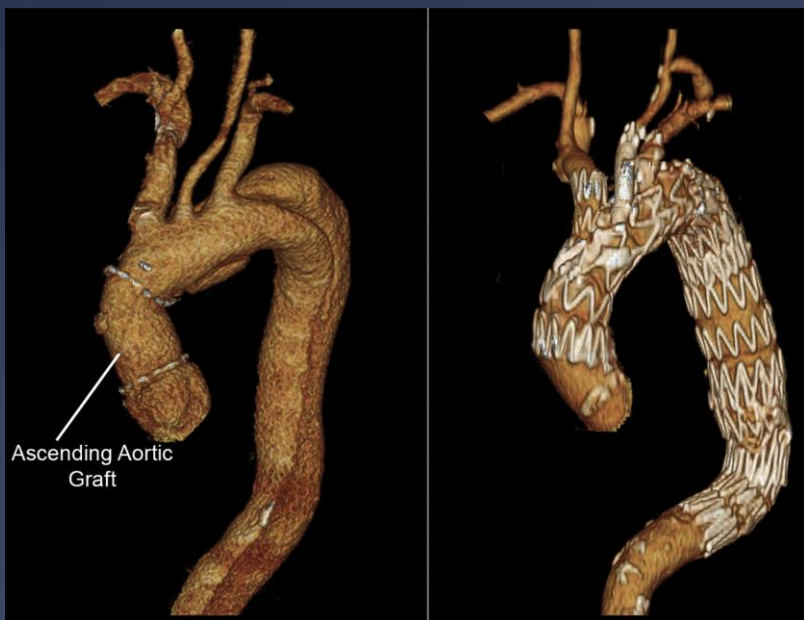


# Chronic TAAD-Repair



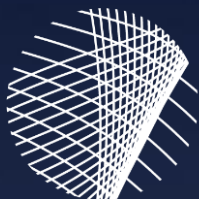
## Inner-Branched Endografts for the Treatment of Aortic Arch Aneurysms After Open Ascending Aortic Replacement for Type A Dissection

Charles P. E. Milne, MBBS (Hons), FRACS (Vasc), Mau Amako, MD, PhD, Rafaele Spear, MD, PhD, Rachel E. Clough, MRCS, PhD, Adrien Hertault, MD, Jonathan Sobocinski, MD, PhD, Wendy Brown, MBBS (Hons), PhD, and Stéphan Haulon, MD, PhD



- \* N=73; 2009-2015 Type 1 AD
- \* Eligibility for B-TEVAR
- \* Access, diameter, angulation
- \* 70% anatomically suitable



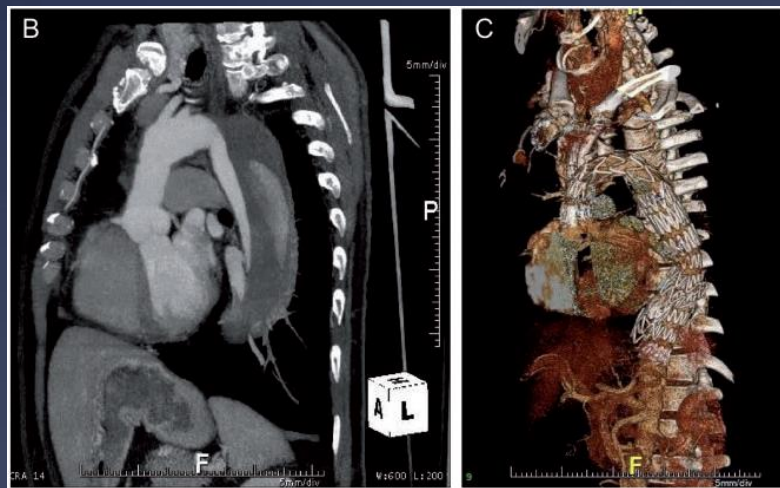


# Chronic TAAD-Repair



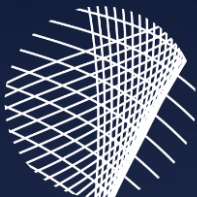
## Branched endografts in the aortic arch following open repair for DeBakey Type I aortic dissection

Nikolaos Tsilimparis<sup>a,\*</sup>, Christian Detter<sup>b</sup>, Franziska Heidemann<sup>a</sup>, Konstantinos Spanos<sup>a</sup>, Fiona Rohlfes<sup>a</sup>, Yskert von Kodolitsch<sup>c</sup>, Sebastian E. Debus<sup>a</sup> and Tilo Kölbel<sup>a</sup>



- \* N=20; 2012-2016 Type 1 AD
- \* Technical Success 95%
- \* 30d Mortality 5%
- \* Stroke 5%
- \* False Lumen occlusion 50%
  - \* Knickerbocker 15%
  - \* Candy-plug 5%





