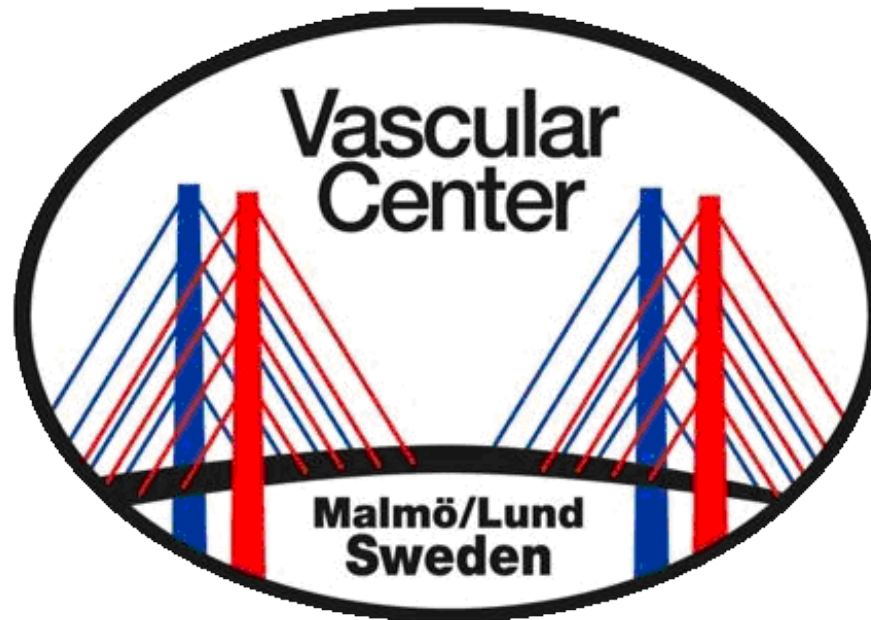


Total Arch Endovascular Repair



Tim Resch MD

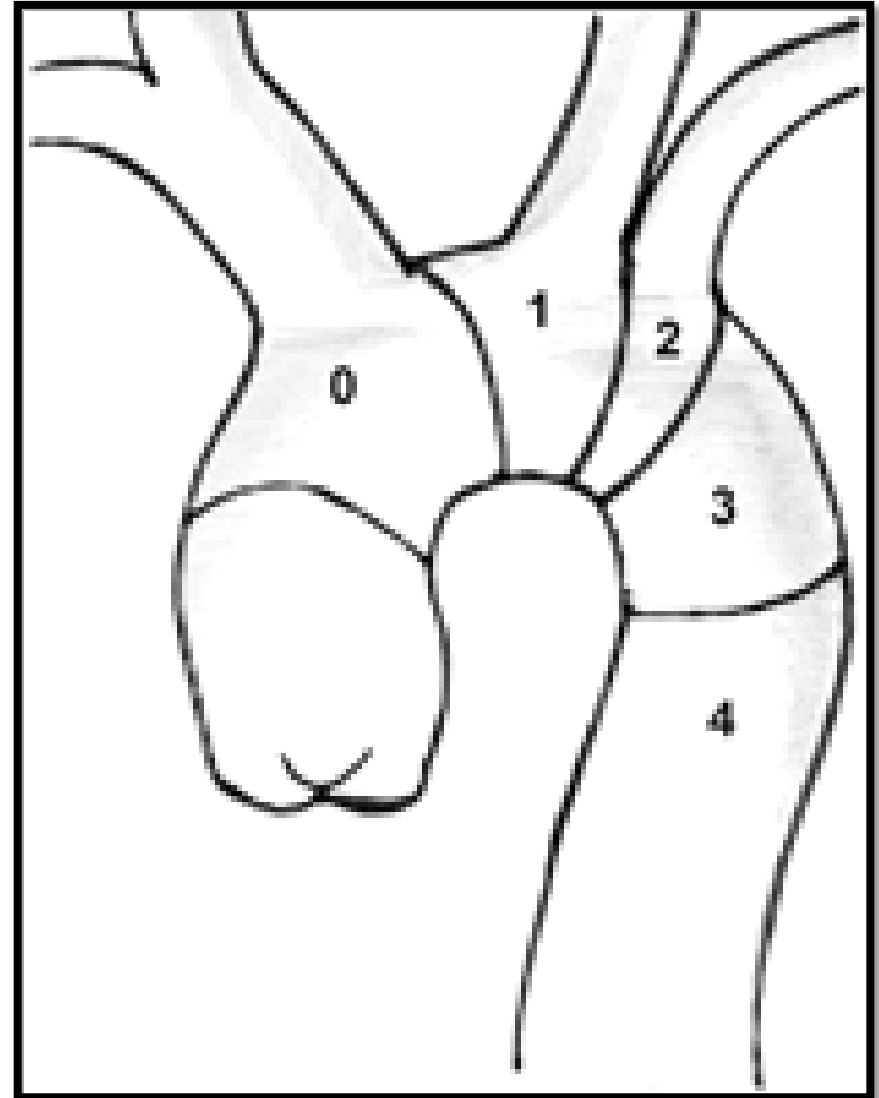
The Aortic Arch

- Complex Anatomy
- Vital Supraaortic trunks
- Endovascular repair complex
 - Tailoring
 - Orientation
- Physiological stress



Anatomical Limitations of TEVAR

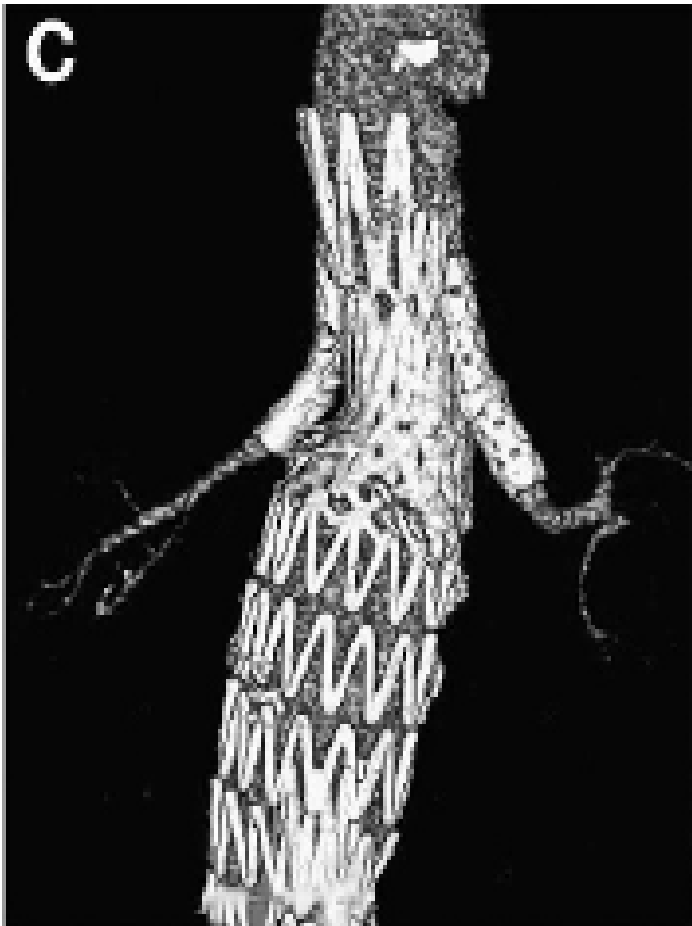
- Malkawi et al (JEVT 2010)
 - LSA coverage needed often
 - Distance LCCA –LSA <15mm in 80%
- Sobocinski et al (EJVES 2011)
 - A Dissection. Arch branch repair extends indication. BUT only 50% suitable
- Sonesson et al (manuscript)
 - Majority of open arch not suitable for endo
 - Ascending Aorta too wide and/or valve/coronaries



Chimney Technique

- First described for use in the juxtarenal aorta
- Bailout technique for inadvertent visceral artery coverage
- For aneurysms distal seal zone is mandatory
 - Seal around chimney grafts is unpredictable

Technique



- Brachial cath of renals
- Deployment of renal stents
- Kissing balloon

Chimneys in the Aortic Arch

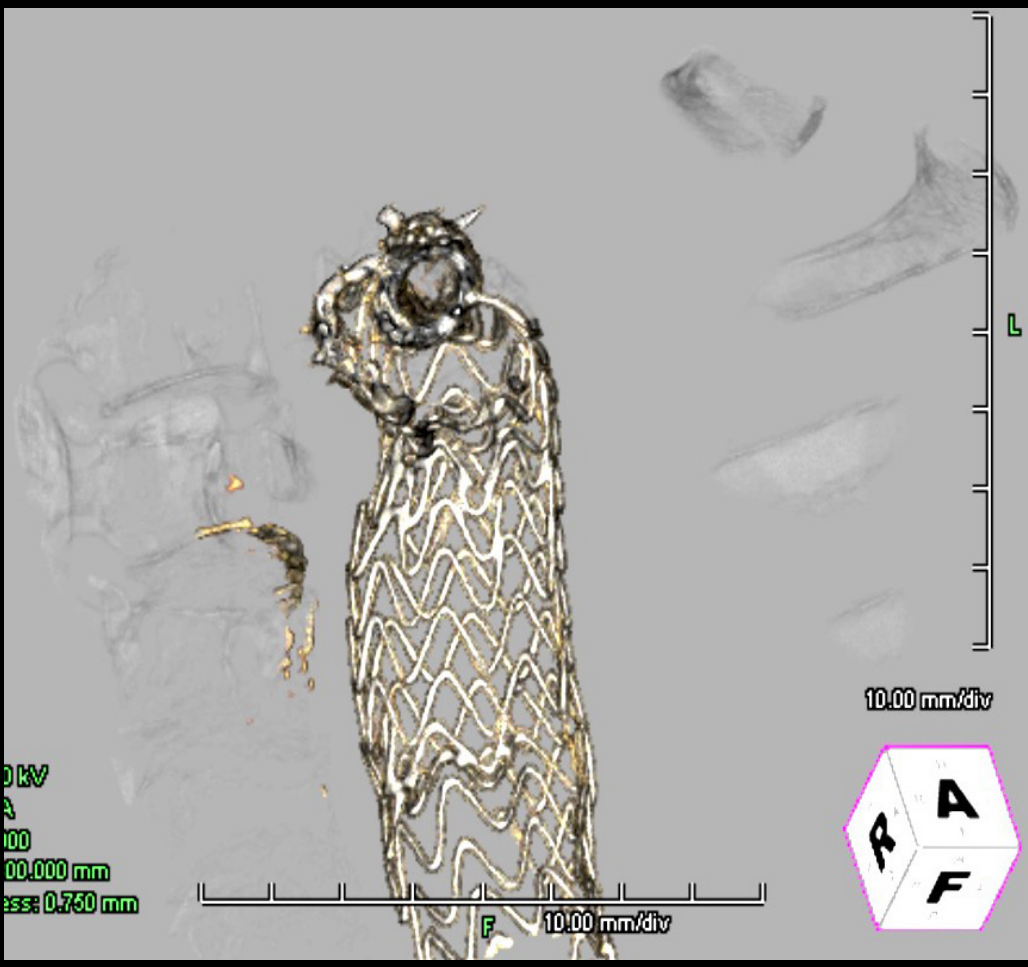
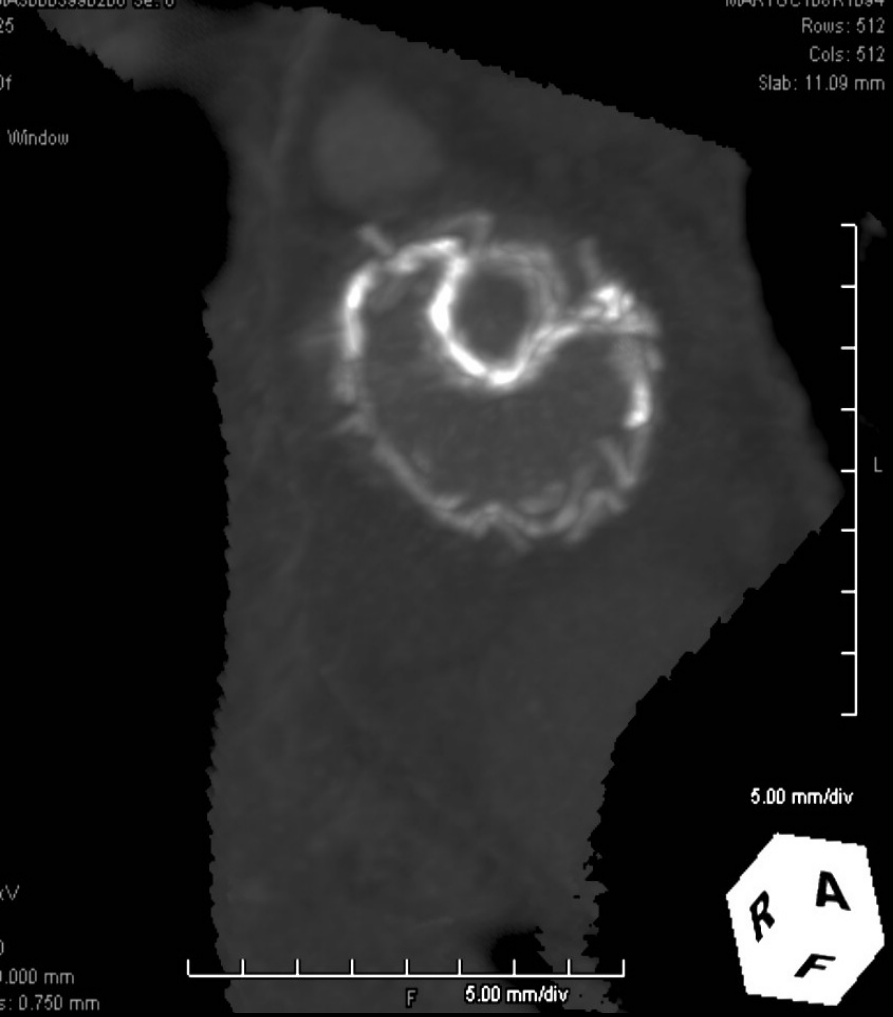
- Criado et al 2007
 - Off the shelf devices
 - Simple technique
 - Long-term outcome?





