

September 11-13

2014

Crowne Plaza Hotel
Liège, Belgium

4th International Meeting on Aortic Diseases

New insights into an old problem CHU Liège, APF

www.chuliege-ima.be

Aortic arch debranching and thoracic endovascular repair

Erik Debing, MD, PhD
Department of Vascular Surgery
University Hospital Brussels



September 11-13

2014

Crowne Plaza Hotel
Liège, Belgium

4th International Meeting on Aortic Diseases

New insights into an old problem CHU Liège, APF

www.chuliege-ima.be

Faculty disclosure

Erik Debing

I disclose the following financial relationships:

- ✓ Consultant for Abbott Vascular
- ✓ Receive grant/research support from Medtronic
- ✓ Advisory board of Boston Scientifique and C.R. Bard
- ✓ Paid speaker for Bayer, Boehringer Ingelheim, Daciichi Sankyo





Background

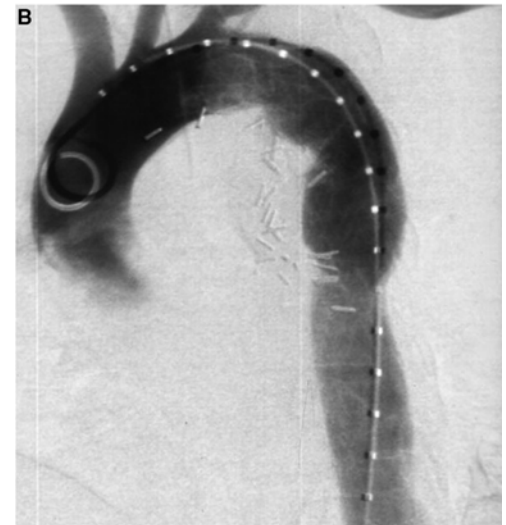
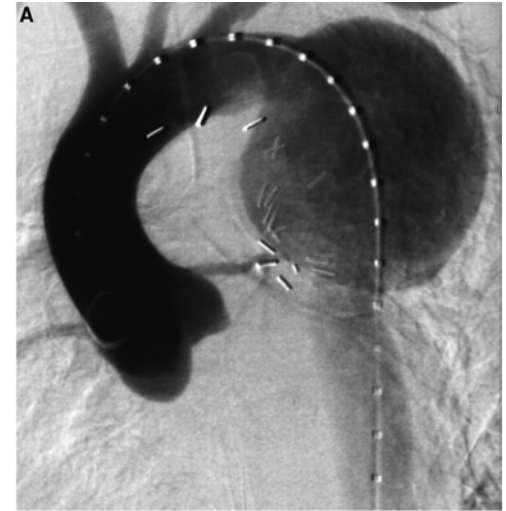
The traditional treatment of thoracic aortic aneurysms is open surgical graft replacement. Despite progressive surgical advances, conventional surgical repair is still associated with substantial morbidity and mortality, especially in elderly patients with other major medical conditions.

Aortic arch aneurysms present a particular challenge to endovascular repair due to the involvement of supra-aortic vessels and the anatomic curvature of the arch. A variety of maneuvers have been recommended for thoracic endografting to address the landing zone limitations imposed by the arch vessels.



Dake MD, Miller DC, Semba CP, et al.
Transluminal placement of endovascular
stent-grafts for the treatment of
descending thoracic aortic aneurysms. N
Engl J Med. Dec 29 **1994**;331(26):1729-34

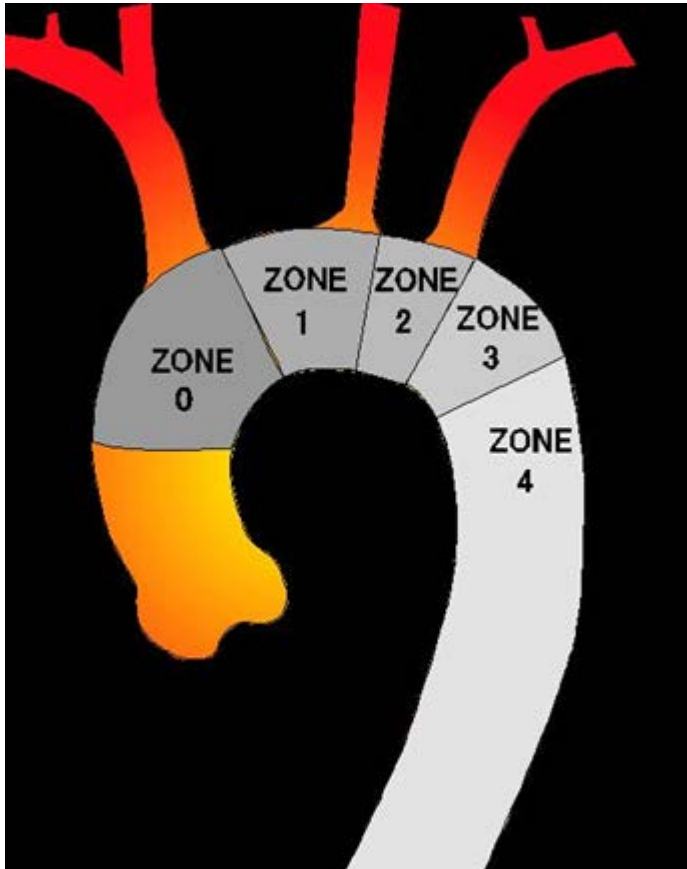
2008 coming-out year for TEVAR, as 2
additional stent-graft devices (Cook TX2
and Medtronic Talent) received
marketing approval in the US
They joined the Gore TAG stent which
was the first to be granted regulatory
approval in **2005**





Indications for TEVAR

- Aneurysm
- Dissection
- Traumatic rupture
- Intramural haematoma
- Penetrating ulcer



Depending on the proximal landing zone of the stentgraft, the descending aorta and aortic arch can be divided into 5 zones

75% TEVAR proximal fixation site within arch zones 1,2 or 3

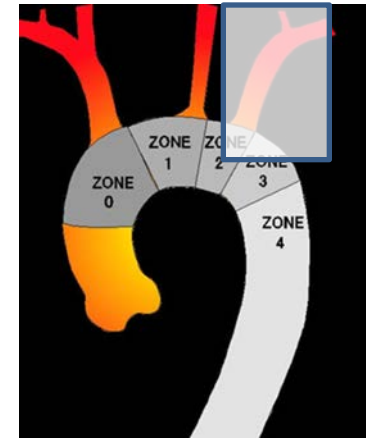
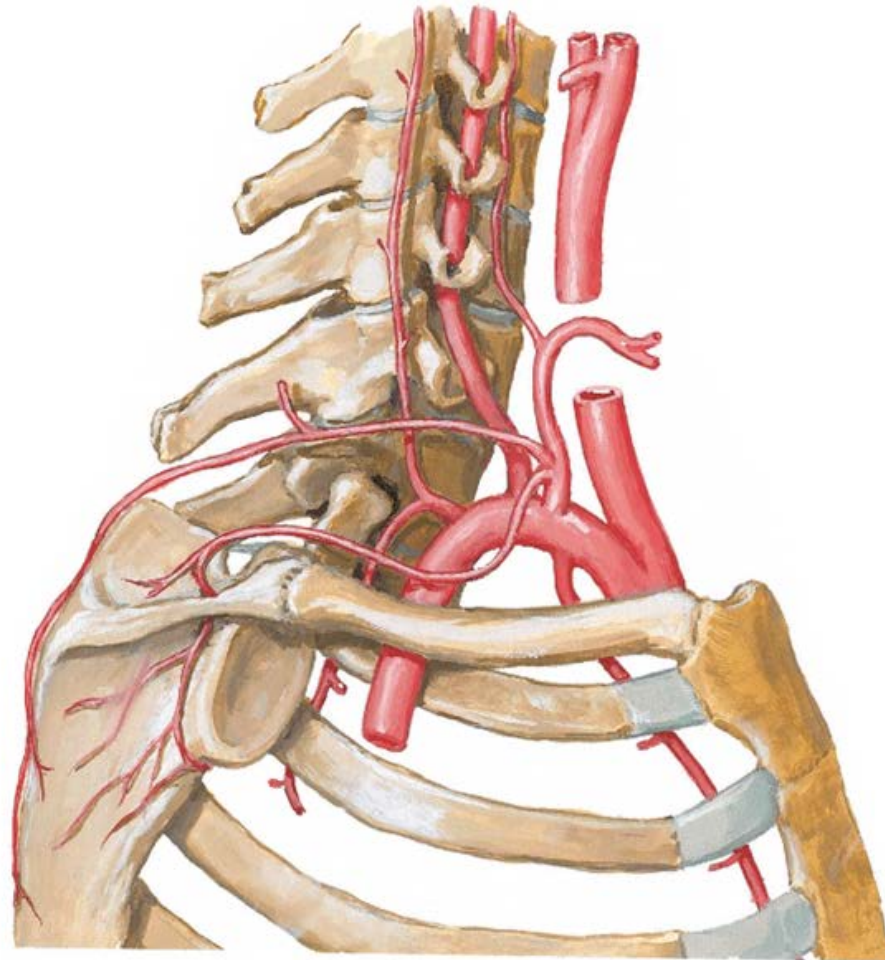
Fixation in zone 0,1 and 2 = covering of the supra aortic branches - revascularisation