# Chronic TAAD



## Challenges:

### Proximal landing zone:

- \* Kinking of ascending graft
- \* Oversizing

### Supraaortic branches:

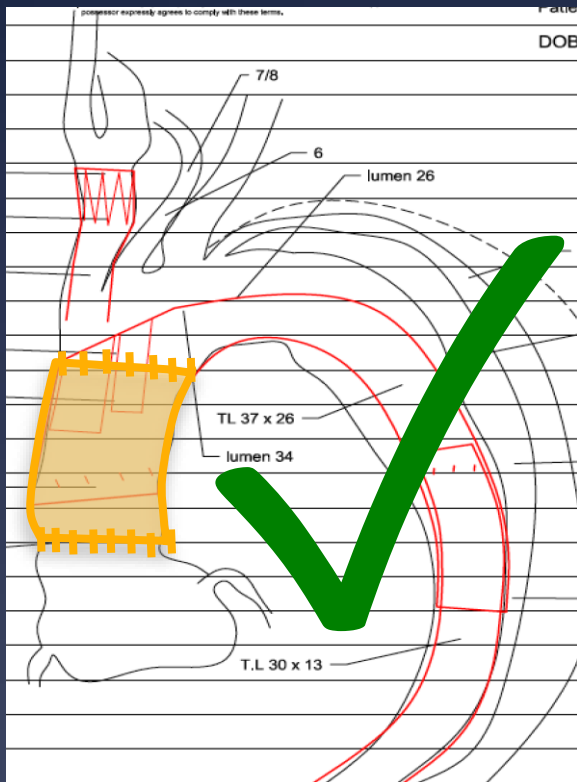
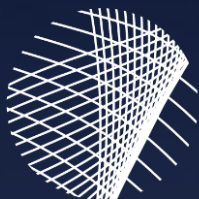
- \* Dissection of targetvessels
- \* Distal entries