02263916
MAS0003990206 Se: 6
25
of
Window

Sensation 16
MARTGCT08R1094
Rows: 512
Cols: 512
Slab: 11.09 mm



100 kV
100
100.000 mm
ess: 0.750 mm

Malmö Experience

Indication	n
Type B dissection	8
Arch rupture	8
TAA rupture	1
Transection	1
ABF	1
Iatrogenic LCA coverage	4

All Emergencies

Chimney location

Chimney location	N
Innominate artery	7
Left Carotid artery	11
Left Subclavian artery	5

Outcome

- FU
 - 1mo-5y (mean 18mo)
- 3 deaths within 30d (stroke, MOF, rupture)
- 4 type 1 EL –
 - 1 successfully embolized
 - 1 chimney extension successful
 - 2 persistent
- TVP 100% - no stent occlusions

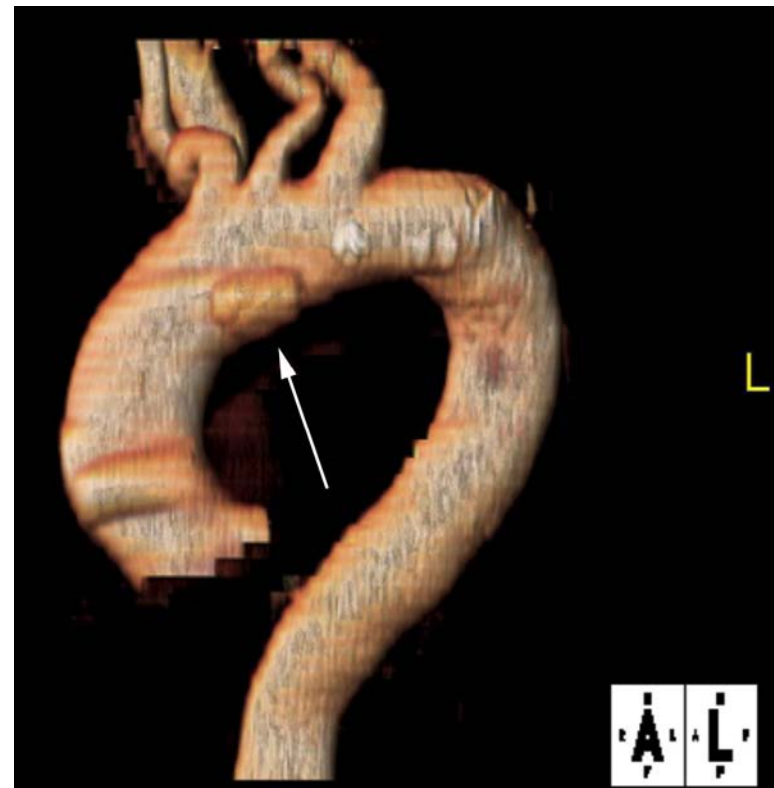
Chimney Technique - Considerations

- Simple??
- Standard Equipment
- Anatomically versatile
- Endoleaks
- Longterm durability

In Situ Fenestration Technique

- McWilliams first report 2004
 - In situ fenestration of LSCA
- Numan et al ICVTS 2008
 - Experimental study
- Ahanchi
 - N=6 (LSA)
 - Laser-assisted fenestration
 - 5/6 Technically successful

Ruptured Aortic Arch

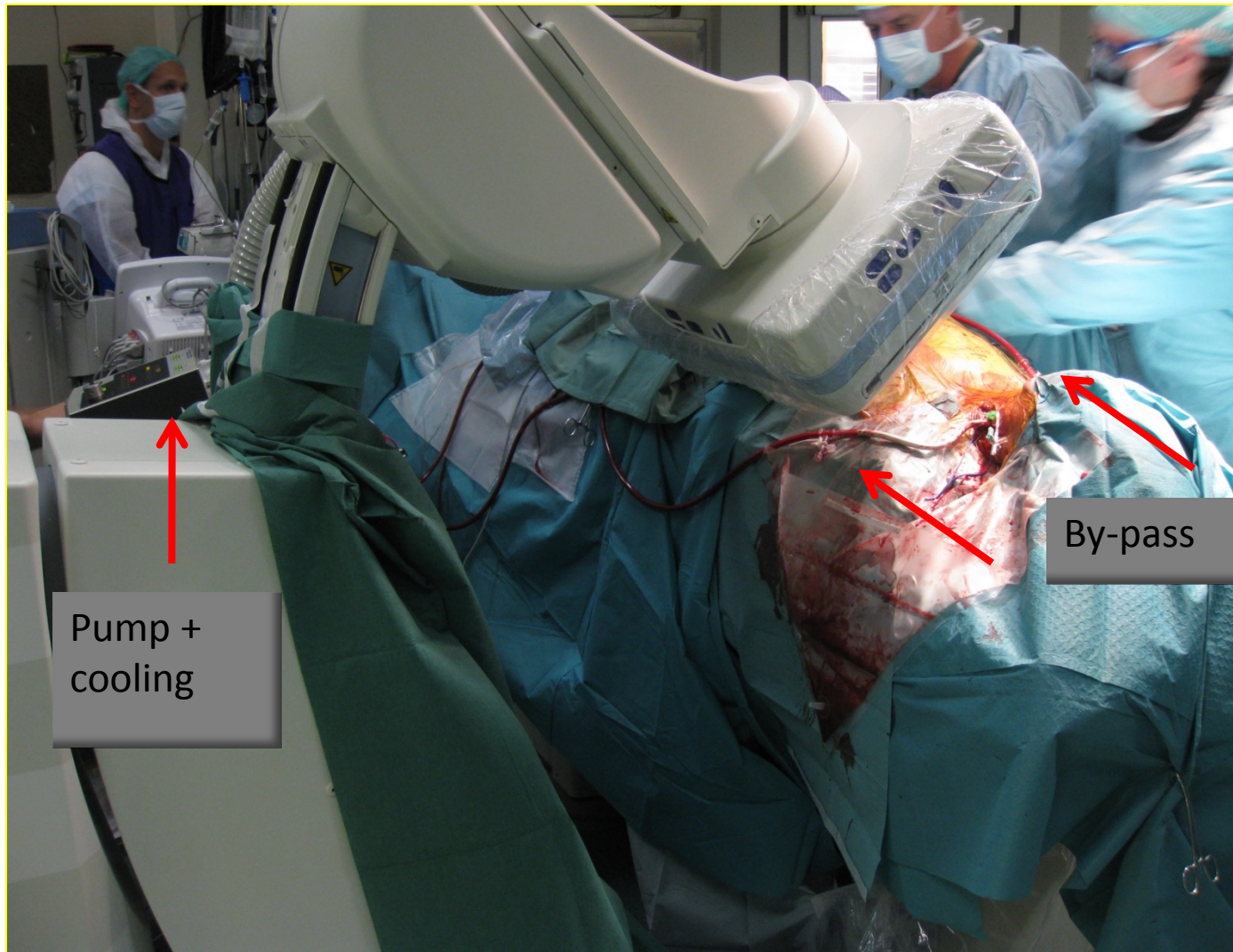


Sonesson JVS 2009

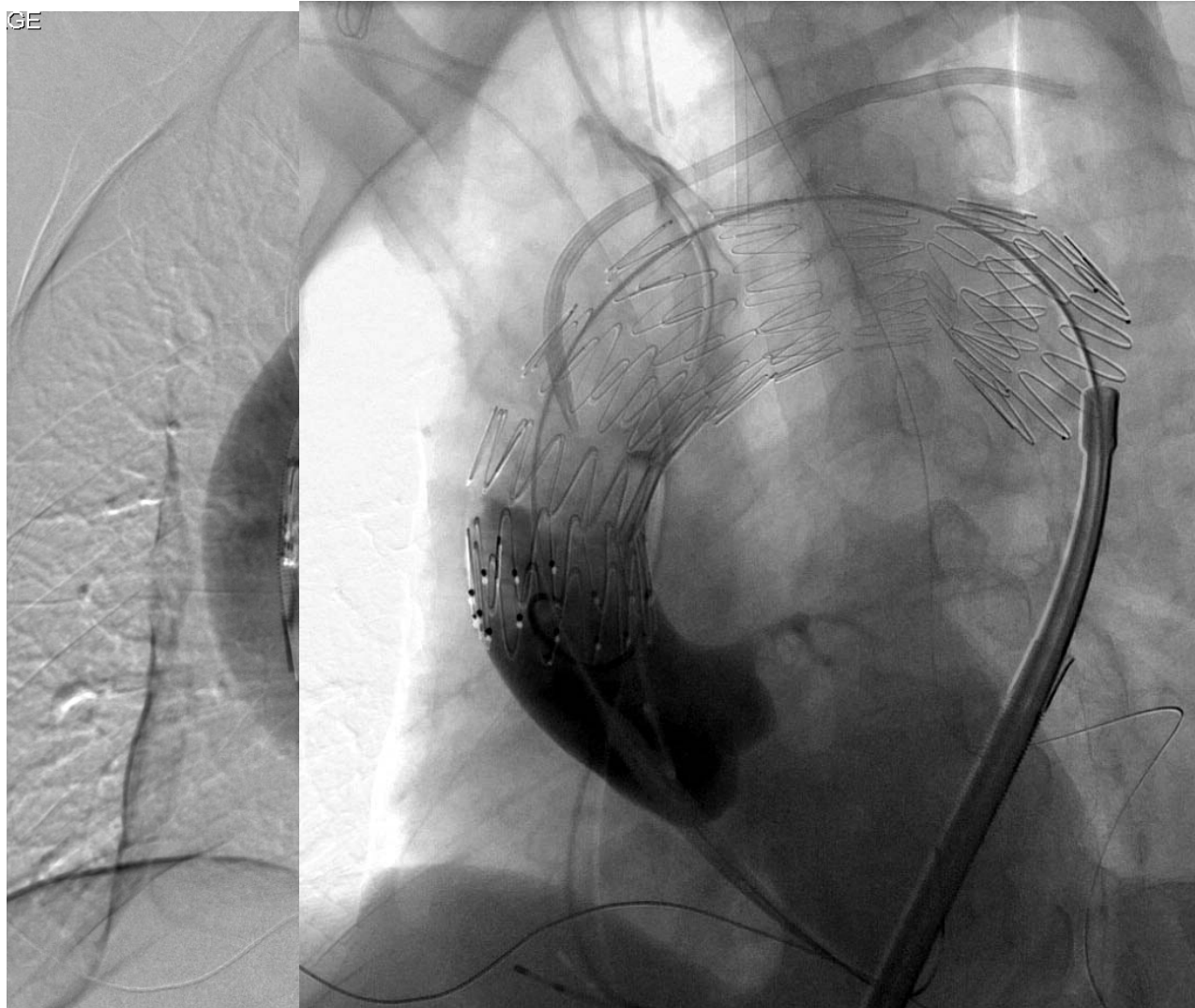
Steps for in situ fenestration

- **Temporary by-pass from femoral to carotids**
- **Deployment of thoracic stent-graft**
- **Fenestration**
- **Termination of by -pass**