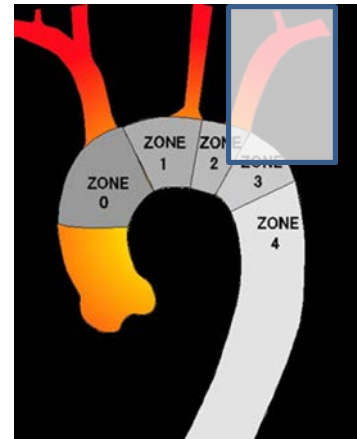
Left subclavian artery

Is the vessel that must be dealt with most frequently

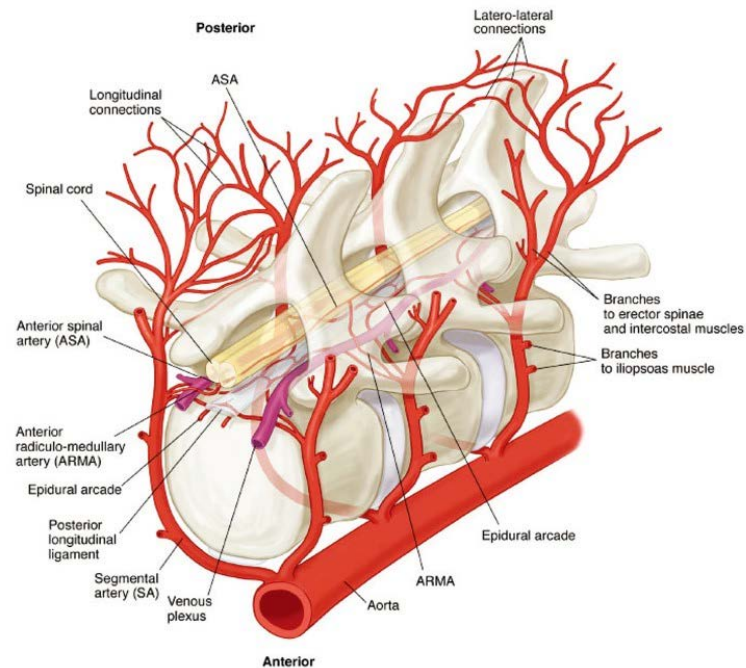


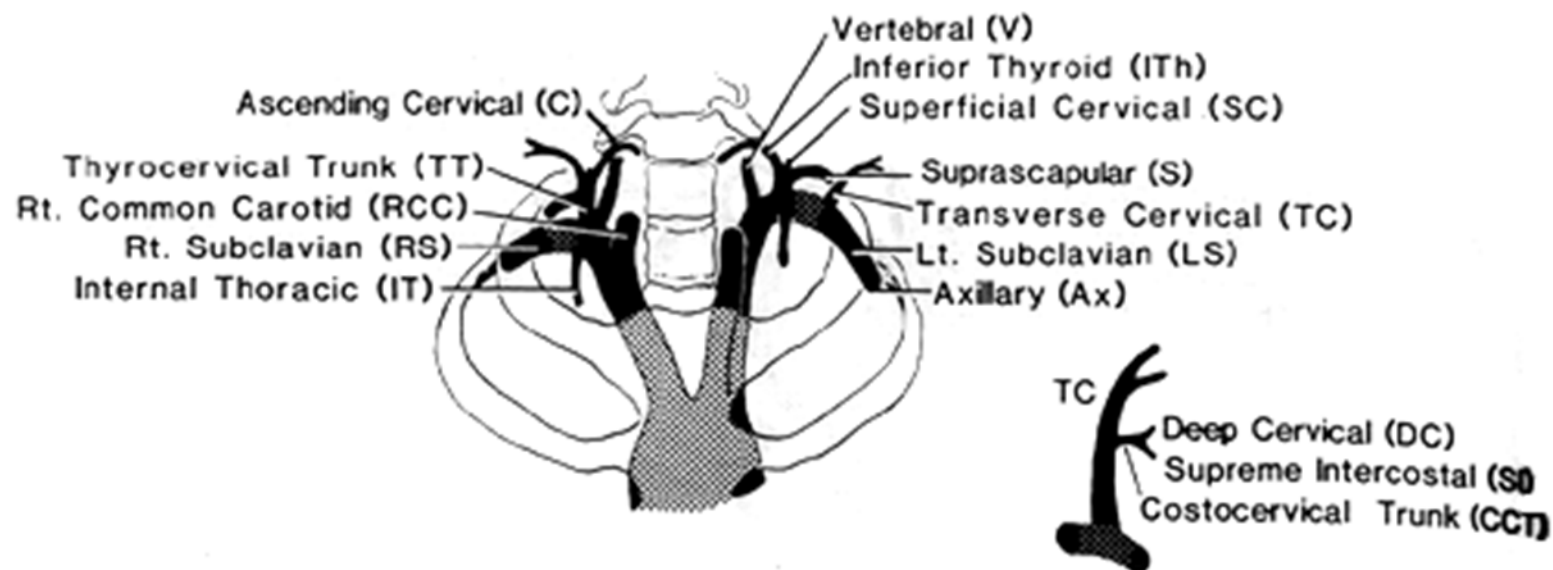


The left subclavian artery supplies blood to the cerebral circulation, cerebellum, posterior neck, thyroid gland, upper limb and the superior and anterior chest wall.

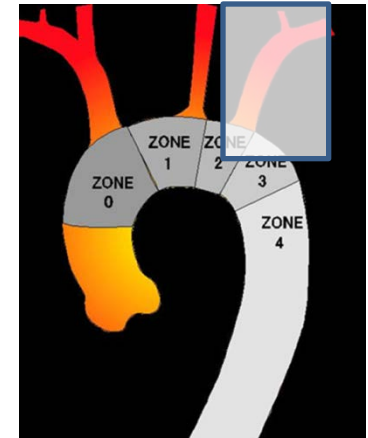


LSA provides blood flow to the upper spinal cord through the vertebral artery to the anterior spinal artery and collateral perfusion to the left intercostal vessels through the thoracodorsal and other chest wall branch arteries





Left subclavian artery (LSA)



Potential consequences of endograft coverage of the LSA:

Systematic review: coverage of the LSA is associated with a trend towards an increase in the risk of:

- ✓ Paraplegia (OR 2,69; CI 0,75-9,68)
- ✓ Anterior circulation stroke (OR 2,58; CI 0,82-8,09)
- ✓ Arm ischemia (OR 47,7; CI 9,9-229,3)
- ✓ Vertebrobasilar ischemia (10,8 CI 3,17-36,7)

(Matsummura et al, J Vasc Surg 2009)



Recommendations of the SVS Level C (no prospective randomized trials)
(Matsummura et al, J Vasc Surg 2010)

❖ **Recommendation 1:** In patients who need elective TEVAR where achievement of a proximal seal necessitates coverage of the LSA, we suggest routine preoperative revascularization despite the very low-quality evidence (Grade 2, level 2)

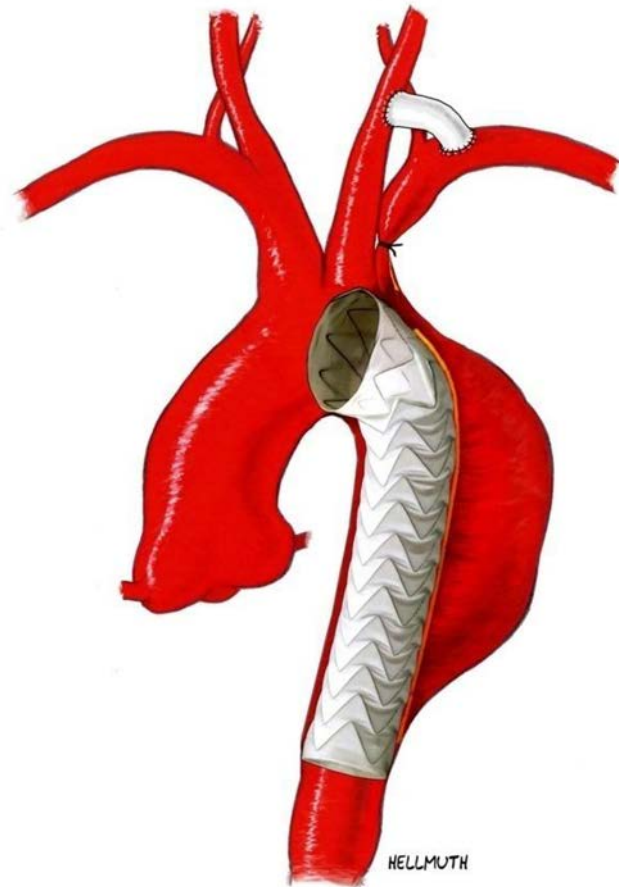
❖ **Recommendation 2:**

Strongly recommended

- ✓ LIMA-coronary bypass
- ✓ Dominant left vertebral artery (60% of patients)
- ✓ Occluded or absent right vertebral artery
- ✓ AV shunt in left arm
- ✓ Prior infrarenal aortic operation
- ✓ Planned extensive (>20cm) coverage of the descending aorta
- ✓ Hypogastric artery occlusion