### Distal landing zone:

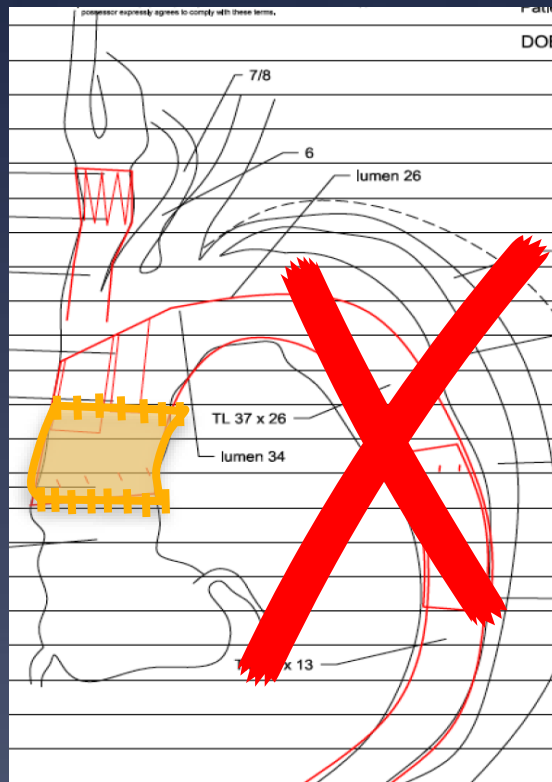
- \* False-lumen perfusion



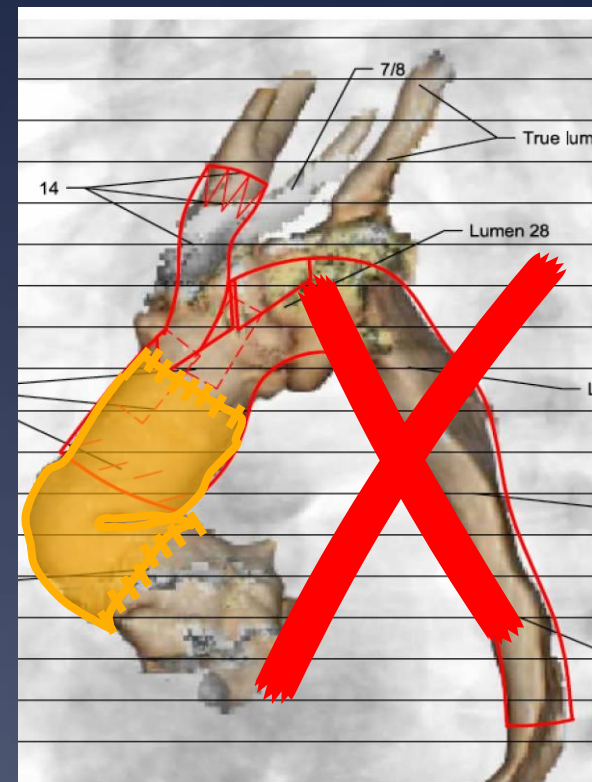
# Proximal Landingzone



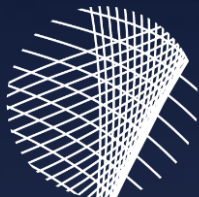
Suitable: 70%



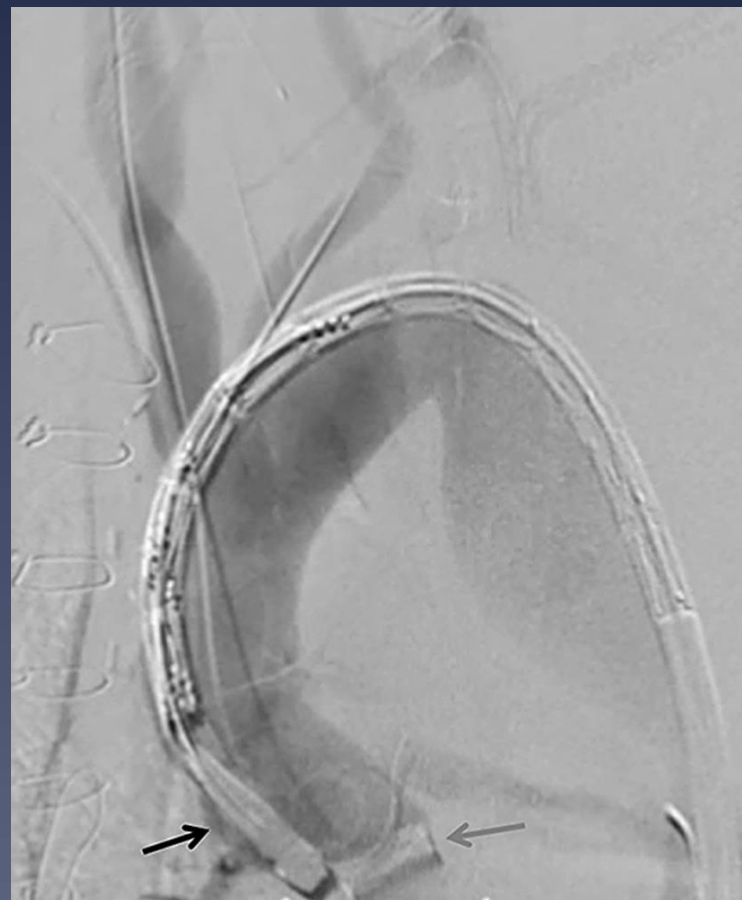
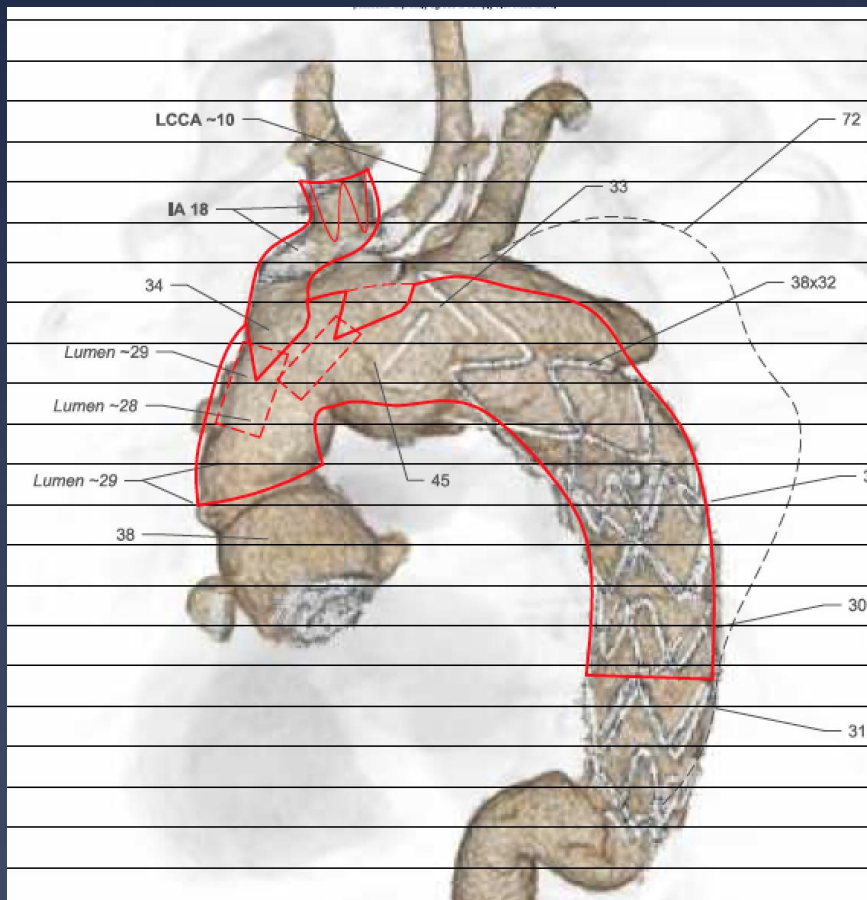
Graft too short: 21%