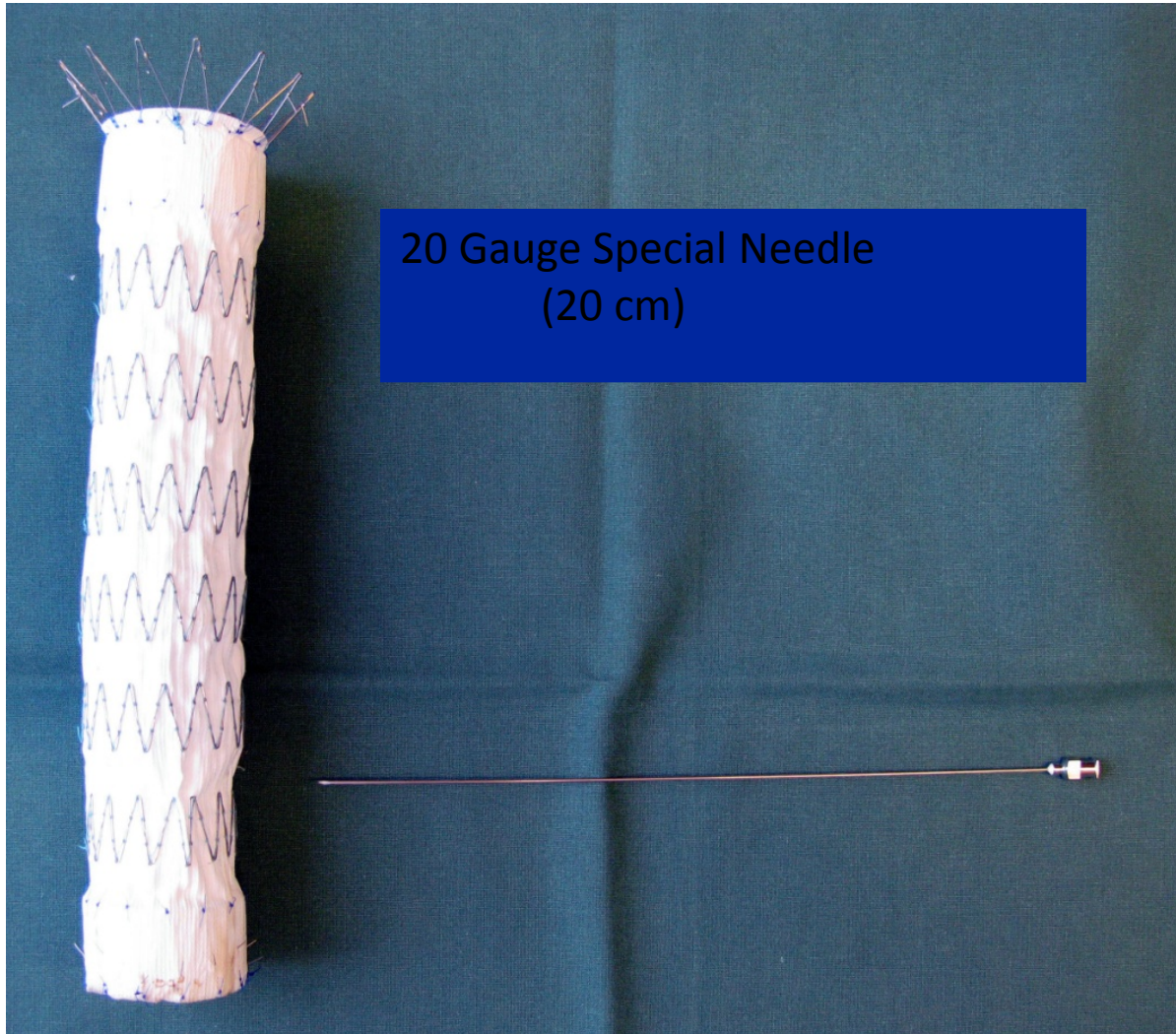
Temporary by-pass from femoral to carotids