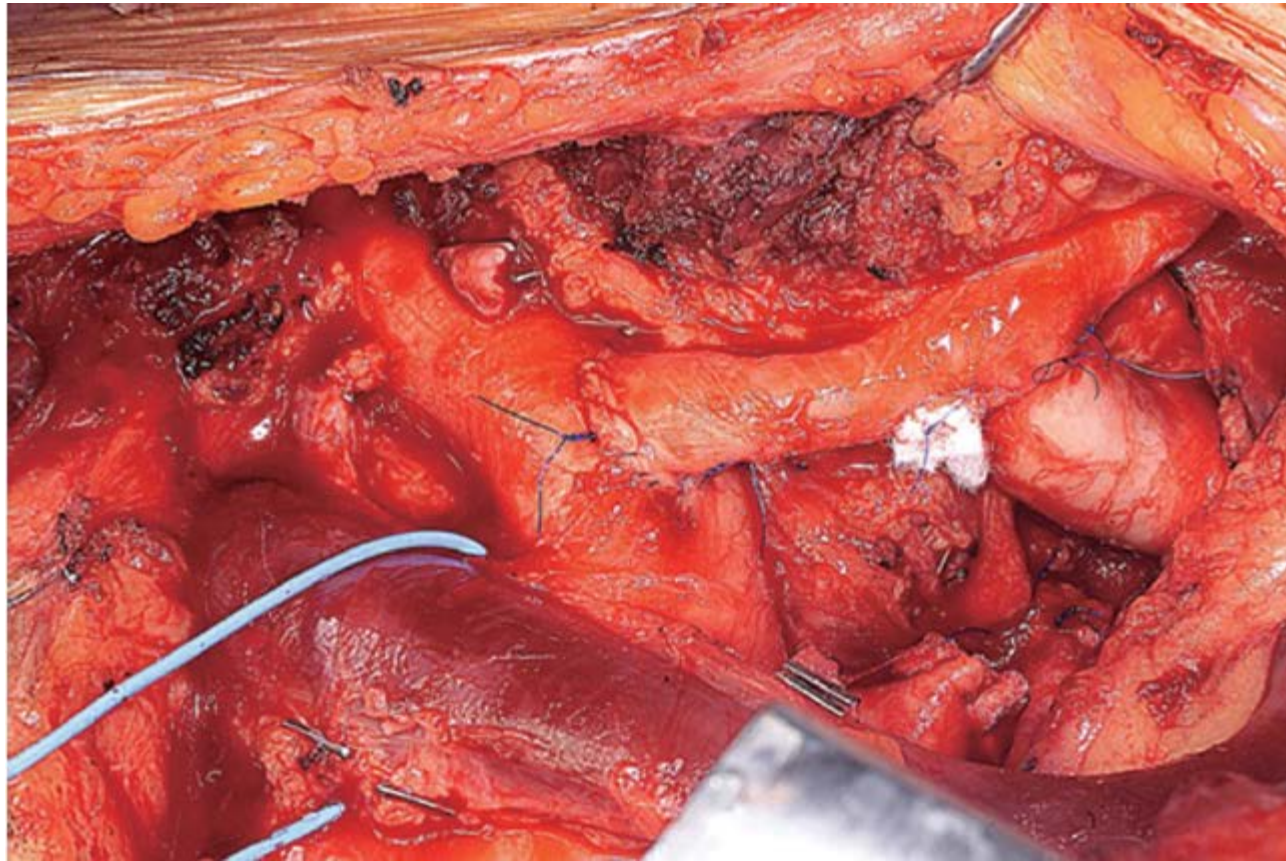


LSA debranching techniques





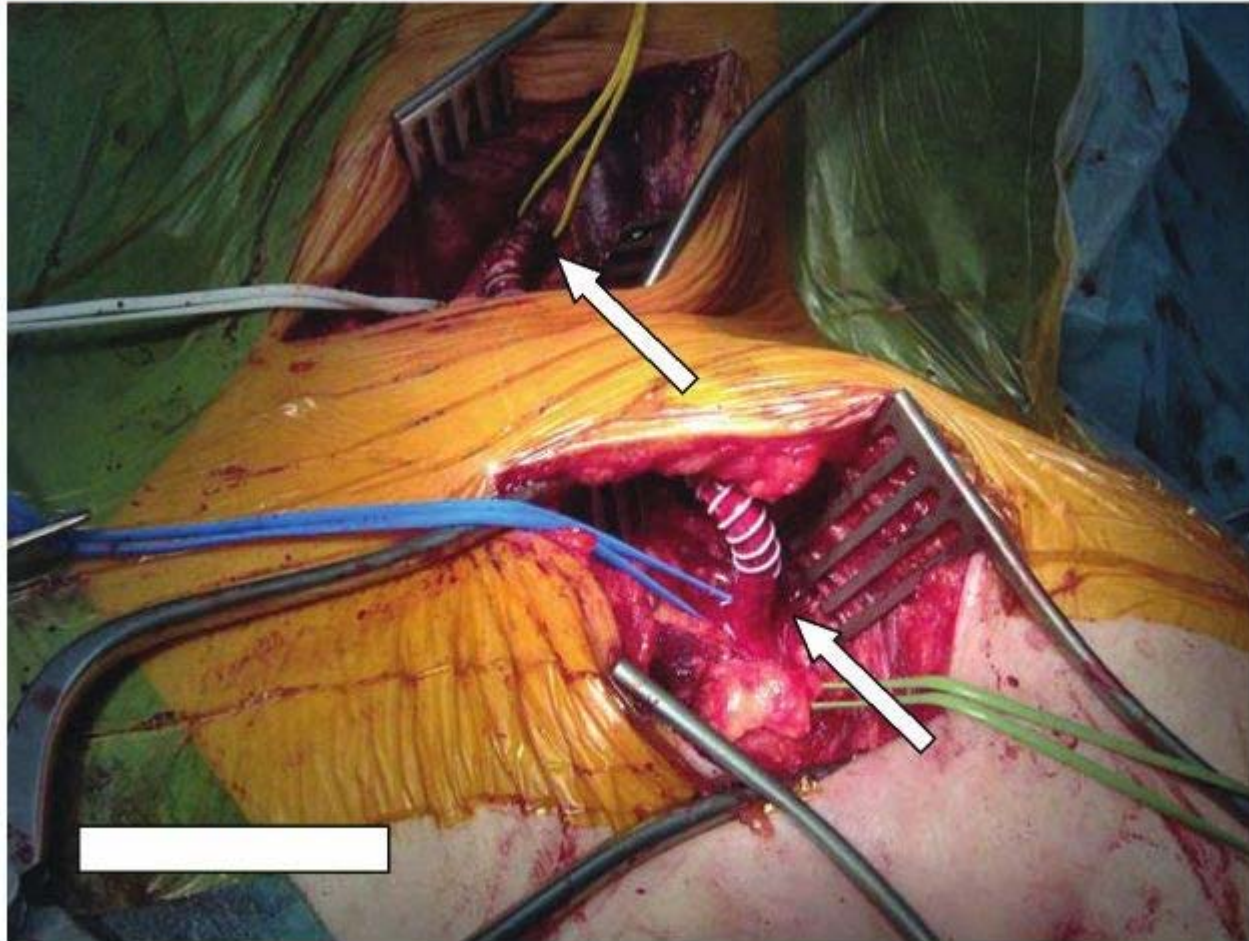
Transposition of LSA on the left common carotid artery



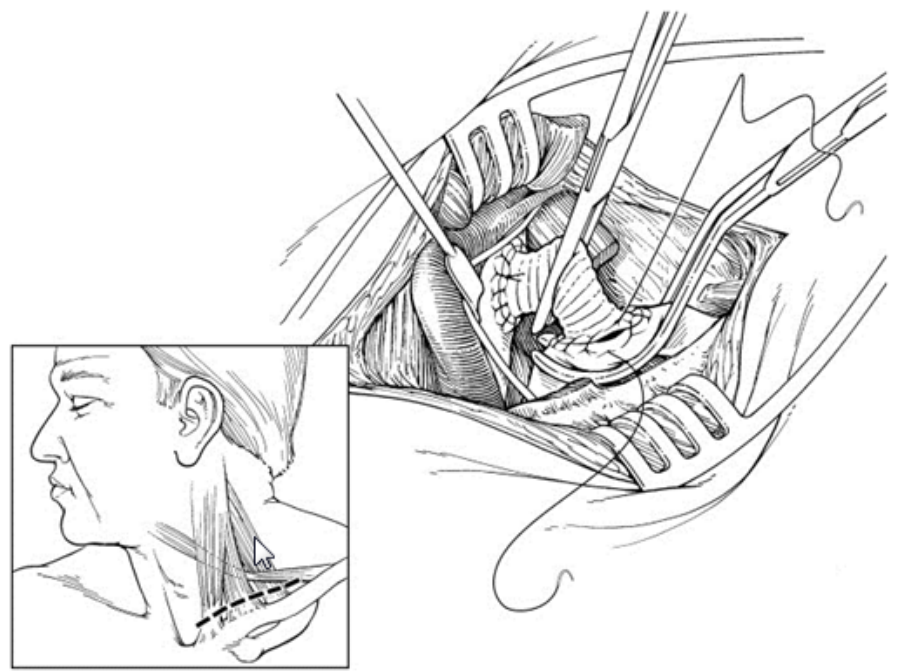
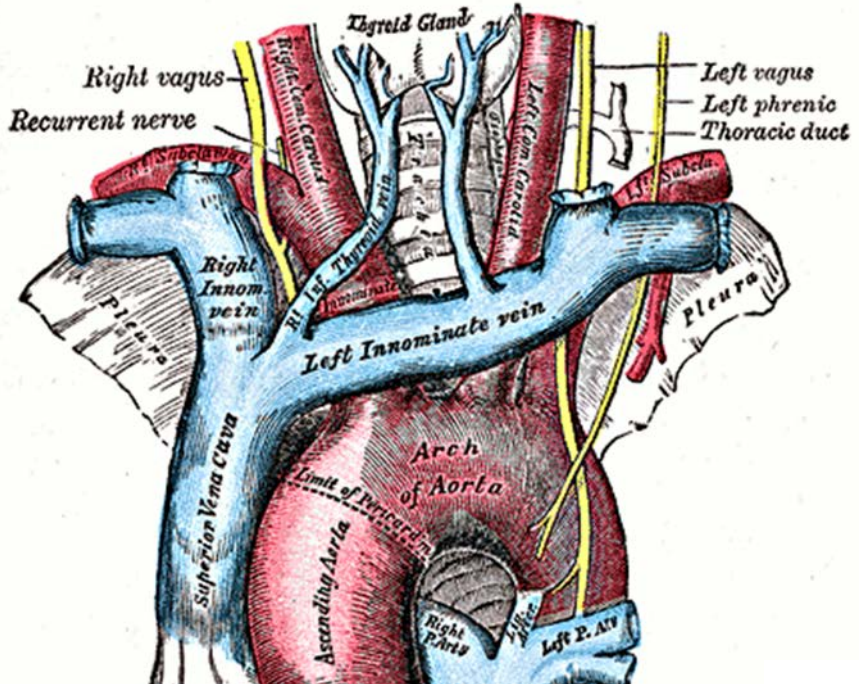