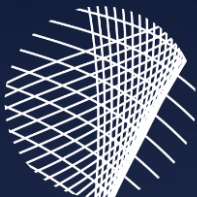
Major Kink: 7%



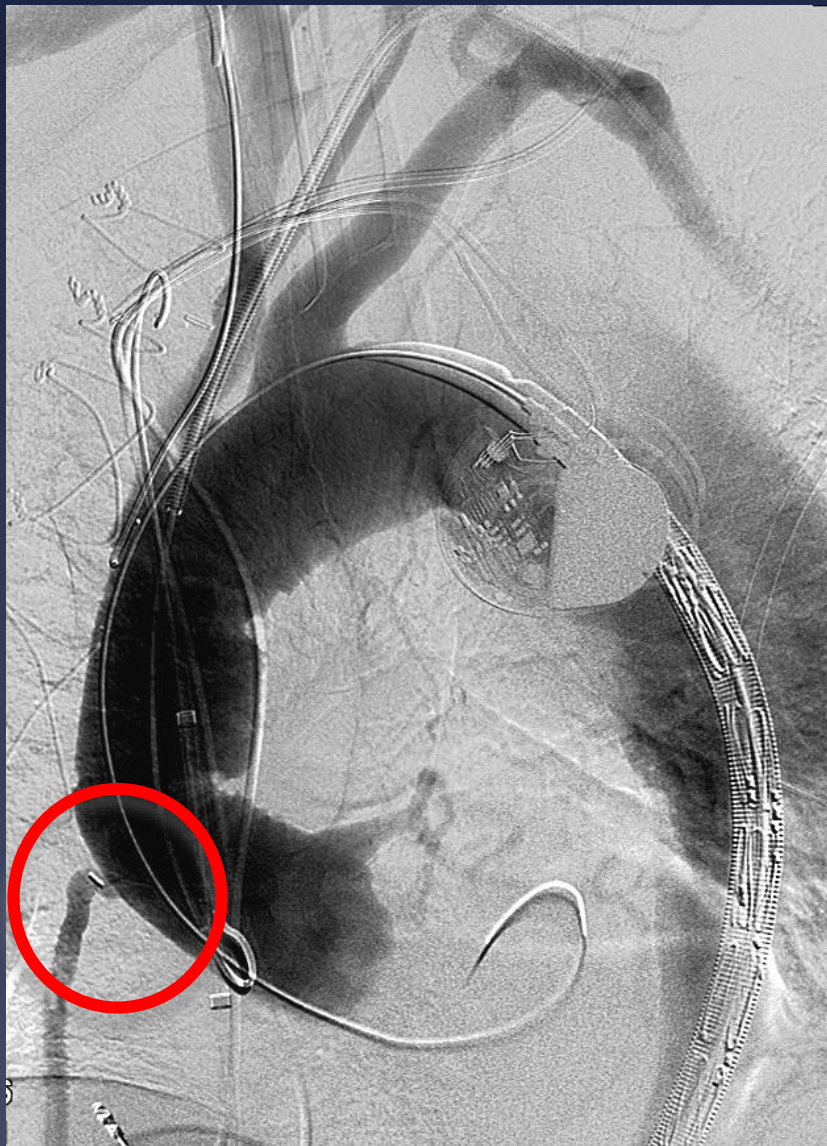
# Mechanical Valve



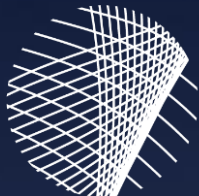




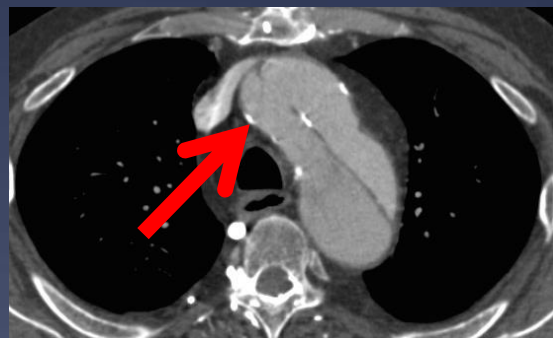
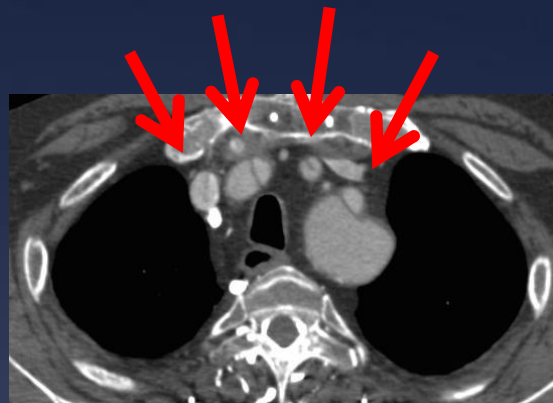
# CABG from Ascending

