

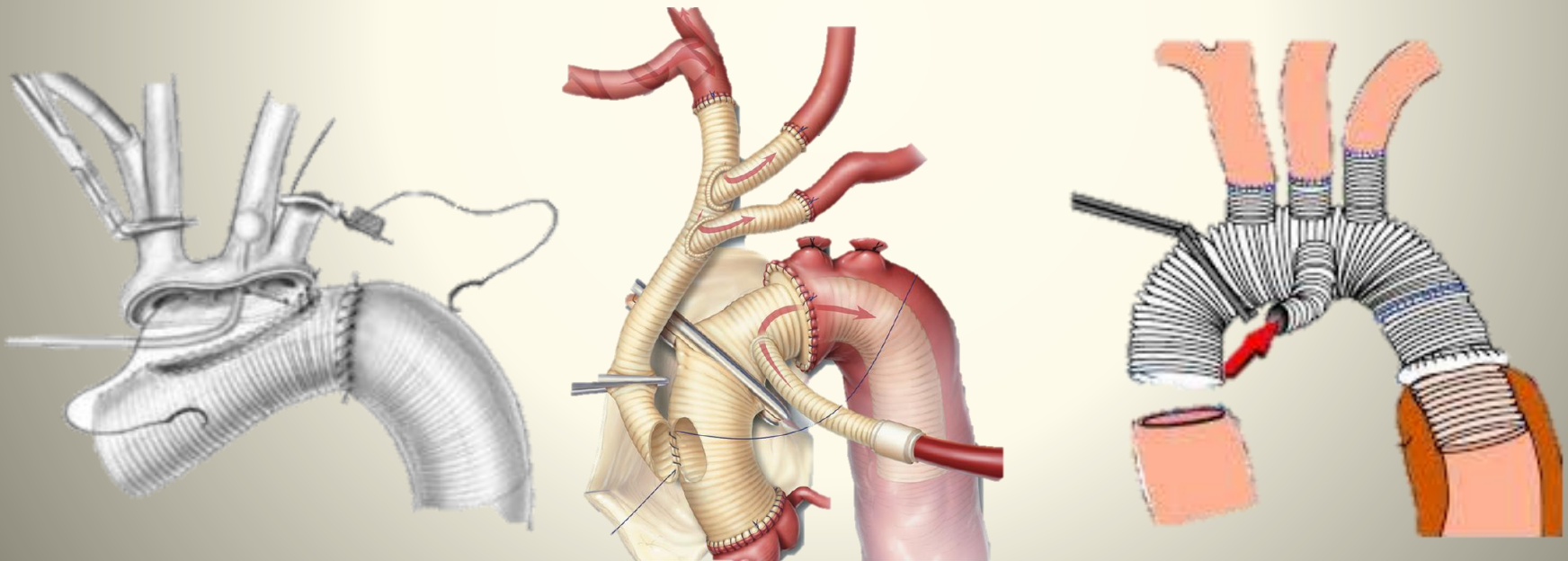
Aortic Arch Treatment Open versus Endo Evidence versus “Zeitgeist”