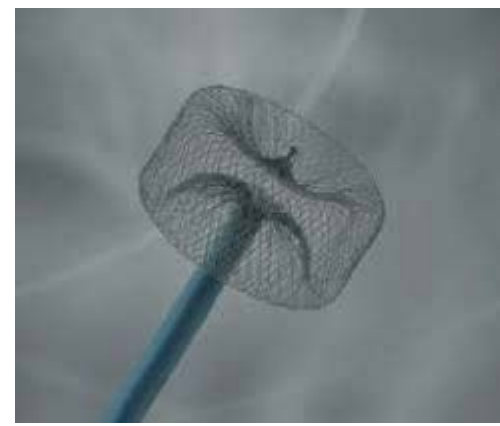
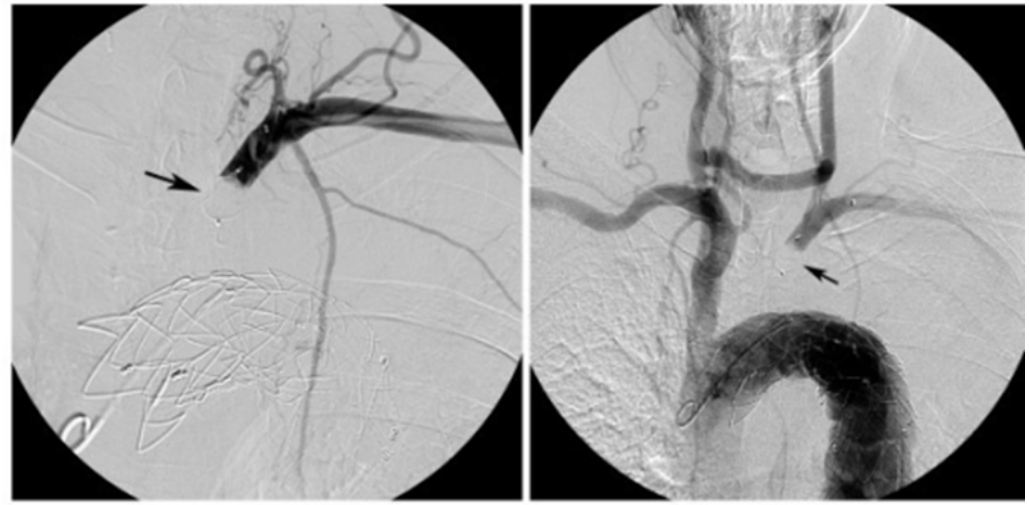
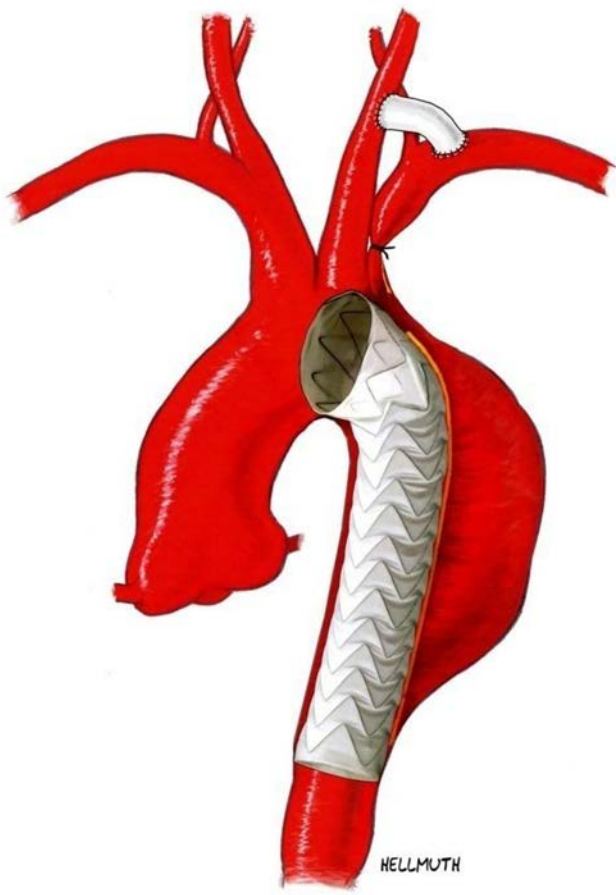
Carotid – axillary bypass

Medscape



Source: J Med Case Reports © 1999-2011 BioMed Central Ltd







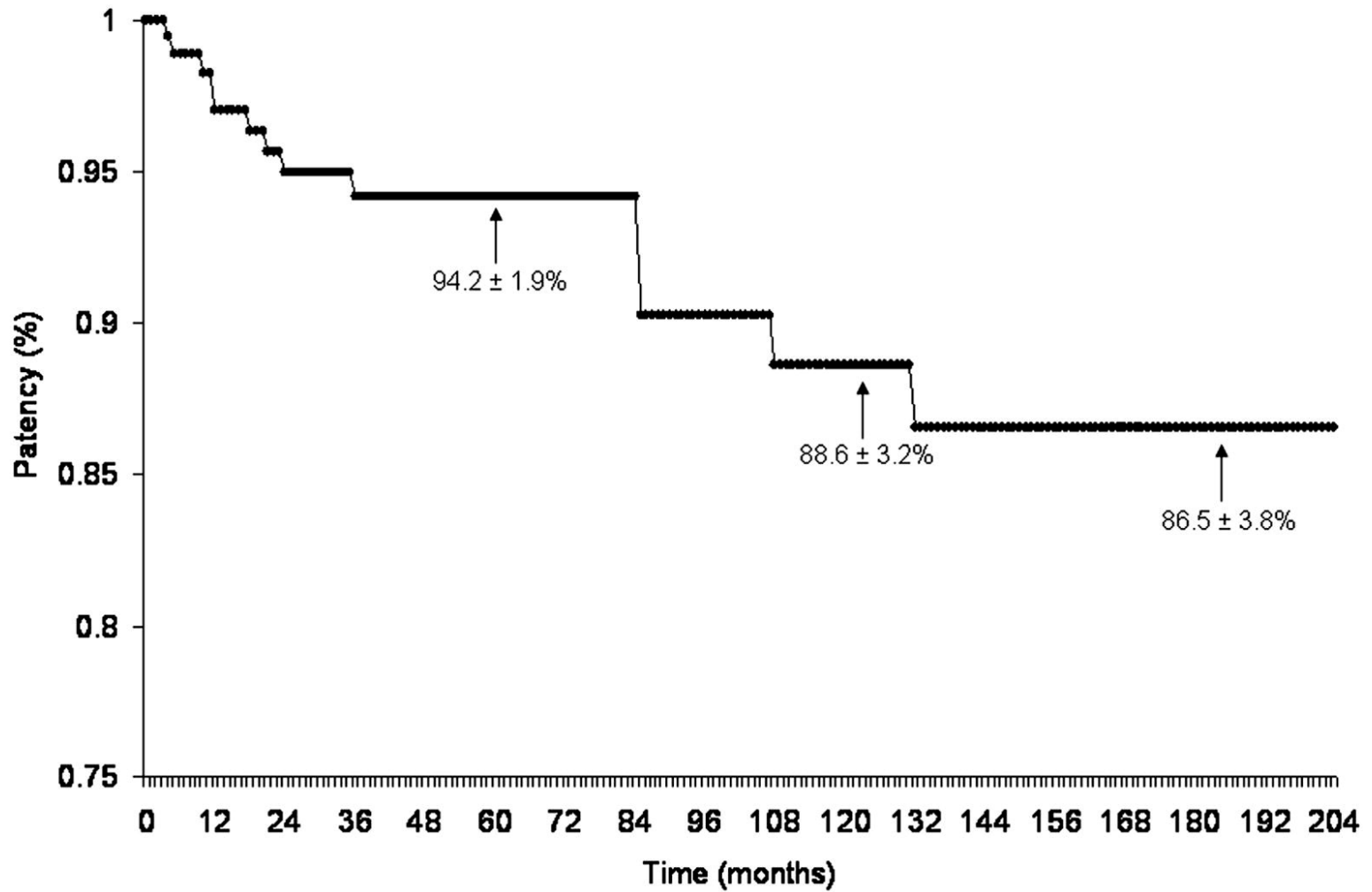
Potential complication of LSA debranching

- ✓ Stroke
- ✓ Bleeding
- ✓ Injury of the thoracic duct
- ✓ Injury of the phrenic nerve - vagus
- ✓ Injury of the sympathetic chain
- ✓ Injury of the brachial plexus
- ✓ Pneumothorax
- ✓ Prosthetic graft infection

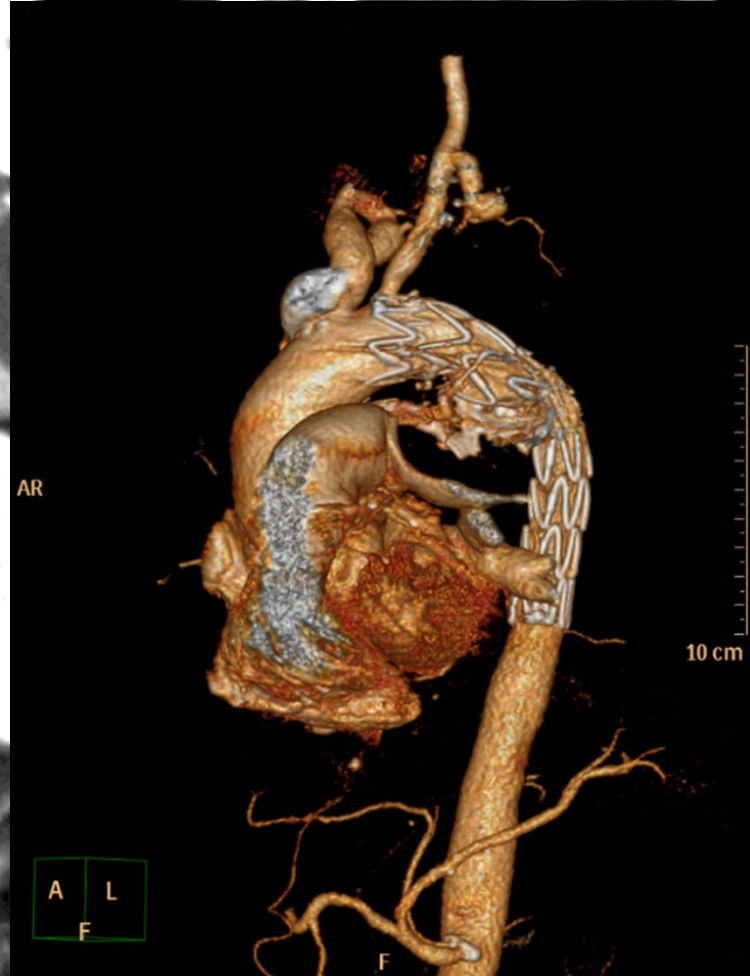
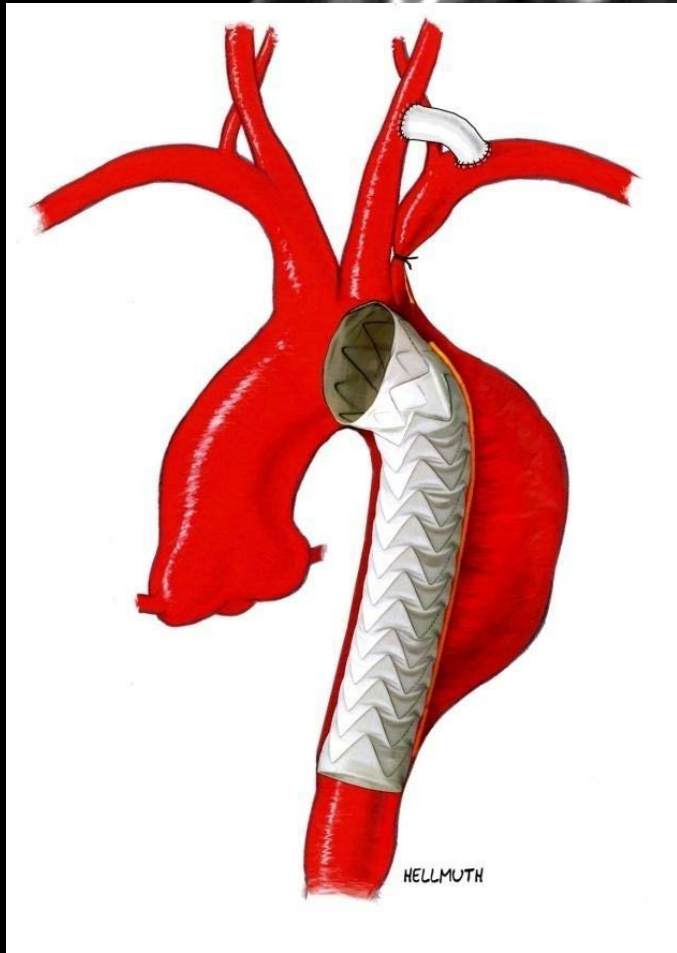