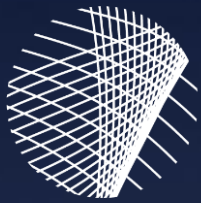






# Residual Dissection





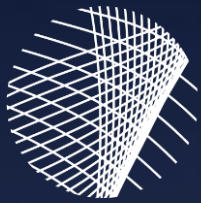
# Residual Dissection



Bilateral carotid-subclavian bypass



Axillo-axillary bypass



# Residual Dissection

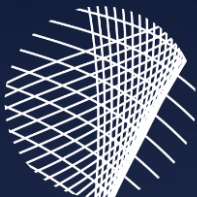


True lumen catheterization



Creation of landing zone



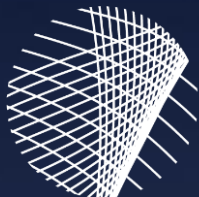


# Dissected Carotid Artery

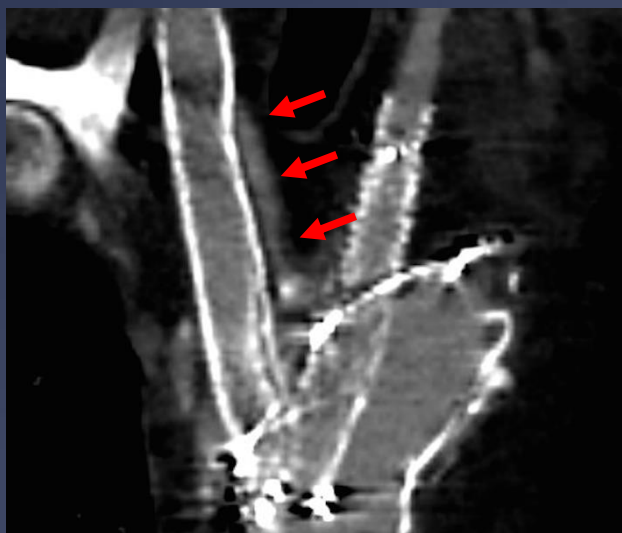
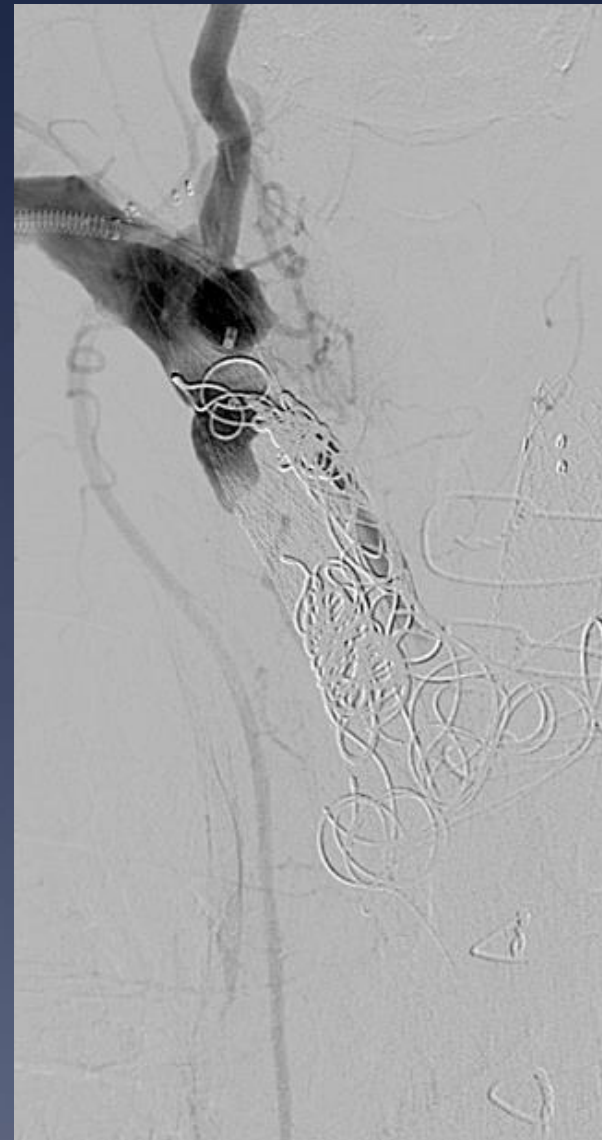
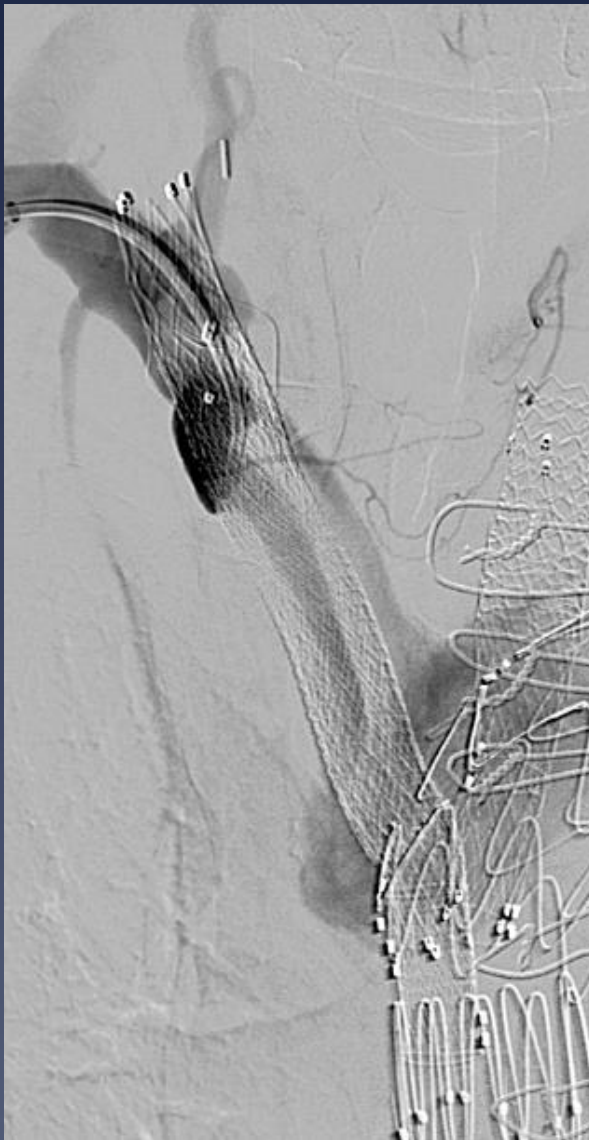