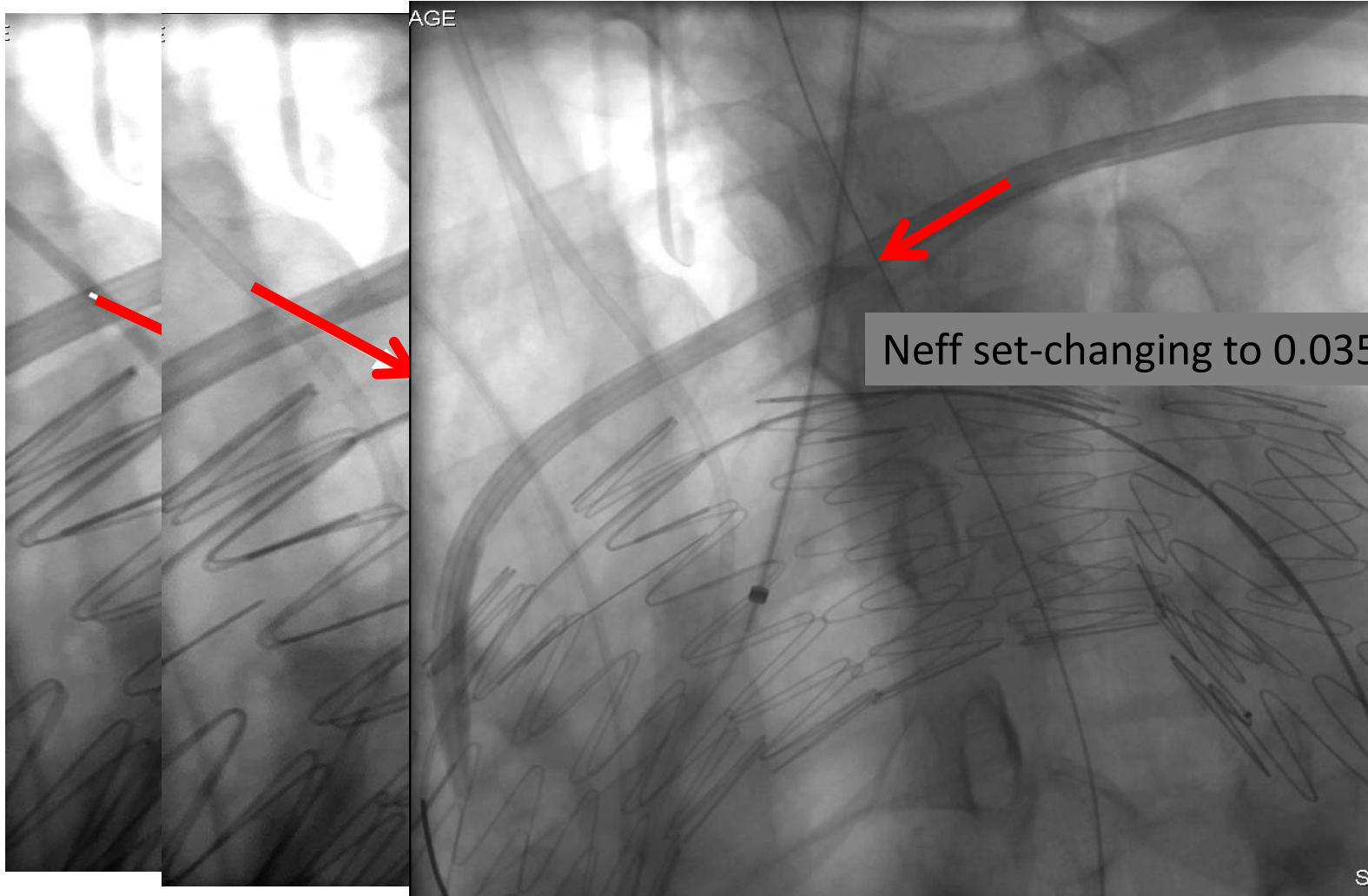
Deployment of stent-graft



Fenestration of arch vessels

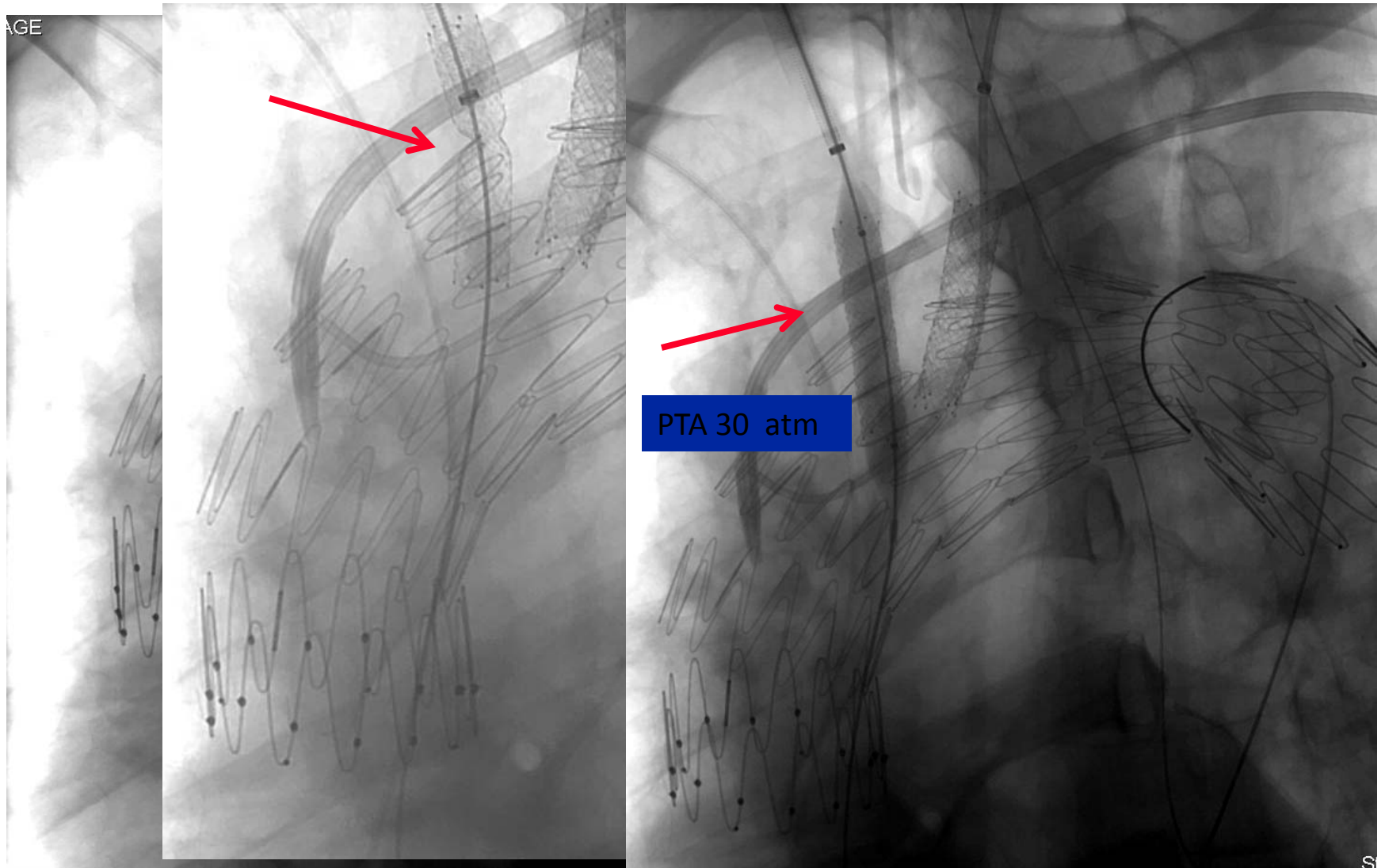


Fenestration of arch vessels



Fenestration of arch vessels

AGE



Final angiogram

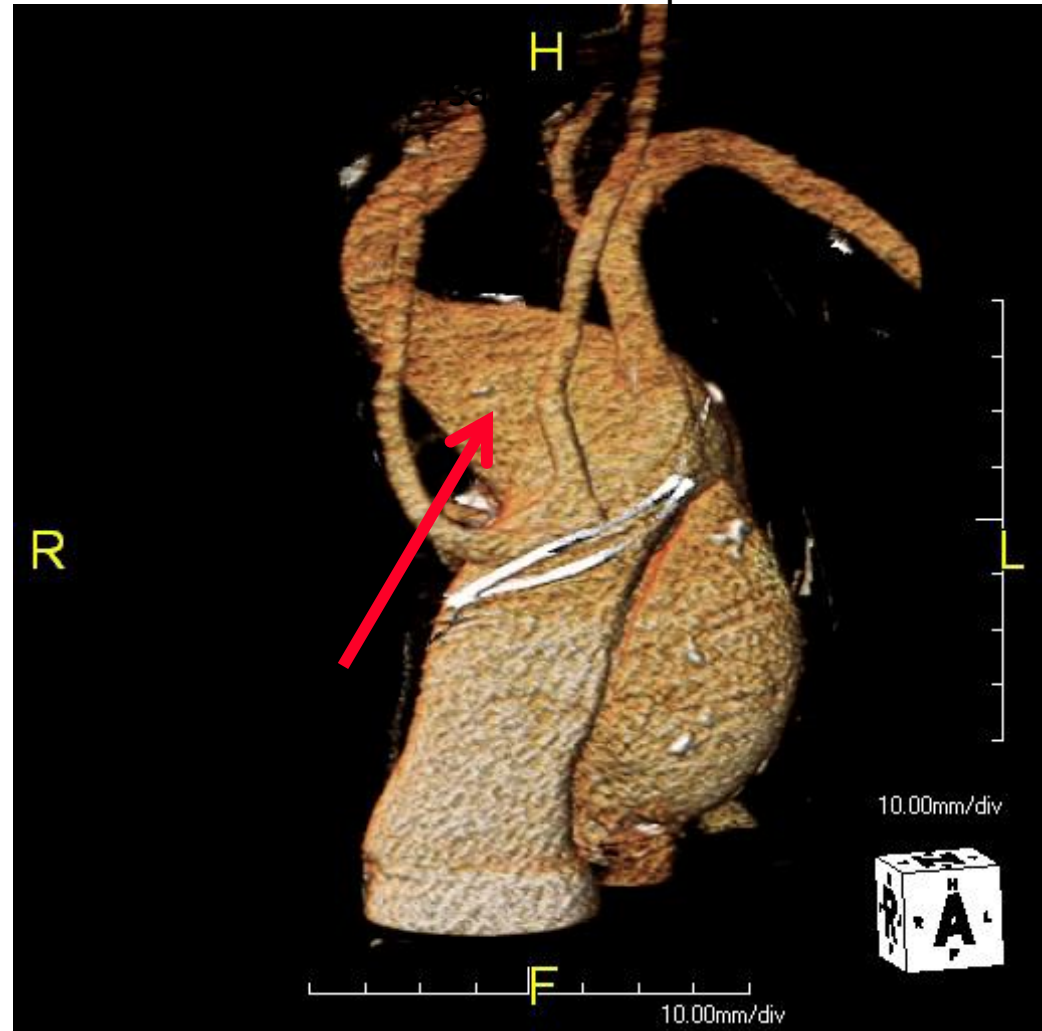
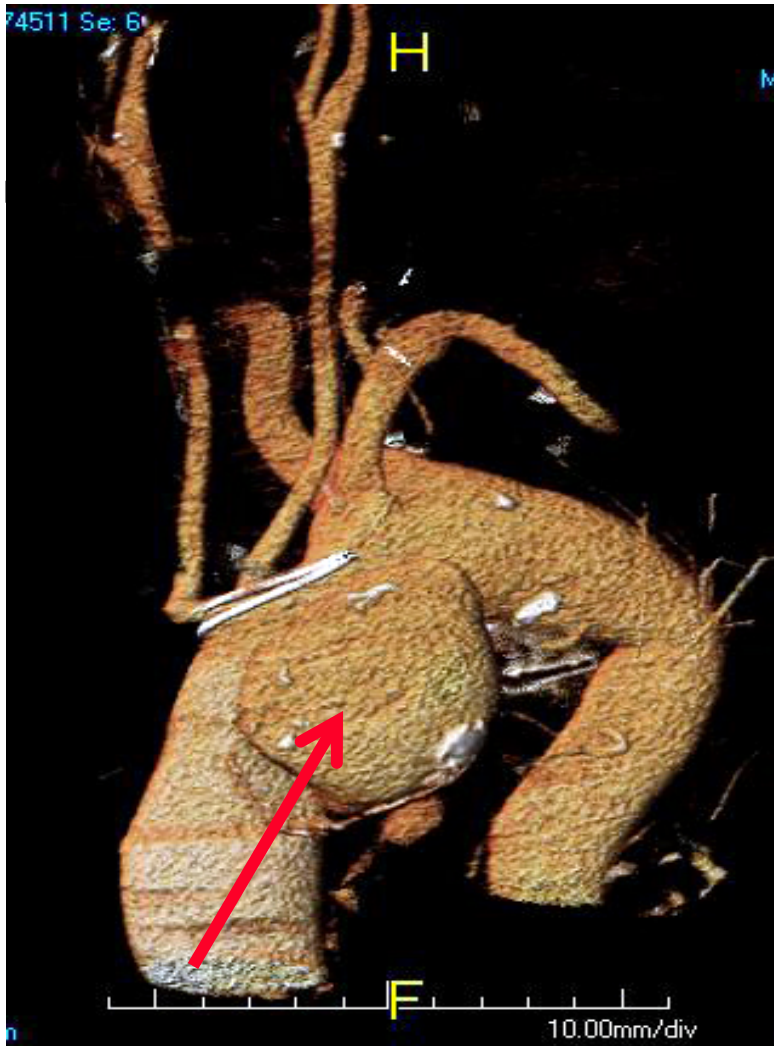
2 year post-op



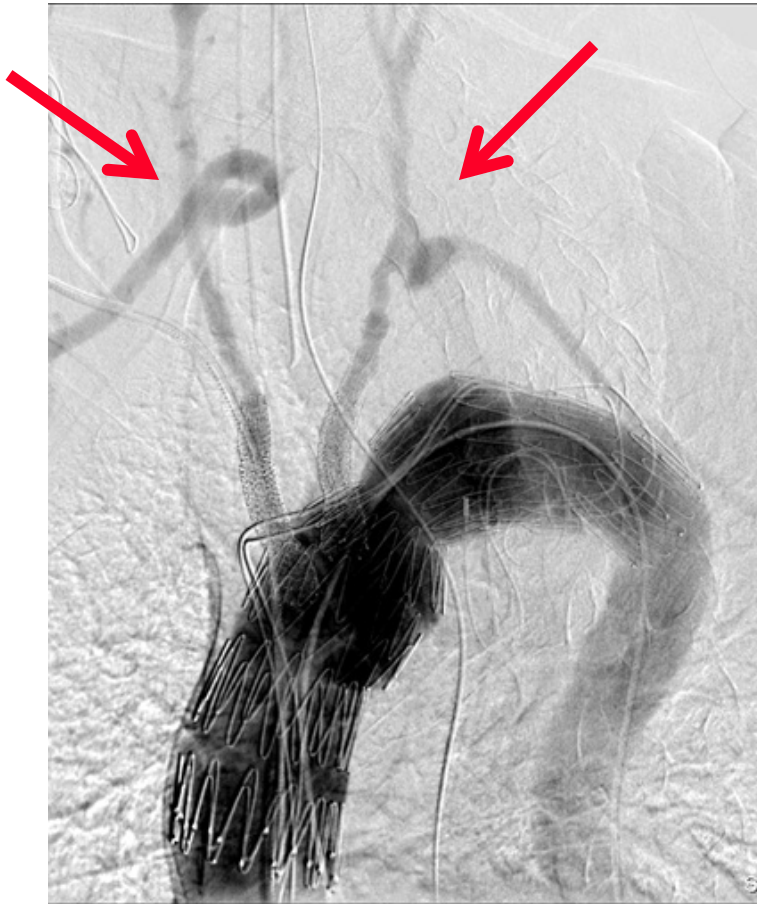


POD 3

8 cm Arch Pseudoaneurysm with a Abberant RSCA Aneurysm



Final angiogram



1 year postop



Issues

- Brain circulation during fenestration procedure
- Fenestration area in the stent graft
- Fenestration Technique
 - Needle, RF, Laser
- Fabric-seal and stability

Brain circulation during fenestration

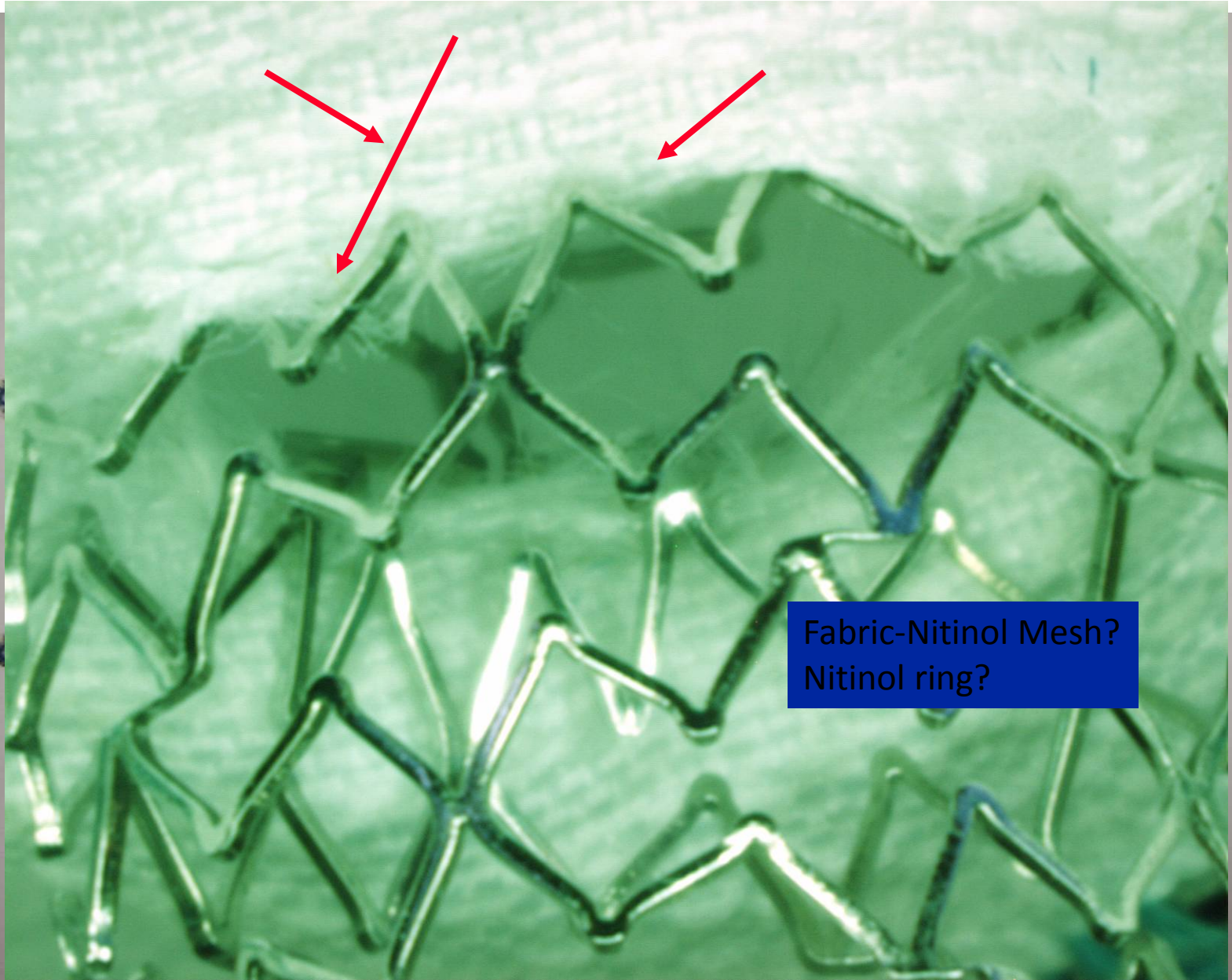
- Pump or without pump
- Cooling or not?
- Internal by-pass (descending aorta to trunc/left carotid)
 - Totally endovascular
 - Successful in vitro (Sonesson 2011)