Patency LSA – CCA bypass

Takach et al, Ann Vasc Surg 2011

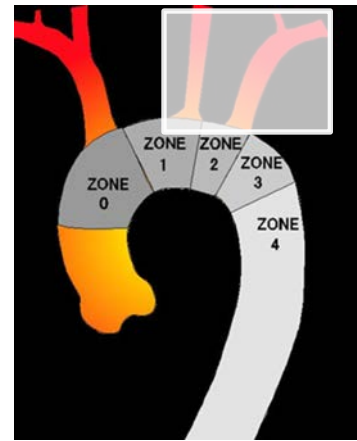
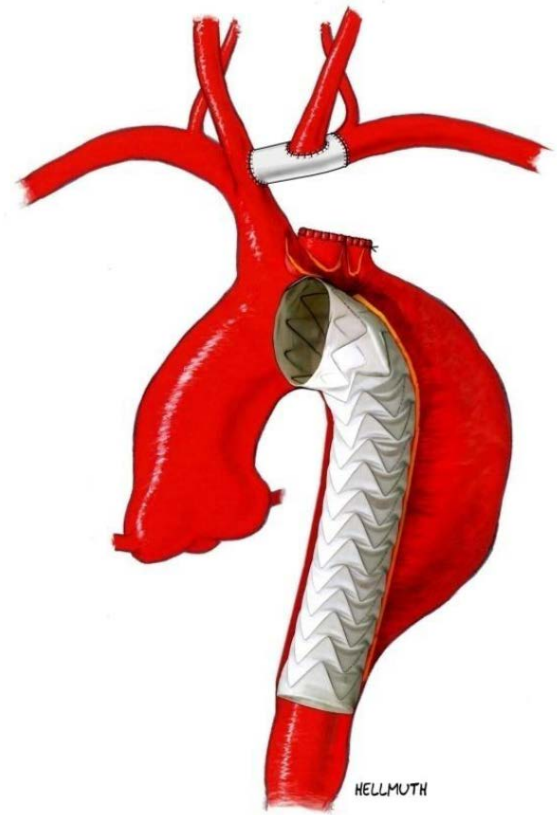
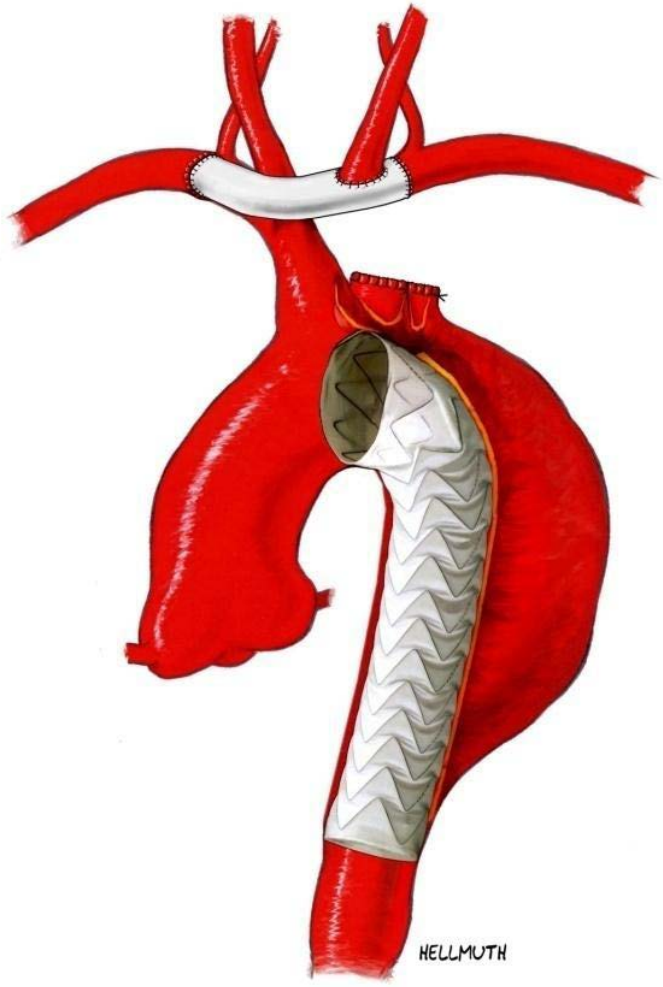


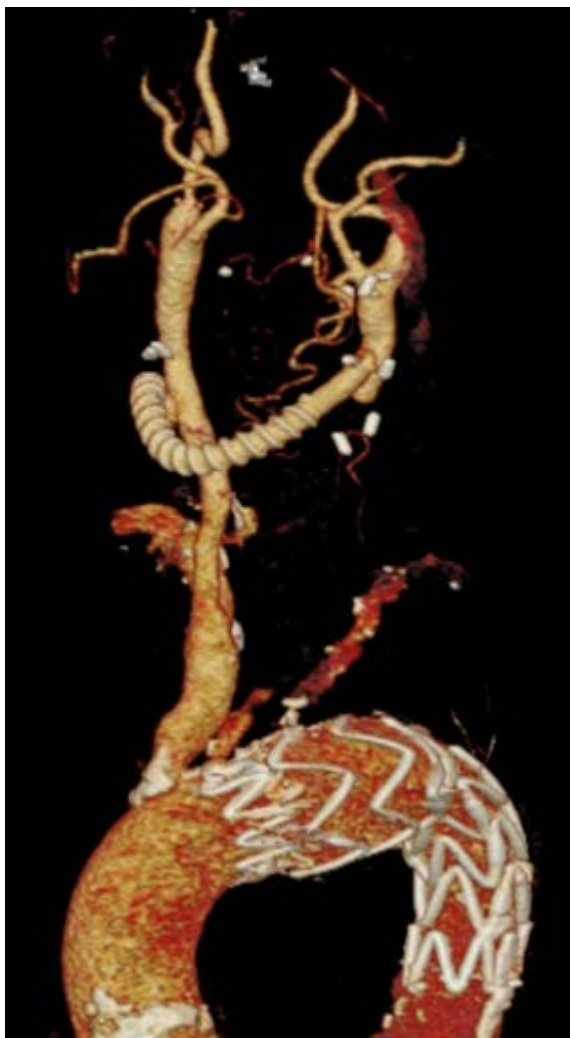
N = 287 159 134 118 103 95 81 74 64 54 47 41 34 29 25 21 16 15





LSA and left common carotid artery





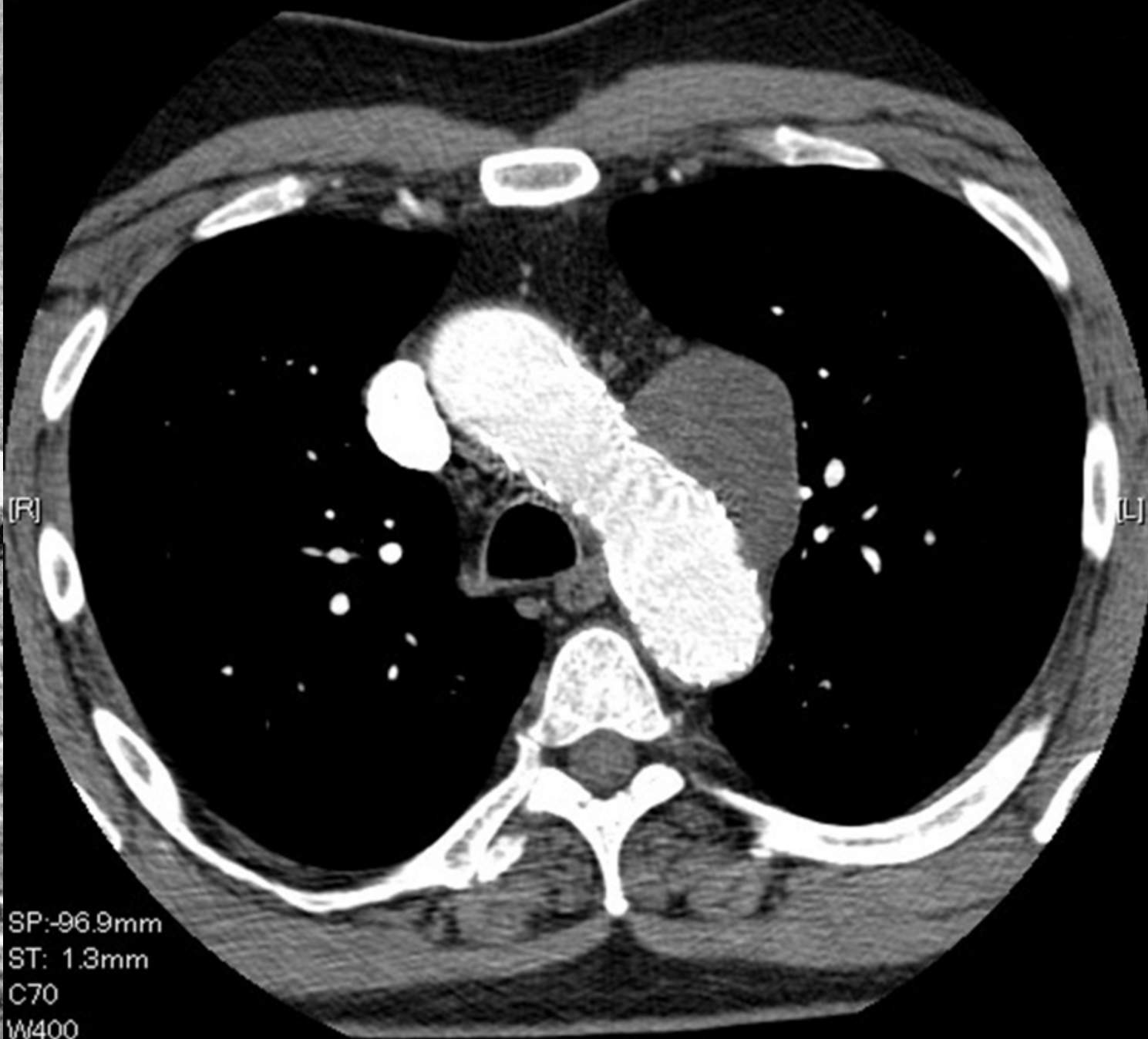
Subcutaneous CC bypass

Patency rates
1, 3 and 5 years of 100%, 98% and 96%

AbuRahma et al, J Endovasc Ther 2007



Retropharyngeal CC bypass



SP: -96.9mm
ST: 1.3mm
C70
W400

Not for diagnostic use

[P]