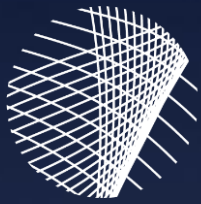
Landing in dissected LCCA



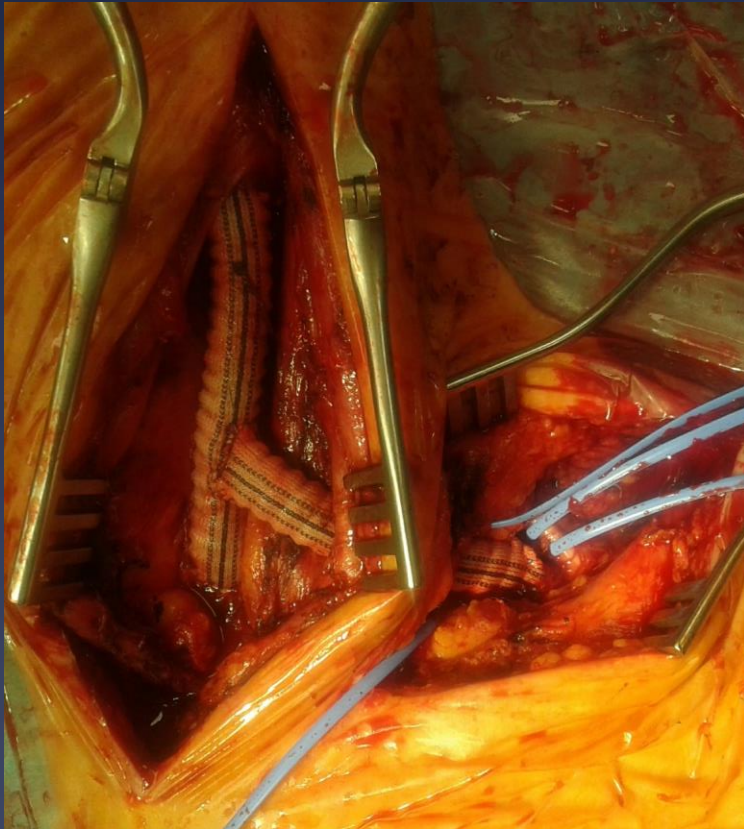


# Residual Dissection

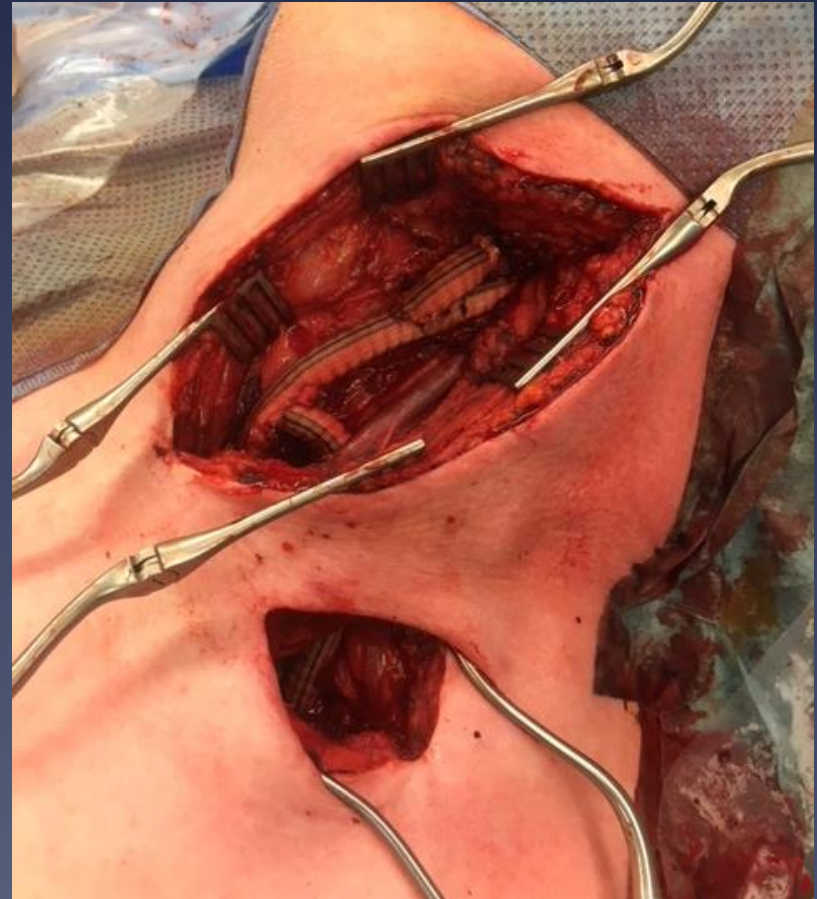




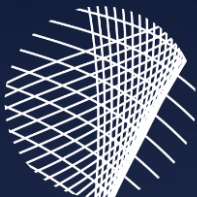
# Residual Dissection



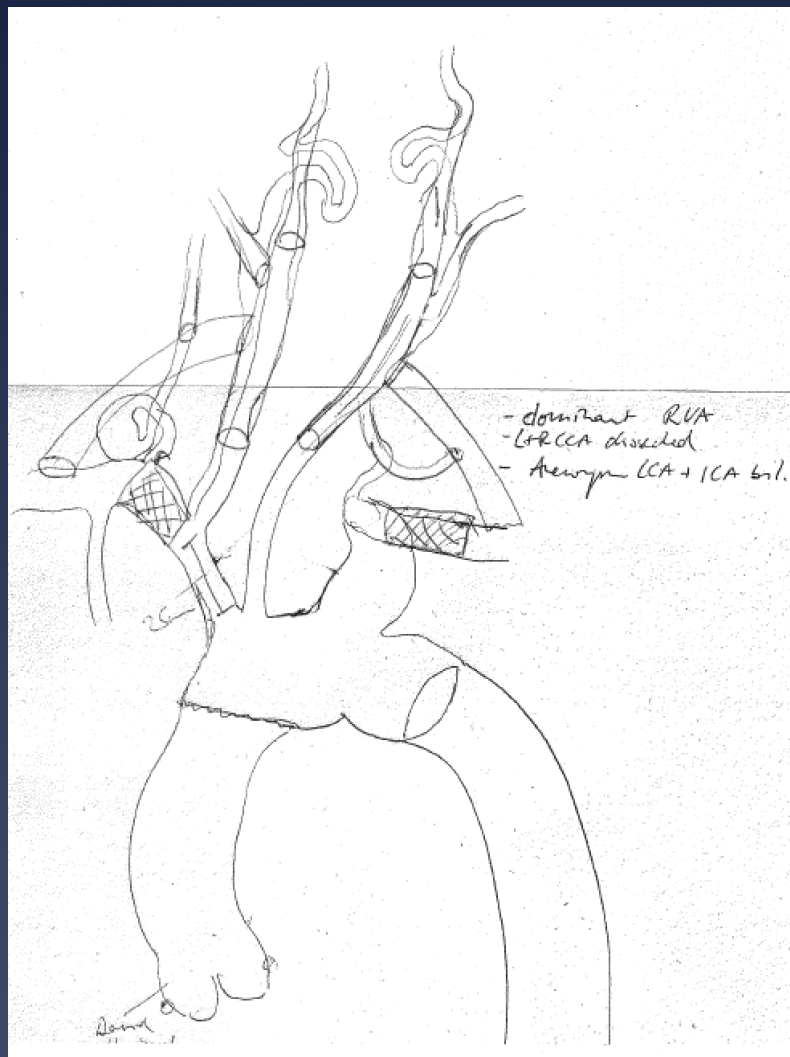
Interposition Graft LCCA



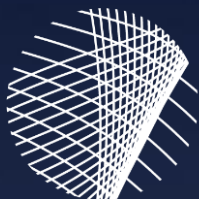




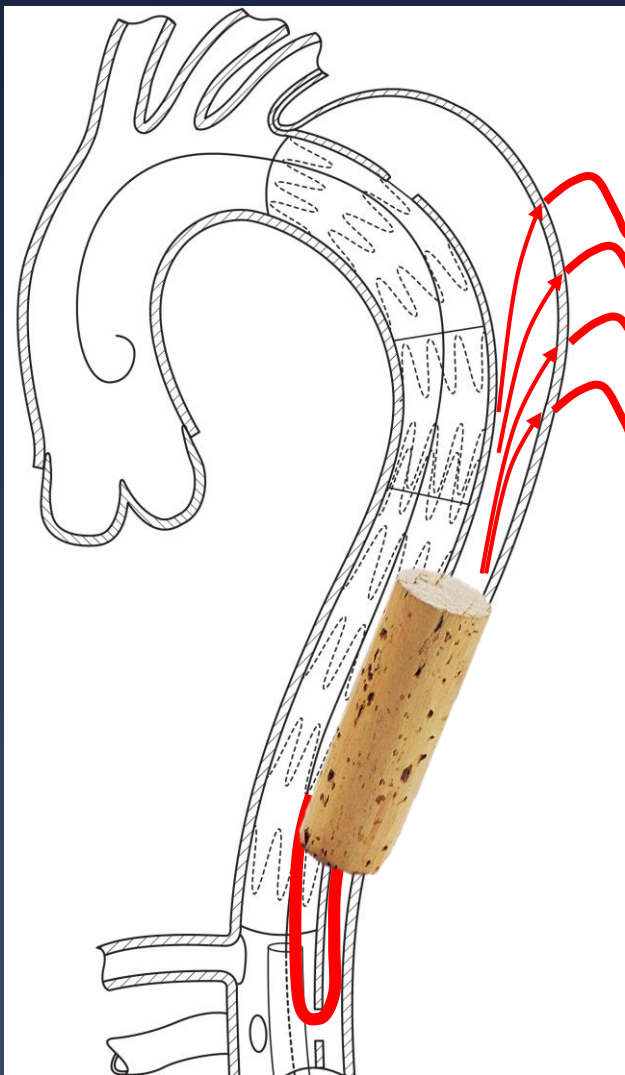
# Genetic Aortic Syndrome



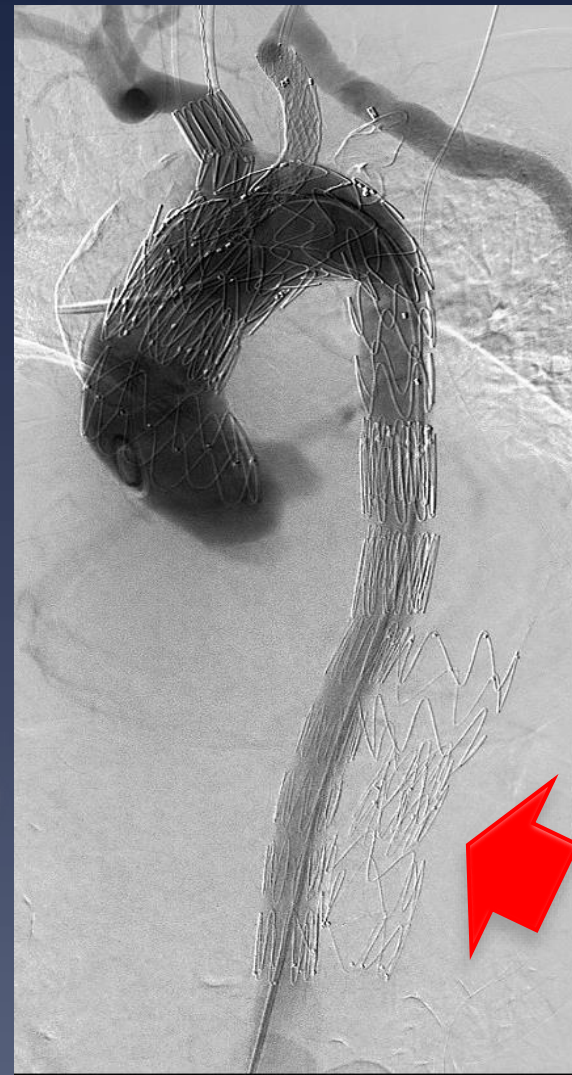




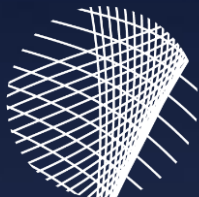
# Distal Landing Zone



A-Branch + Knickerbocker



A-Branch + Candy Plug