Fenestration area



Fabric

- Seal
- Long term stability

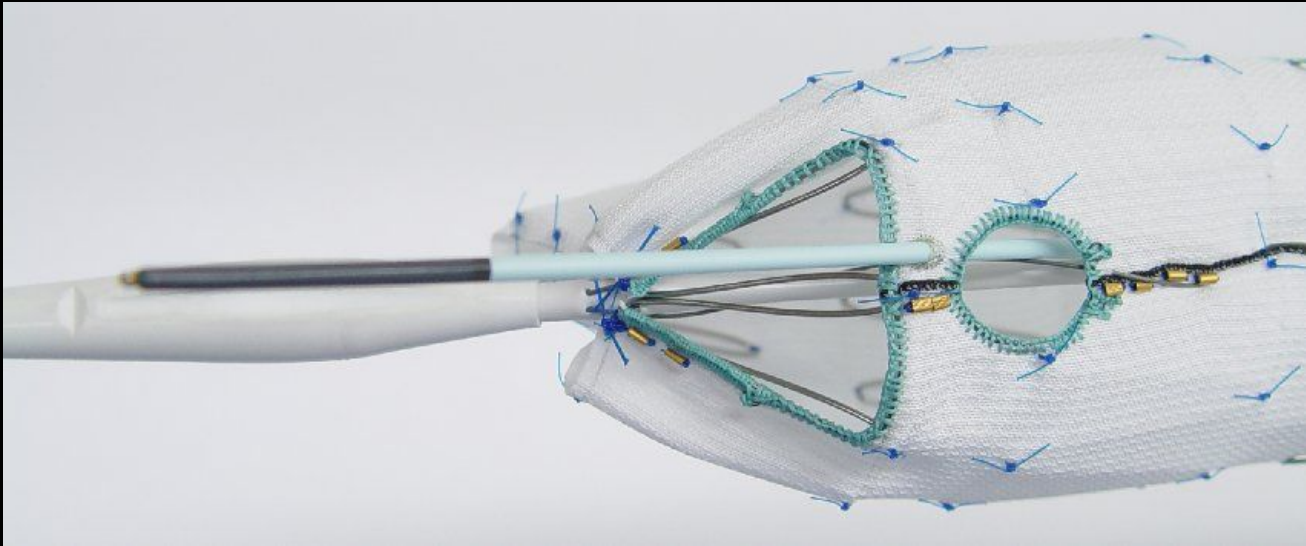
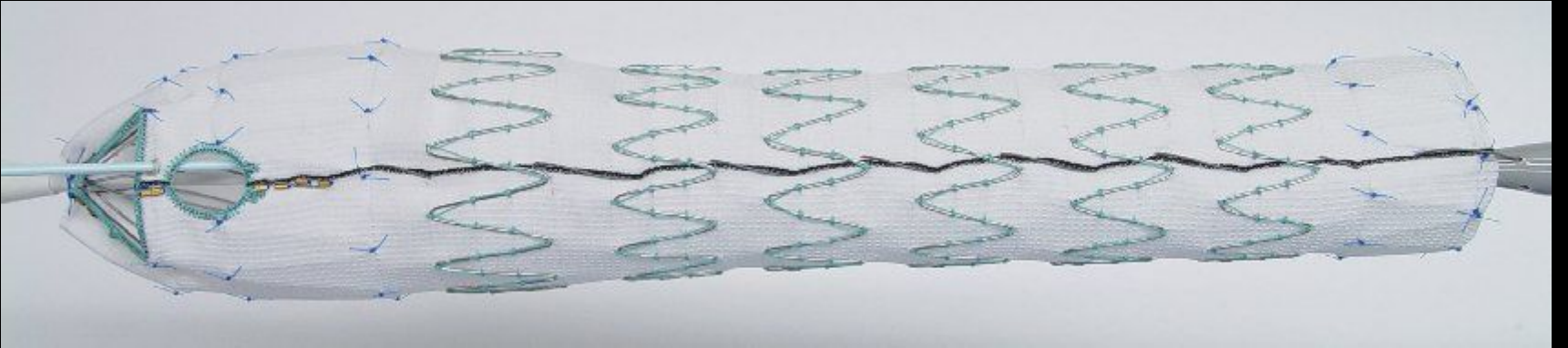


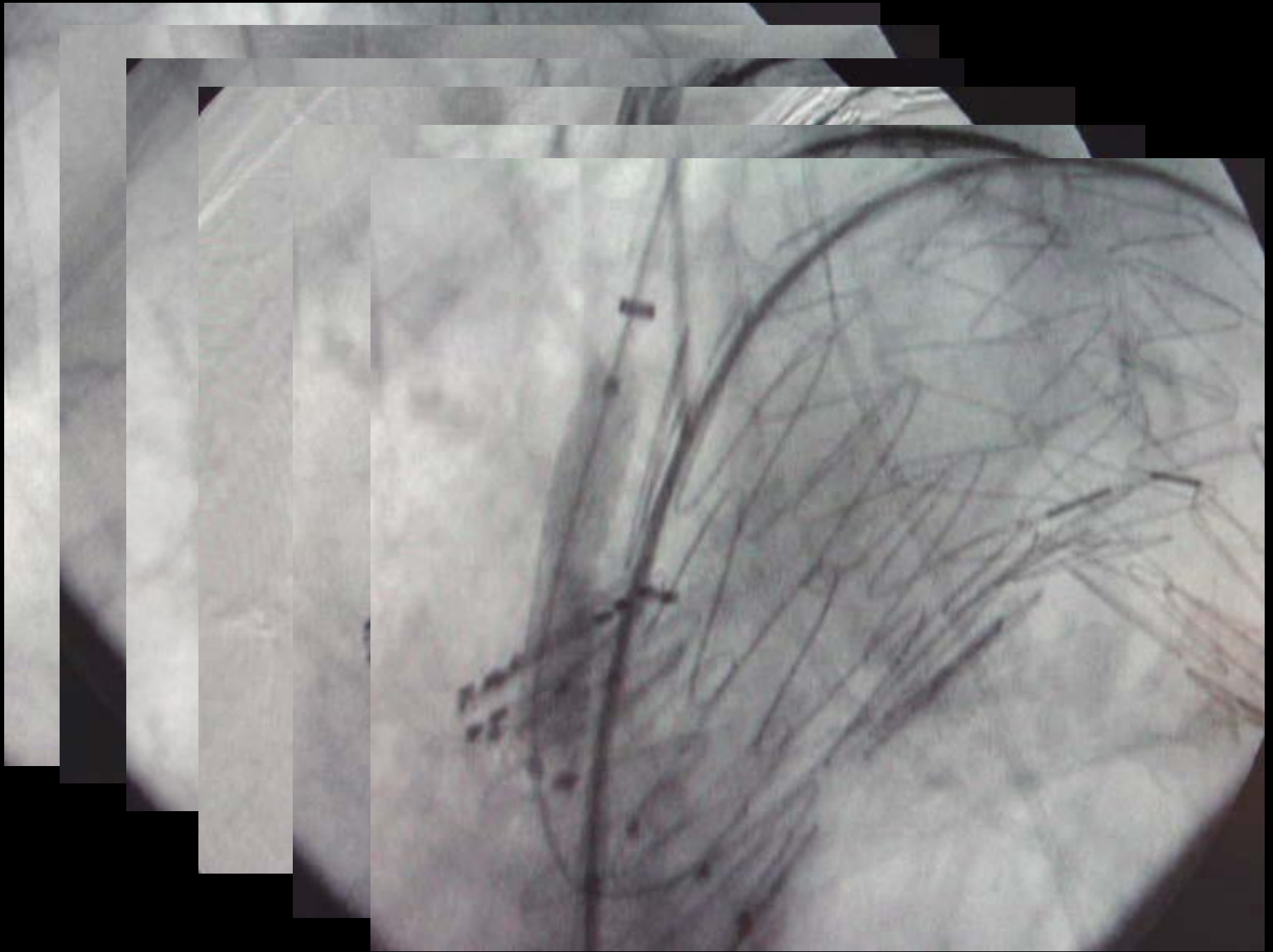
Fabric-Nitinol Mesh?
Nitinol ring?

Developments

- Offers Off-the-shelf option
 - No customization
 - Standard Equipment
- Current areas of development
 - Total endovascular shunting
 - Improved fenestration technique
 - Improved mating stents
 - Enhanced stentgraft – mating stent connection
 - Graft fabric development

Arch Branch





Thoracic endovascular aneurysm repair in Japan: Experience with fenestrated stent grafts in the treatment of distal arch aneurysms

Satoshi Kawaguchi, MD, Yoshihiko Yokoi, MD, Taro Shimazaki, MD, Kenji Koide, MD, Masataka Matsumoto, MD, and Hiroyoshi Shigematsu, MD, Tokyo, Japan

Objective: In the West, stent grafts for endovascular repair of thoracic aortic aneurysms have been commercially available for several years, whereas in Japan, a manufactured stent graft was not approved for this application until March 2008. Nevertheless, endovascular thoracic intervention began to be performed in Japan in the early 1990s, with homemade devices used in most cases. Many researchers have continued to develop homemade devices. We have participated in joint design and assessment efforts with a stent graft manufacturer, focusing primarily on fenestrated stent grafts used in repairs at the distal arch, a site especially prone to aneurysm.

Methods: From 1995 to February 2008, we performed about 1100 endovascular procedures to treat thoracic aortic aneurysms and 682 cases were performed at Tokyo Medical University. In 485 out of 682 the aneurysm was located in the area from the distal arch to the proximal descending aorta. Fenestrated stent grafts were inserted in 288 cases. Computed tomography scans were performed at 3, 6, and 12 months postoperatively and annually thereafter.

Results: The initial success rate in the entire series was 95.2%. Complications included 26 cerebral infarctions (3.8%), six of which (0.9%) resulted in serious paralysis and changes in consciousness. Among patients who received fenestrated stent grafts, paraplegia occurred in 2.6%, aortic injury in 1.2%, and iliofemoral artery injury in 6.0%. No complications resulted from occlusion of aortic arch branches. At ≥ 2 years after intervention, aneurysm diameter was reduced in 62% of patients, 33% had no change, and 5% had a diameter enlargement. The stent graft complication rate during follow-up was 8.4%, the device fracture rate was 1.4%, and the device migration rate was 7%. The 5-year survival rate was 62.4%, with follow-up in 96.8% of the patients.

Conclusion: Endovascular repair has promising results in the descending thoracic aortic region, although some stent grafts and their delivery systems can still be improved. Additional commercial developments and available stent grafts designed for use in the distal arch are urgently needed. (*J Vasc Surg* 2008;48:245-206.)