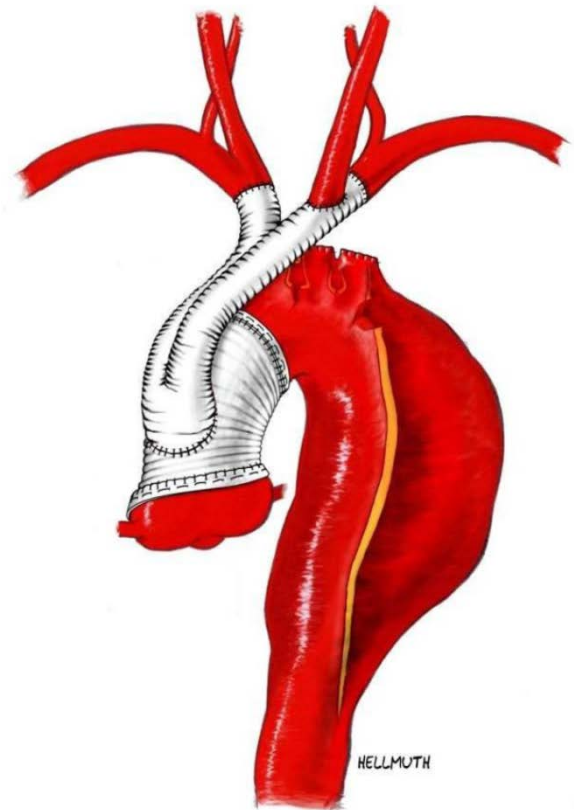
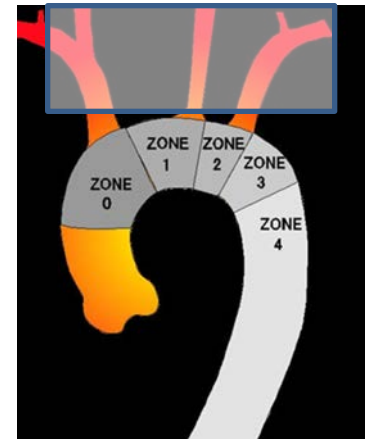
GE MEDICAL SYSTEMS

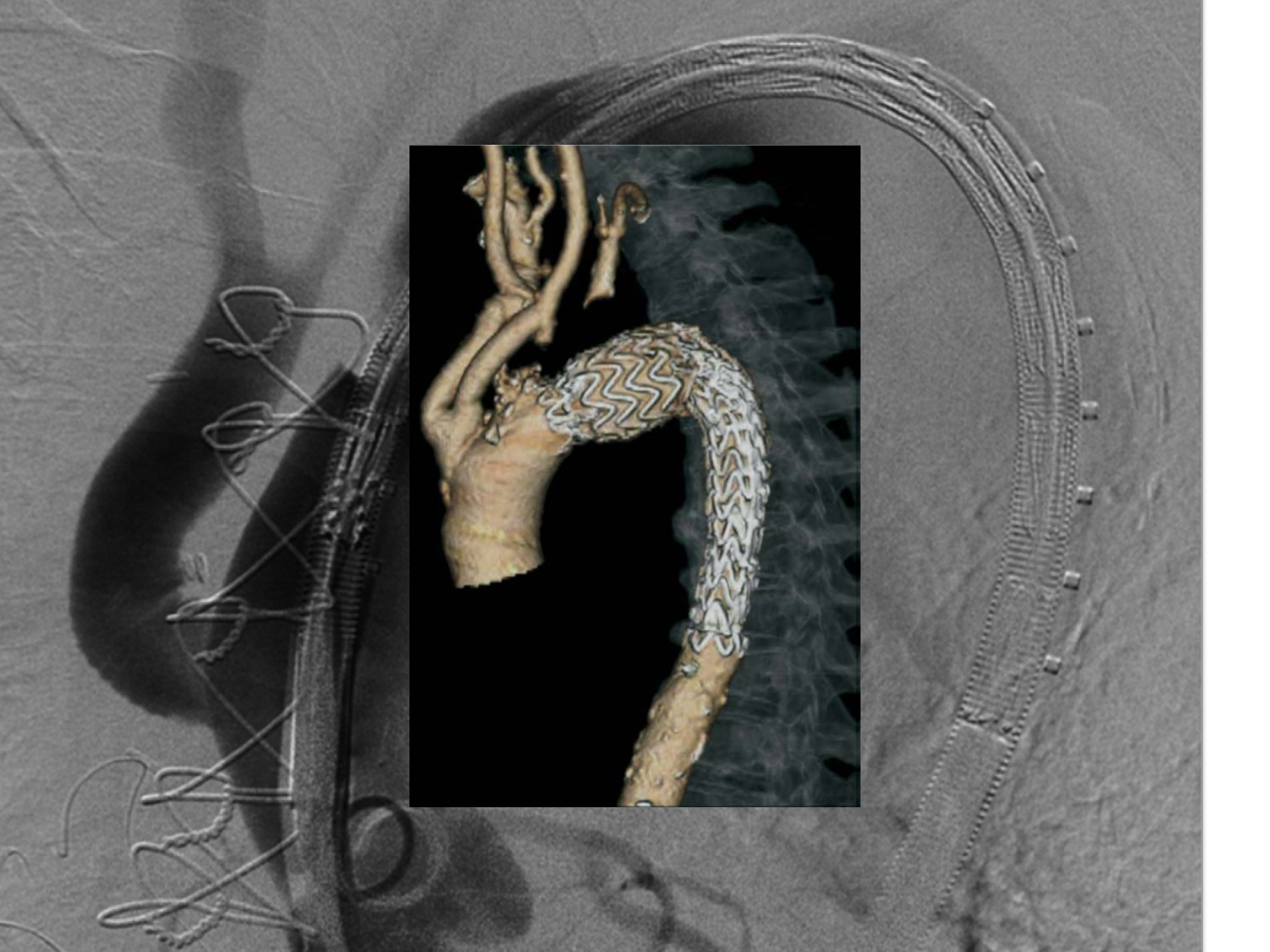


Innominate, left CCA and LSA



Hybrid repair







Results Hybrid technique

- ✓ Antoniou et al, 2010, literature review
- ✓ 18 studies, N=195
- ✓ Type I and II endoleak 9%
- ✓ 30-day mortality 9%
- ✓ 30-day stroke rate 7%

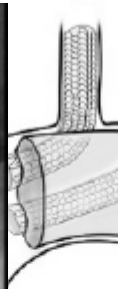
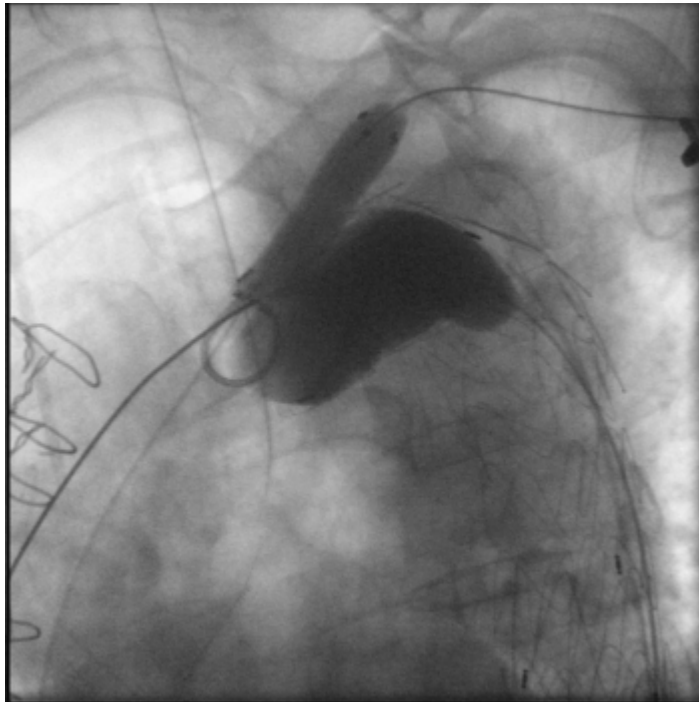