# Endovascular cTAAD-Repair



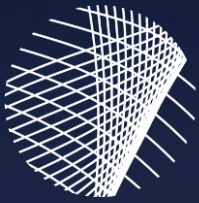
## Endovascular Treatment of Post Type A Chronic Aortic Arch Dissection With a Branched Endograft

*Early Results From a Retrospective International Multicenter Study*

*Dorian Verscheure, MD,\* Stéphan Haulon, MD, PhD,\* Nikolaos Tsilimparis, MD, PhD,†  
Björn Sonesson, MD, PhD,‡ Martin Claridge, MD,¶ Dominique Fabre, MD, PhD,\* and Tilo Kölbel, MD, PhD†*

* Patients:	70	
* Male	50	
* Age	69y	
* Technical success	68 (97%)	
* Stroke:	2 (3%)	} 3 (4%)
* 30d-Mortality:	2 (3%)	
* 1y-mortality	8 (11%)	



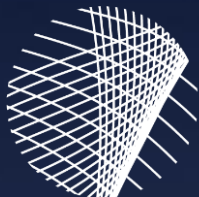


# Summary



- \* Endovascular aortic arch repair offers valid alternative to open surgery in patients with increased surgical risk.
- \* Endovascular arch repair is probably first choice in patients with a graft-replaced ascending aorta.
- \* Significant progress in device development recently.





6<sup>th</sup> AORTIC LIVE SYMPOSIUM

SAVE  
THE DATE



AORTIC  
LIVE 6

2020

October 2020  
Hamburg, Germany

In 2020 the Aortic Live Symposium will return to Hamburg, Germany.

Details to be announced soon!

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[www.aortic-live.com](http://www.aortic-live.com)