Circulation. 1999;100:II-316-II-321

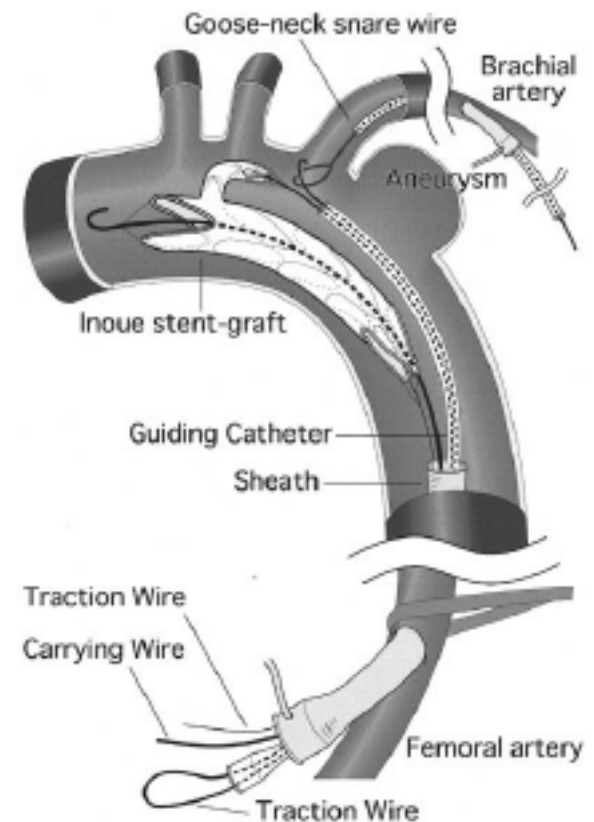
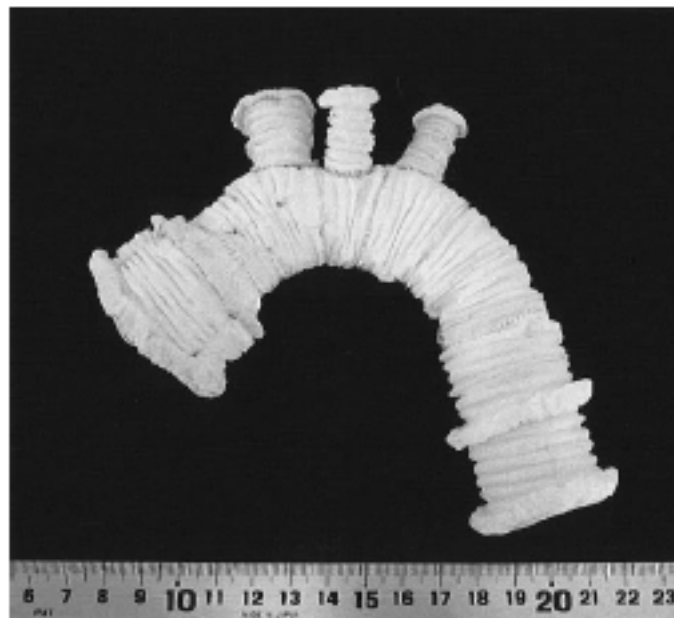
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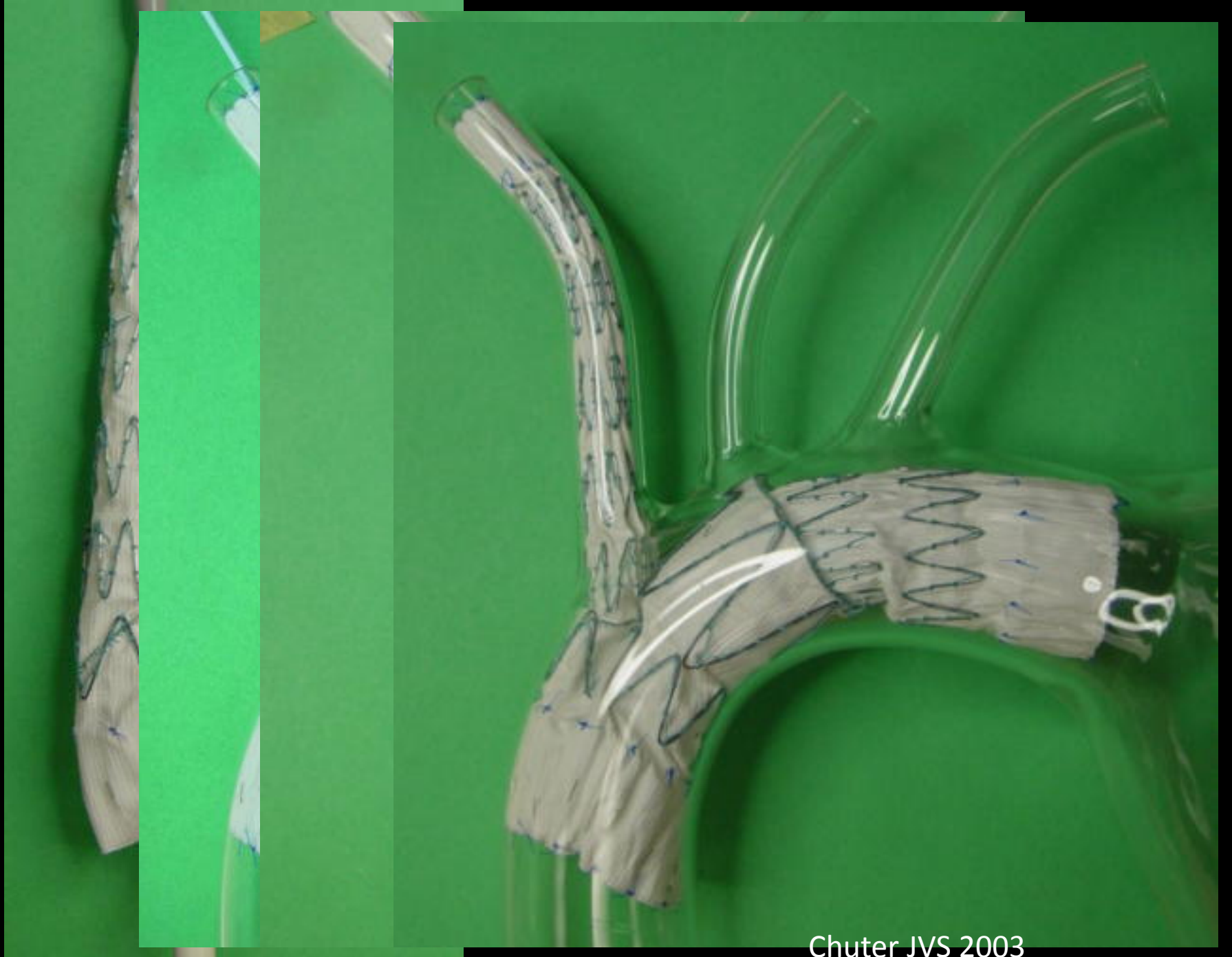
Akiyoshi Tsubokawa, Terumitsu Tanaka, Shunichi Tamaki and Takahiko Suzuki