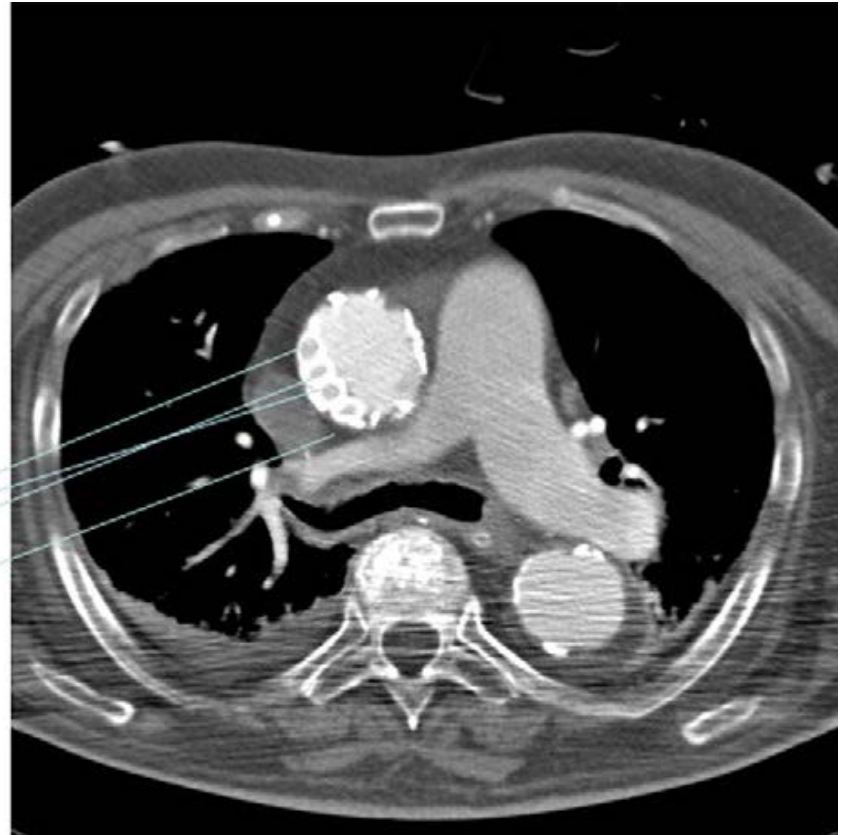
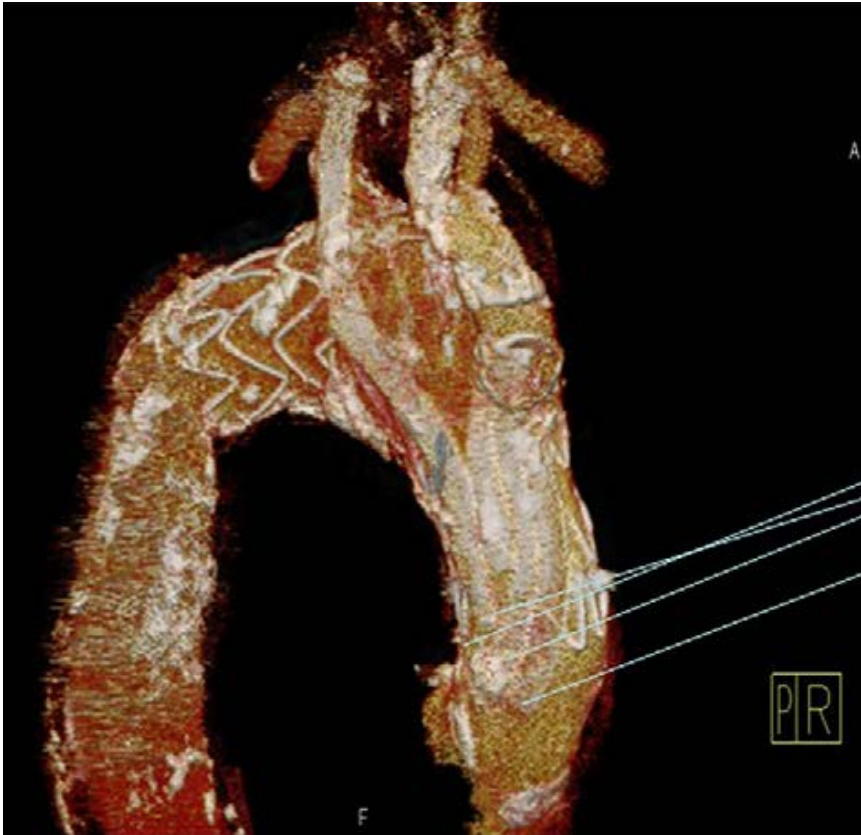


VIS-à-VIS arch branch management

Chimney, snorkel, double barrel, sandwich technique

Initially = trouble shouting maneuver, stenting the vessel origin to re-establish or preserve normal antegrade flow by creating an antegrade parallel channel outside of the aortic endograft





Yoshida RA, et al, Eur J Vasc Endovasc Surg 2011



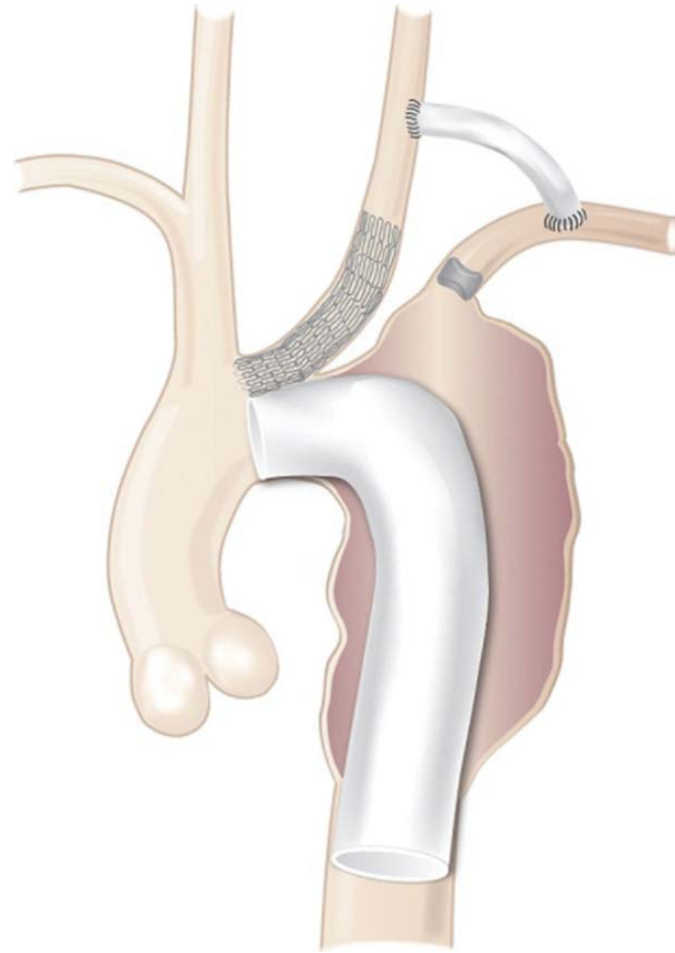
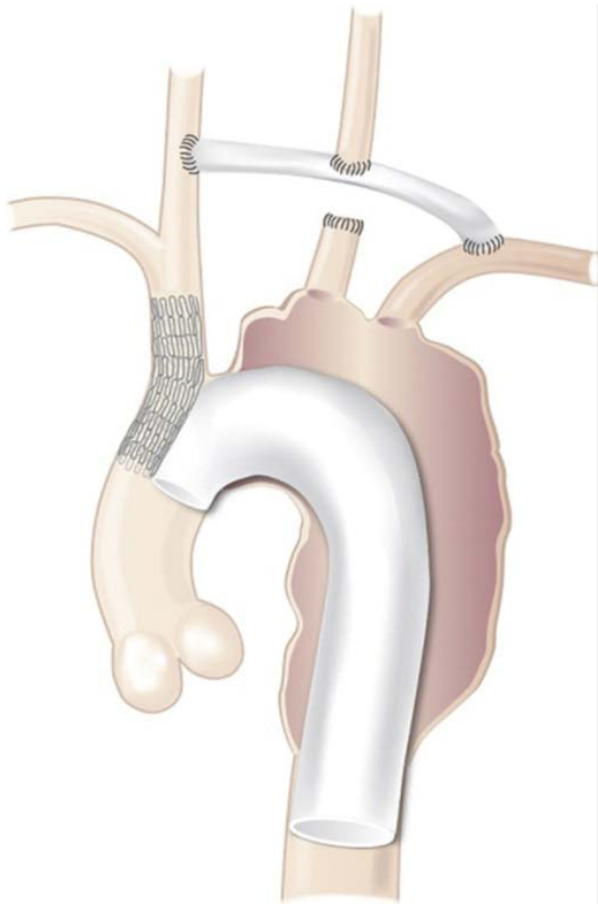
Results – Chimney technique

- ✓ Hogendoom et al, 2013 Review, meta-analysis (20 reports)
 - 94 pts, 101 chimney-stented aortic arch branches
 - 20 BCA, 48 LCCA, 33 LSA
 - 36% balloon-expandable stents, 64% self-expandable stents
 - 72% elective, 28% emergent
 - Median FU 11 months
 - Technical success 98%
 - Endoleaks 18%, type Ia 6,4% (gutters)
 - 30-day stroke rate 5,3% (40% fatal)
 - 30-day mortality rate 3,2%
 - 100% patency

Viabel option for treatment of thoracic aortic pathologies for emergent as well as elective settings.



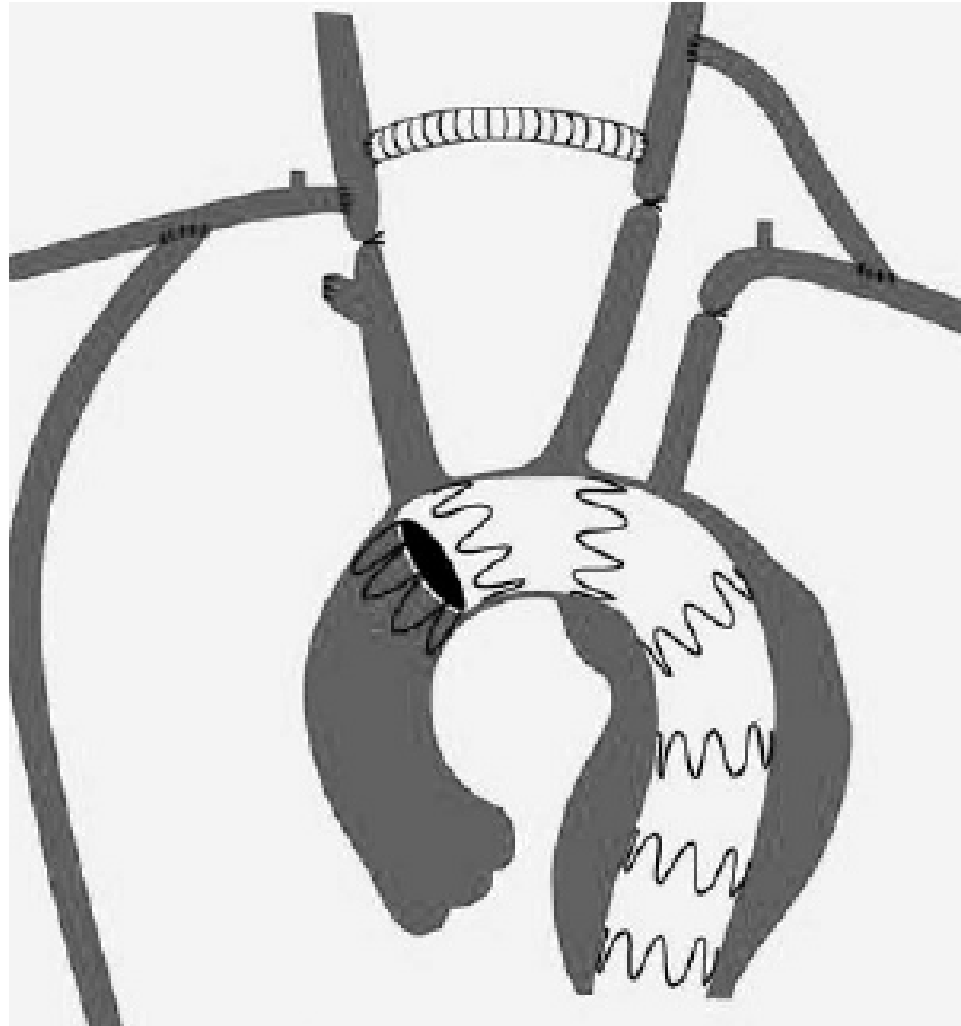
Combined extra-anatomical debranching and chimney