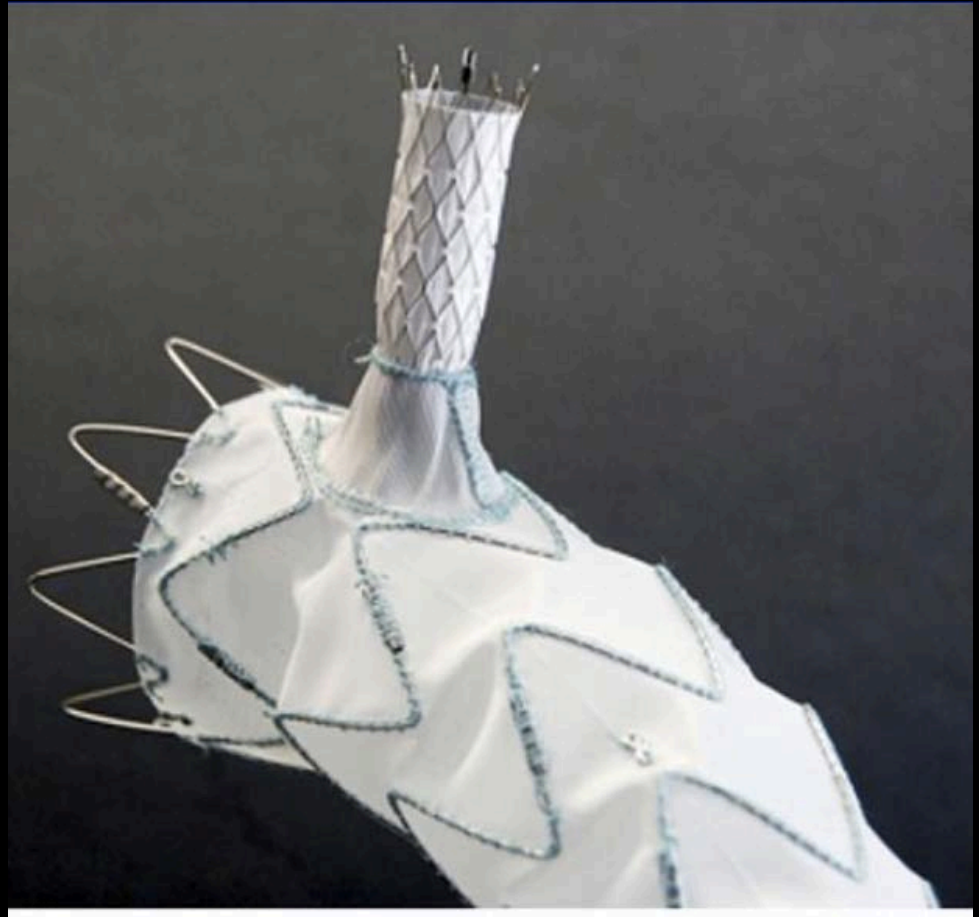
Circulation. 1999;100:II-316-

doi: 10.1161/01.CIR.100.suppl

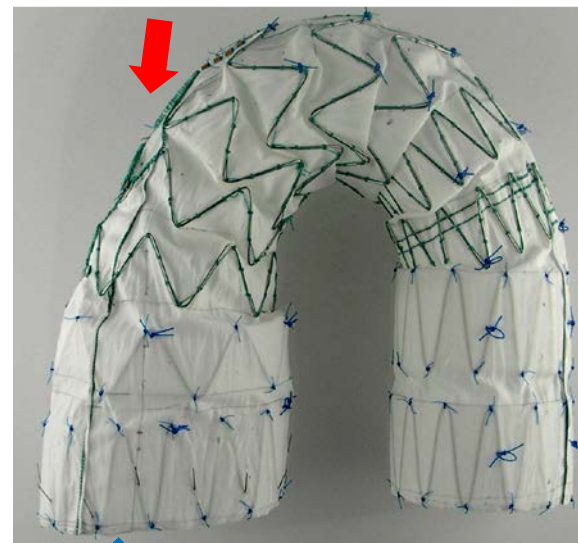
Circulation is published by the American Heart Association, 7272
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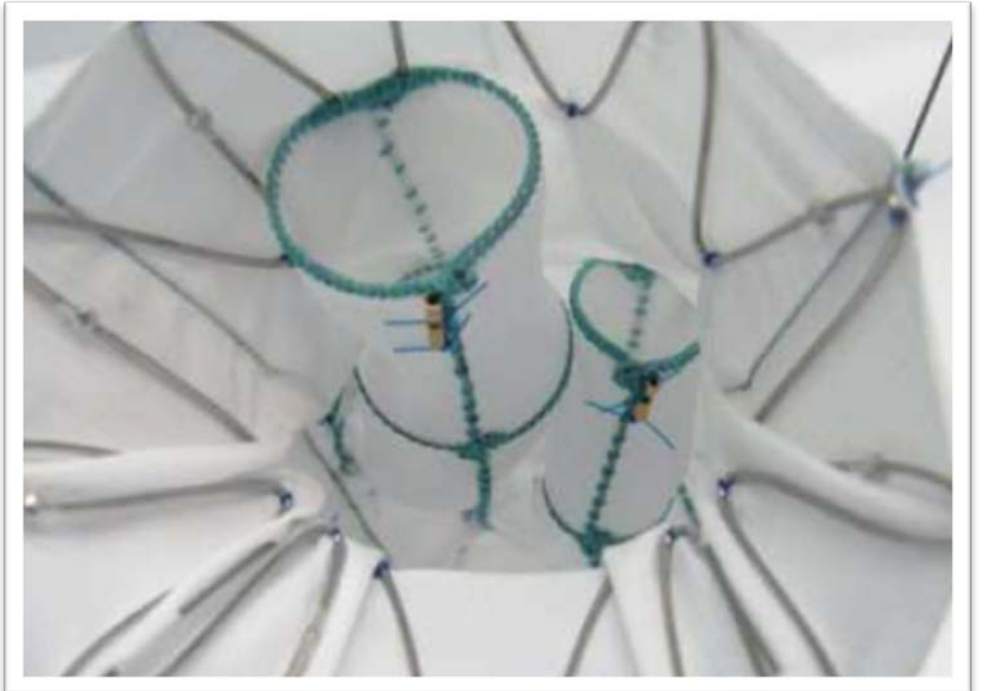
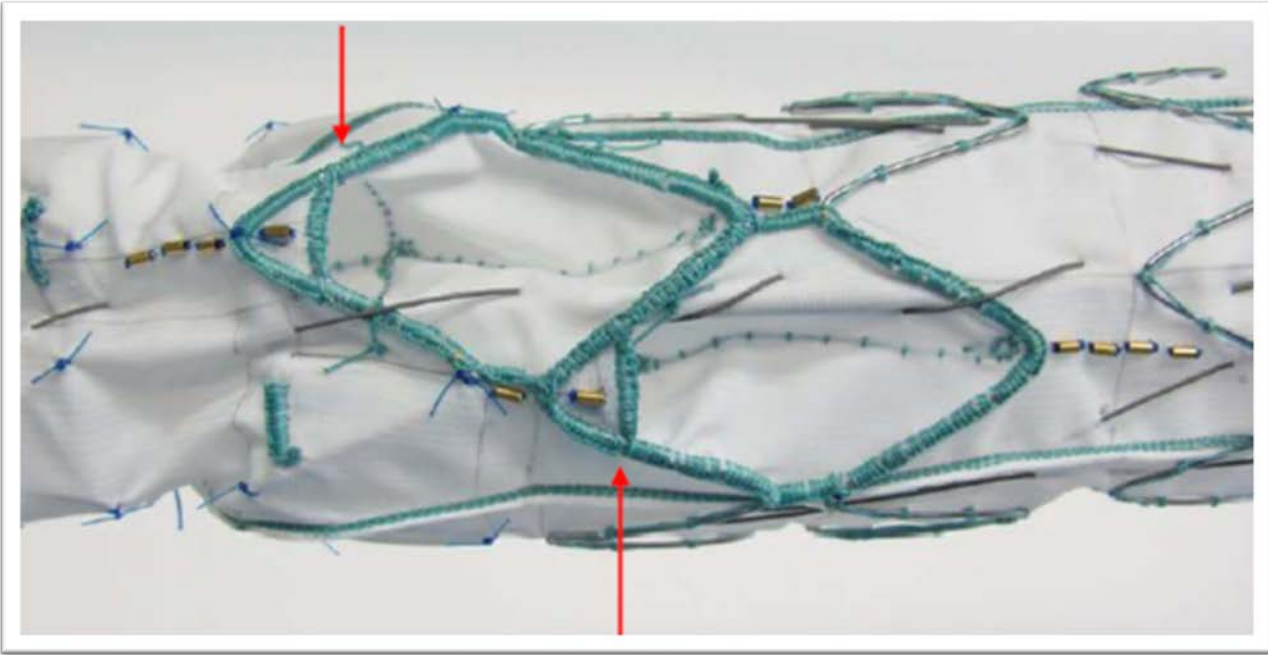




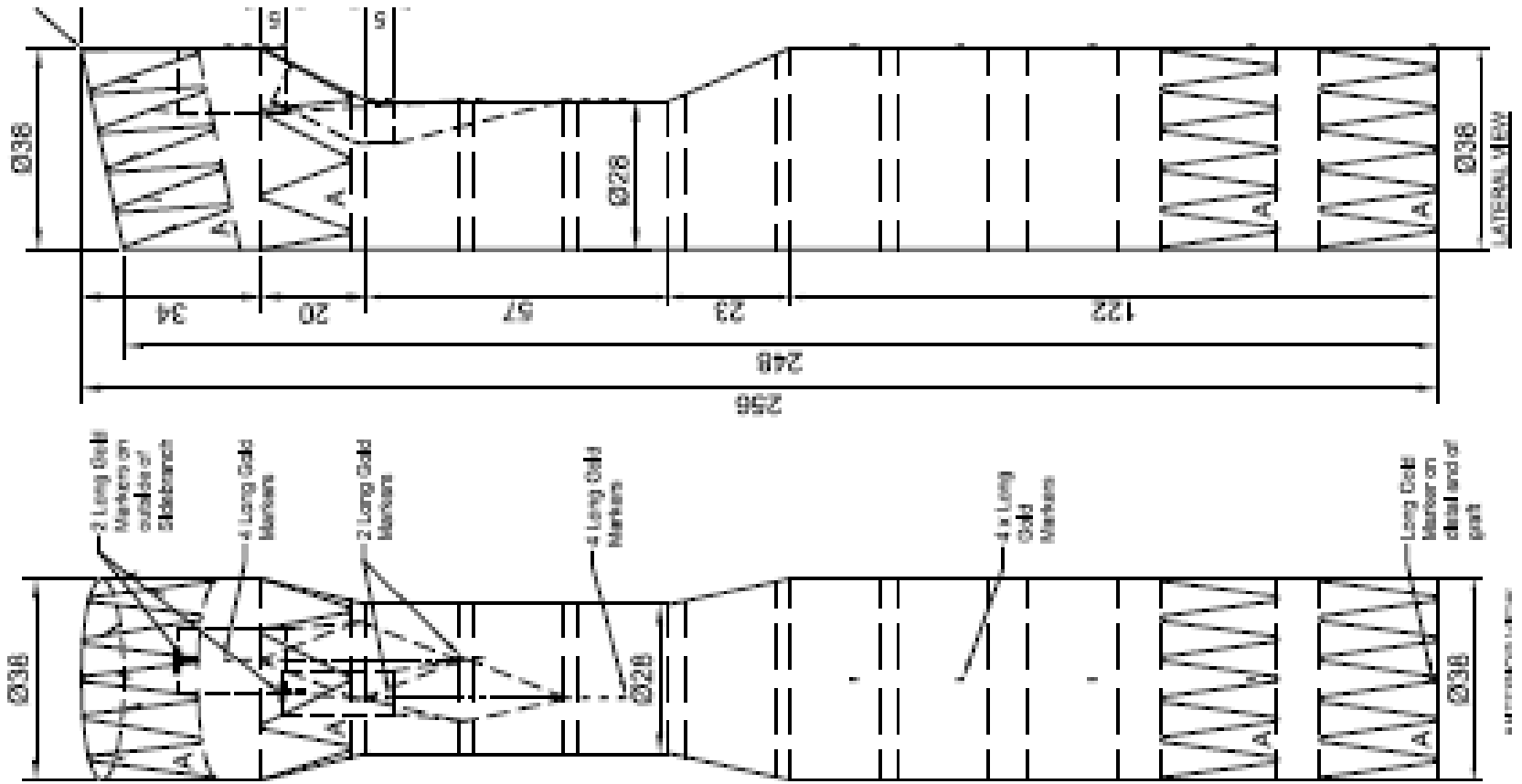


Arch Branch Device Evolution





Aortic Arch





Treatment of Aortic Arch Aneurysms with a Modular Transfemoral Multibranched Stent Graft: Initial Experience

C. Lioupis^{a,b,*}, M.-M. Corriveau^b, K.S. MacKenzie^b, D.L. Obrand^a, O.K. Steinmetz^b, C.Z. Abraham^a

^aMcGill University, Division of Vascular Surgery, Jewish General Hospital, 3755 Côte-Ste-Catherine, Montreal, QC H3T1E2, Canada

^bMcGill University, Division of Vascular Surgery, Royal Victoria Hospital, Montreal, QC, Canada