Cires et al, 2011

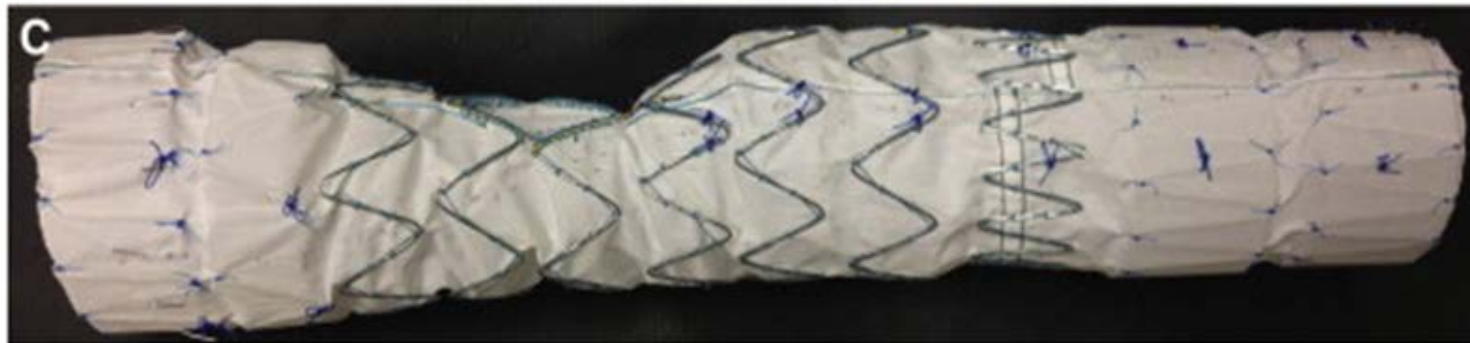
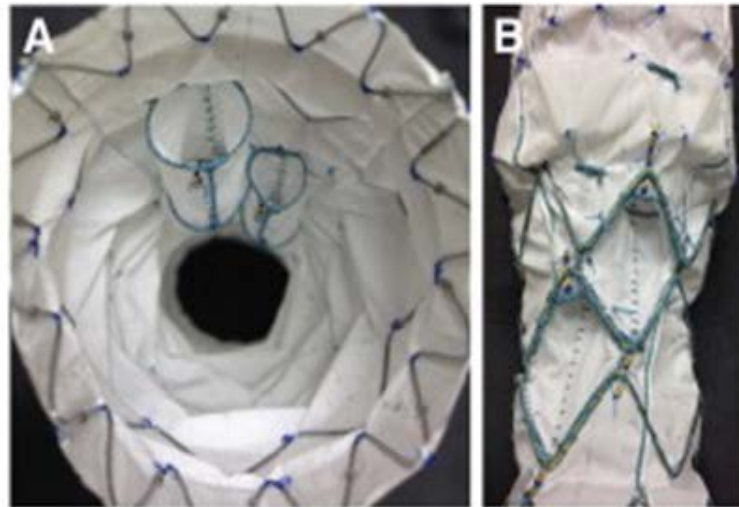


Total aortic arch debranching using FAB



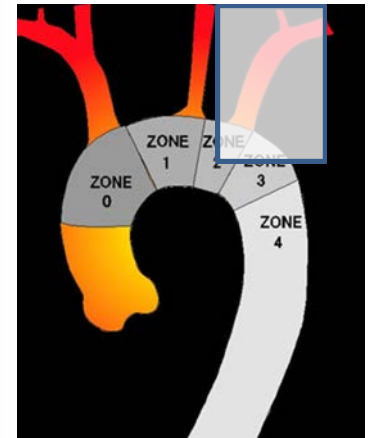
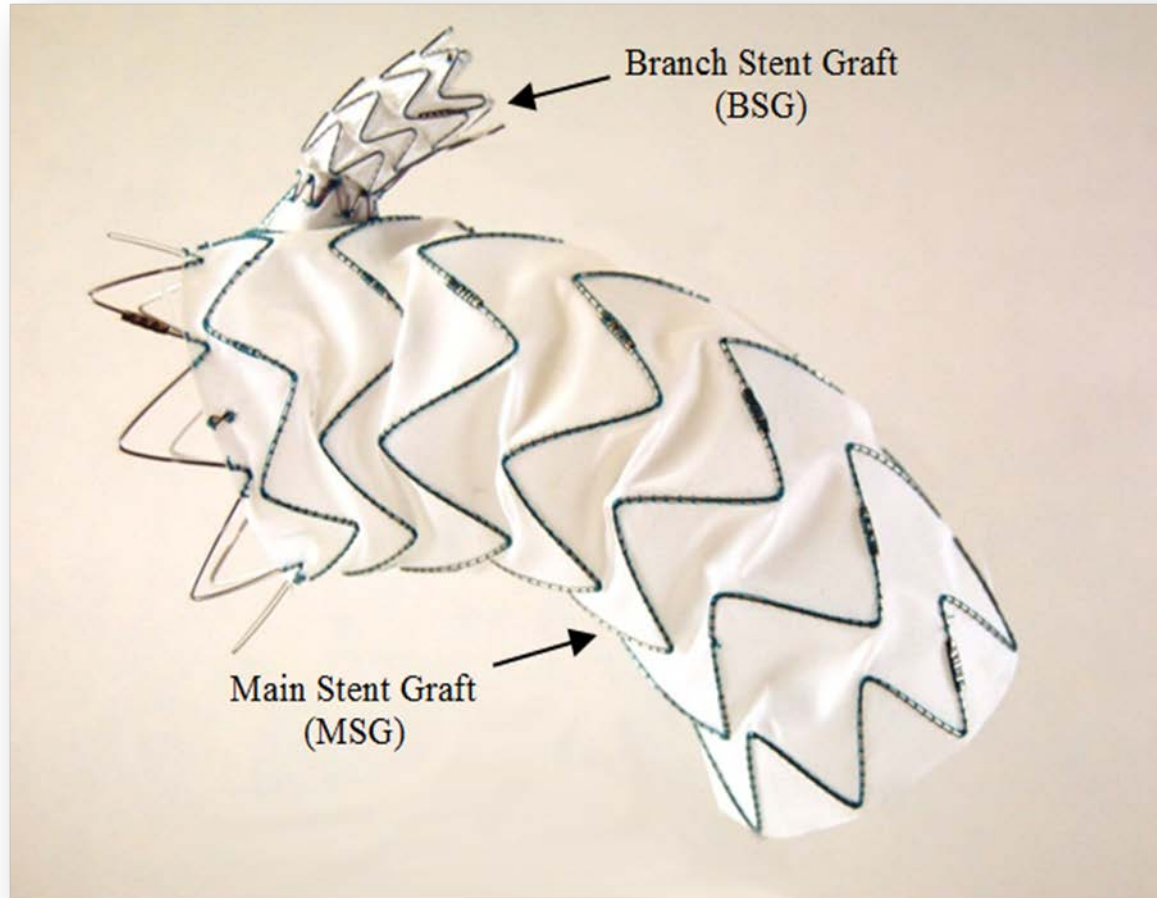
Global experience with an inner branched arch endograft

Stéphan Haulon, MD, PhD,^a Roy K. Greenberg, MD,^b Rafaëlle Spear, MD,^a Matt Eagleton, MD,^b Cherrie Abraham, MD,^c Christos Lioupis, MD,^c Eric Verhoeven, MD, PhD,^d Krassi Ivancev, MD,^c Tilo Kölbel, MD, PhD,^f Brendan Stanley, MD,^g Timothy Resch, MD,^h Pascal Desgranges, MD, PhD,ⁱ Blandine Maurel, MD,^a Blayne Roeder, PhD,^j Timothy Chuter, MD,^k and Tara Mastracci, MD^b





Valiant Mona LSA Thoracic Stent Graft System





Current Status of Early Feasibility Trial

Preliminary Data (Index Procedure):

- 7 subjects enrolled as part of U.S. cohort of FIH trial
- 2 subjects enrolled as part of O.U.S. cohort of FIH trial
- 1 subject enrolled in U.S. outside of FIH trial (emergent case)

Full Cohort	N=10
Technical Success	100%
Patency (MSG/BSG)	100%
Type I or III Endoleak	0%



Conclusion

- ✓ Short- and midterm results showed that is feasible to preserve the patency of supra-aortic branches with debranching and chimney techniques
- ✓ No long follow up results, no randomized trials
- ✓ Chimney technique:
 - ✓ More endoleaks?
 - ✓ Which kind of chimney stent should be the first choice?
Covered or bare metal stents, balloon- or self-expandable stent?
- ✓ Chimney technique can/could potentially replace the hybrid technique in specific patients depending on anatomy and comorbidity conditions
- ✓ Upcoming branched and fenestrated stent graft interventions: less invasive and potentially lower risk of stroke but disadvantages high costs, higher contrast en radiation use, custom made prolonged waiting time.