- N=6
- 4/6 technically successful
- 1 endoleak
- 2 stroke

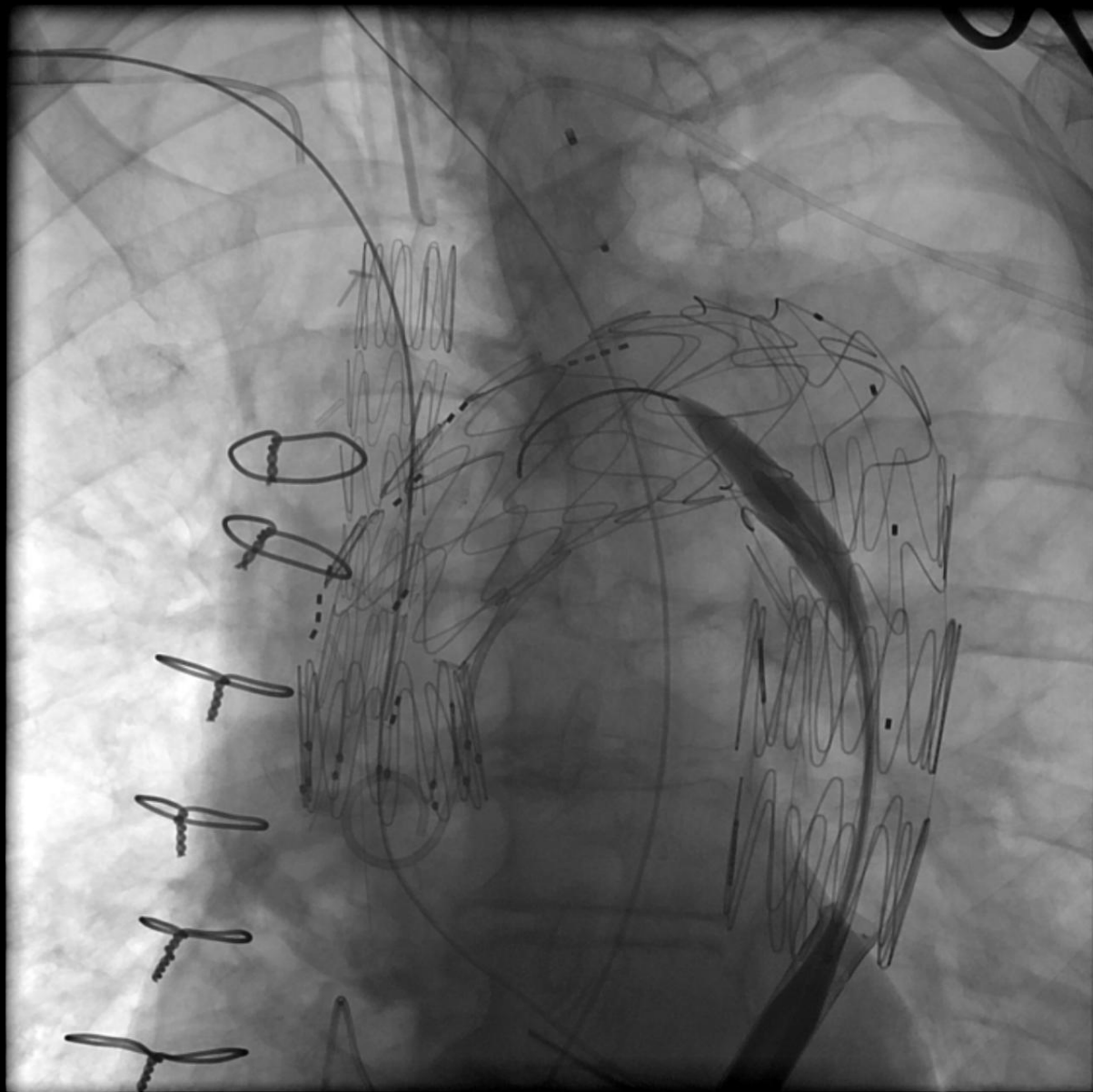
Arch Branch – current world experience

- N= 40+
- Decreasing complication rate
 - 2 strokes in last 20 pts

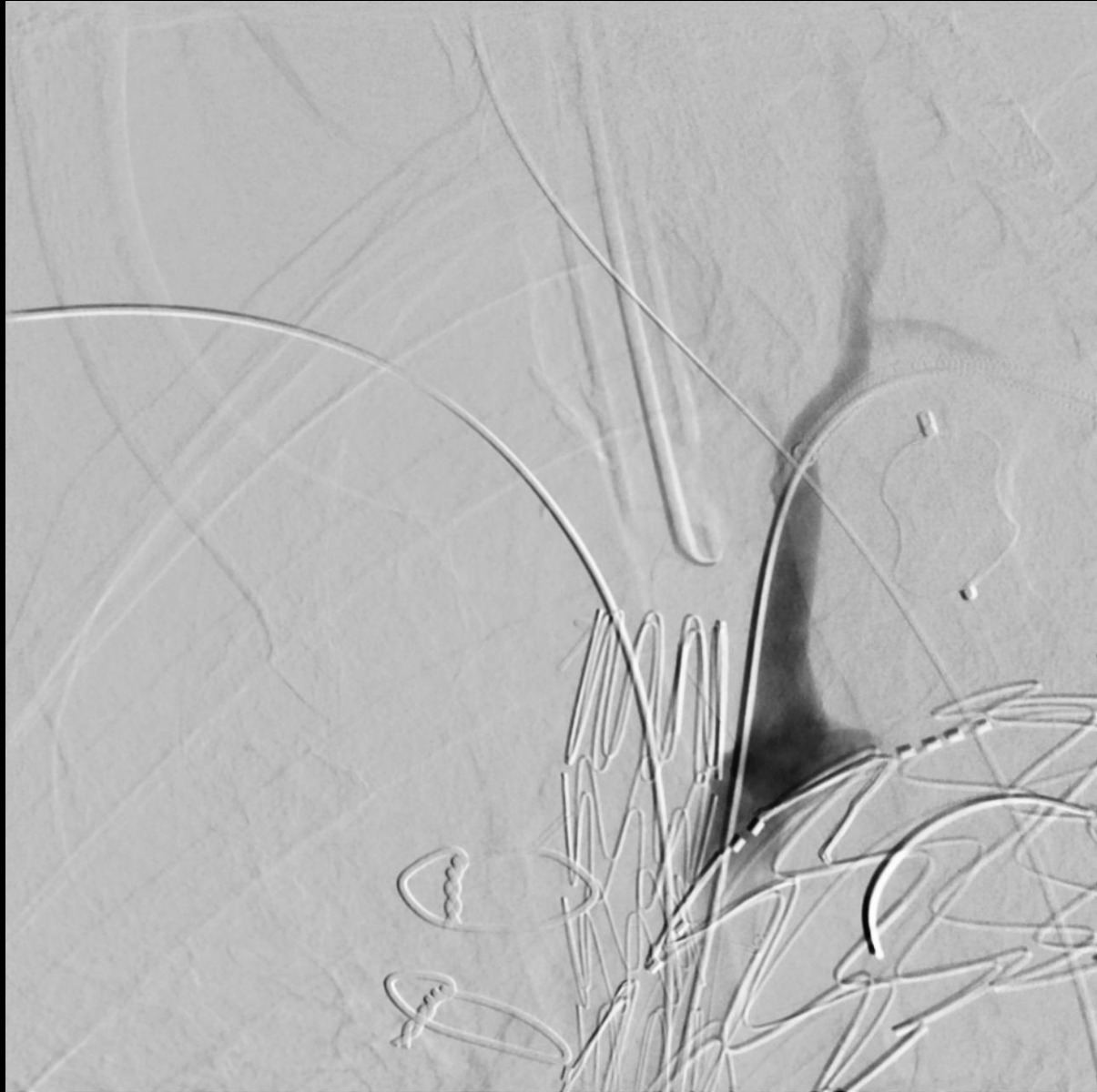


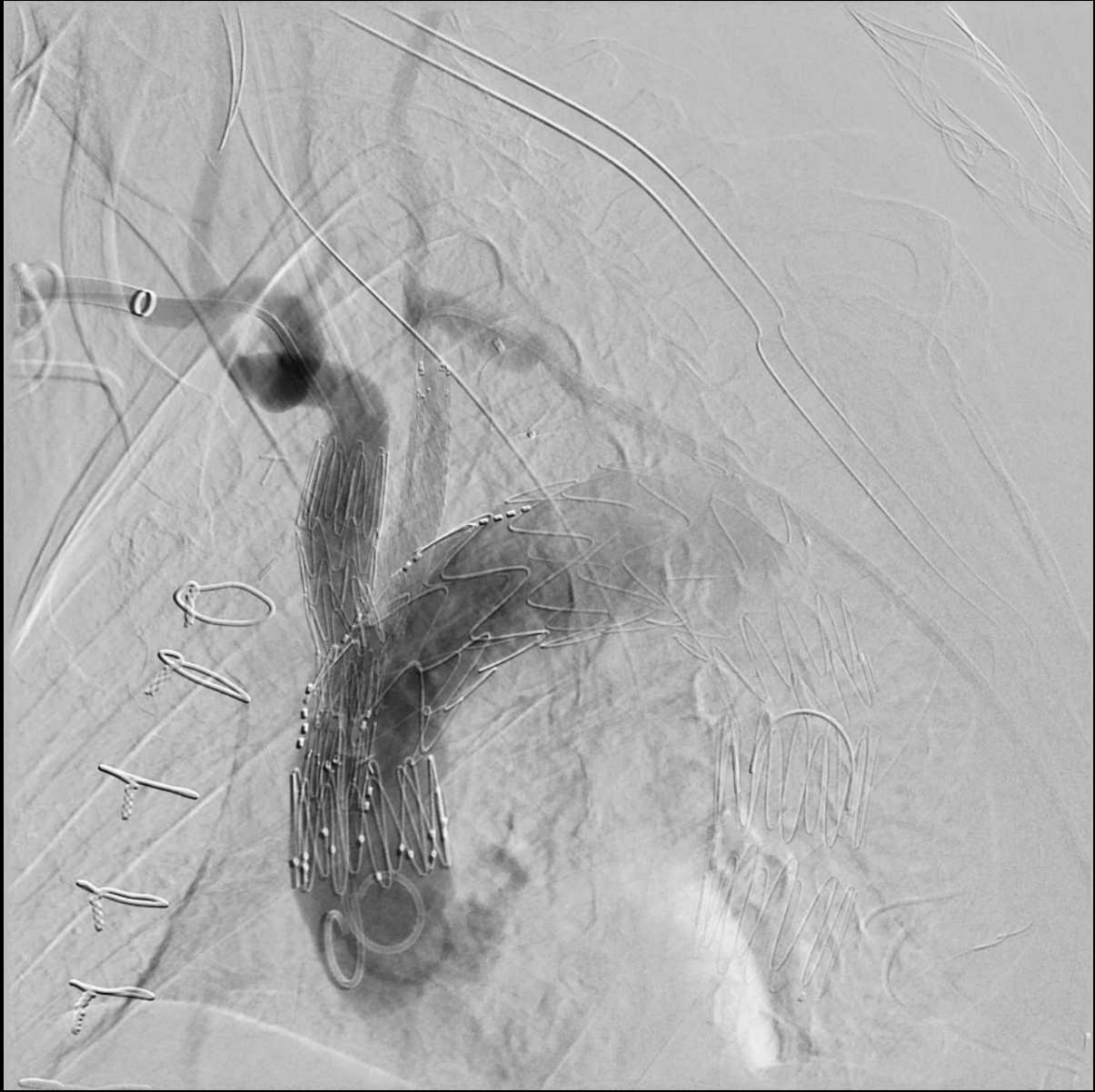




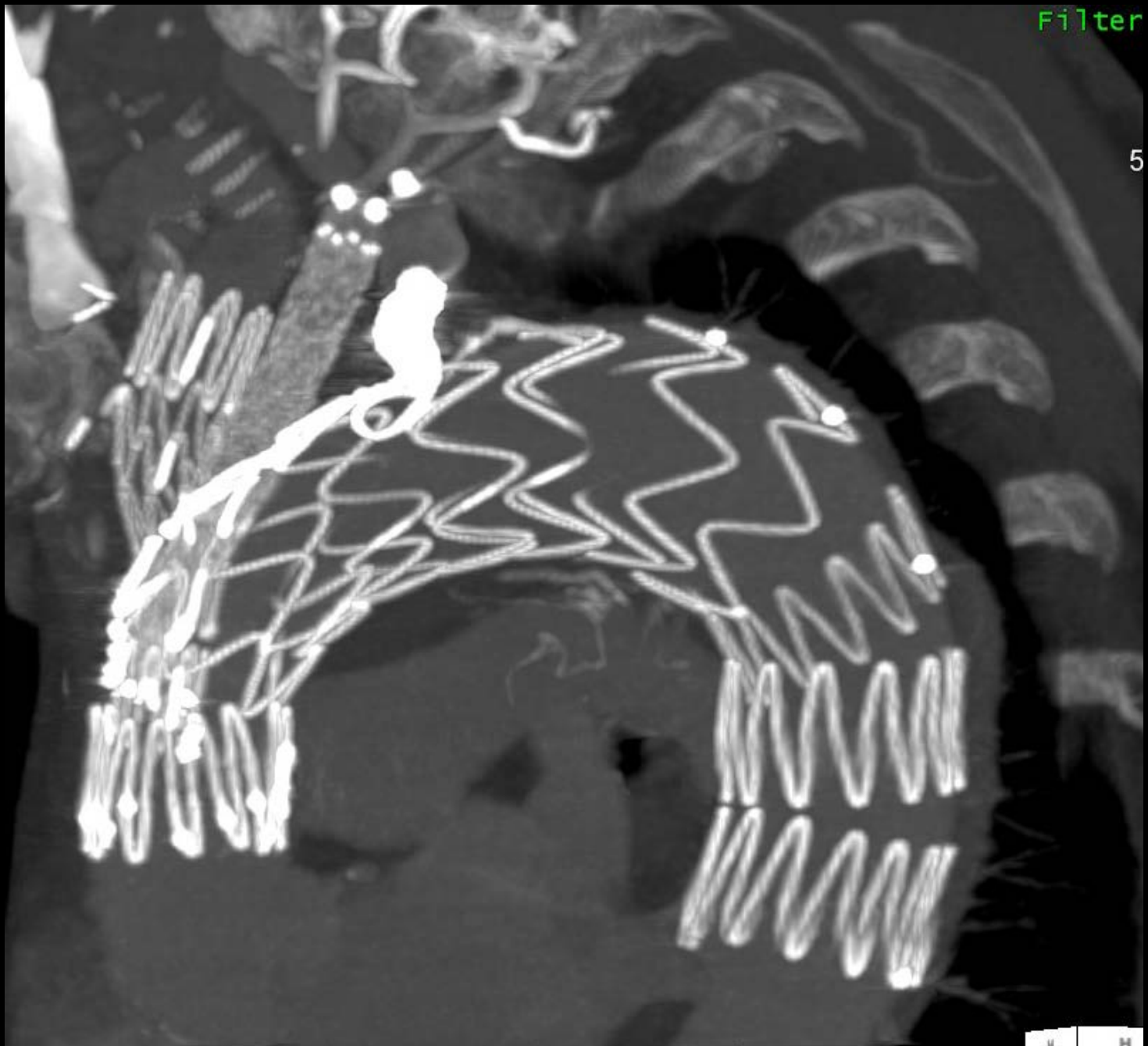














Arch Branch - considerations

- Stable device
- Continuous cerebral perfusion
- Potentially OTS
- Anatomical limitations
- Longterm outcome
- Still in trials

Summary

- Total Endovascular Arch repair feasible
- Extensive Anatomical and Physiological limitations
- Several techniques under development

Thank You
LUNUK LON