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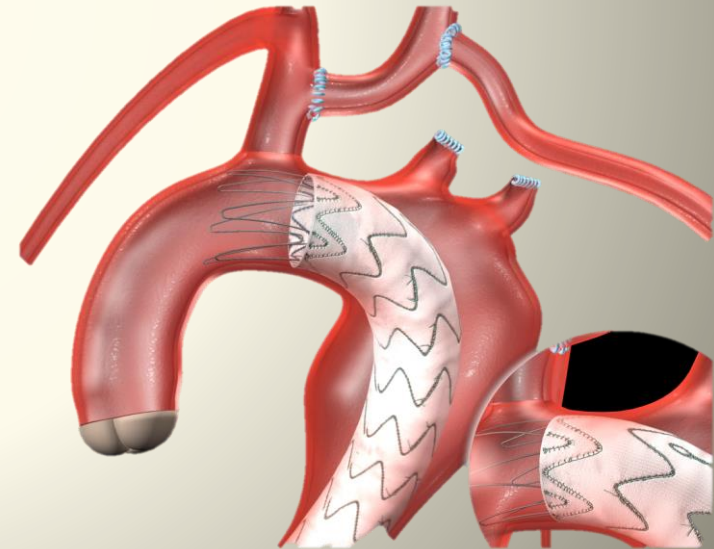
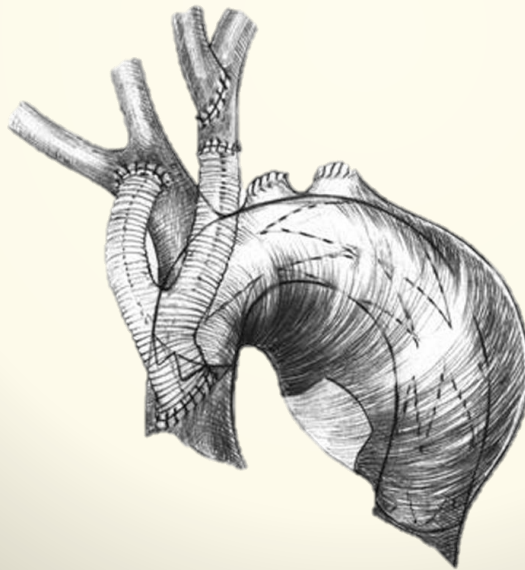
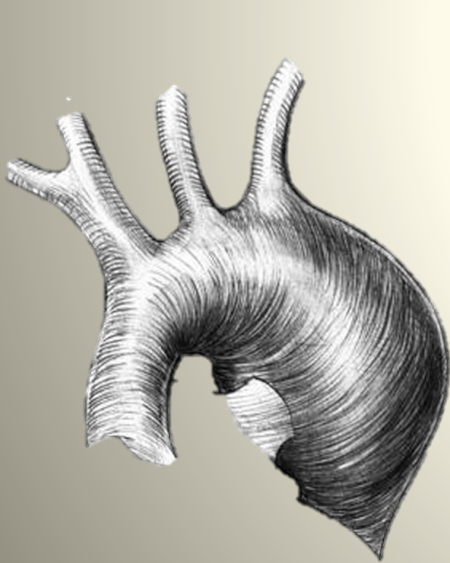
Evidence

- Surgical aortic arch replacement with a Dacron graft and re-implantation (patch, separate) of supra-aortic arteries



“Zeitgeist”

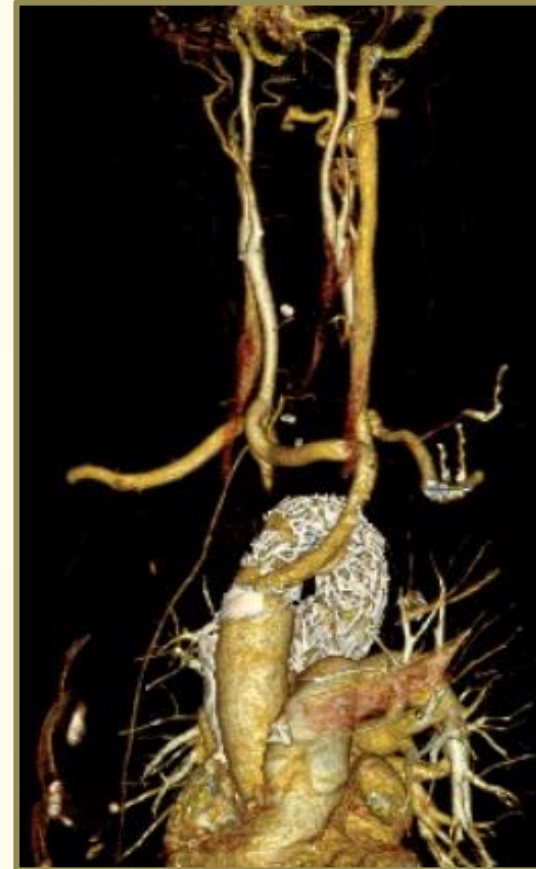
- **Re-routing (de-branching)** techniques of arch vessels to enable endovascular treatment of the aortic arch
- **Complete endovascular** aortic arch treatment using fenestrated or side-branch stent grafts



Advantage of “Zeitgeist” Techniques

- Avoidance of cardio-pulmonary bypass and the use of hypothermic circulatory arrest
- Endovascular techniques were primarily developed for patients judged unfit for conventional surgery

Supra-aortic Re-routing



- Female pat. 70 years, in excellent clinical condition is suffering from hypotension and dizziness

Complications after aortic arch hybrid repair

Philipp Geisbüsch, MD,^a Drosos Kotelis, MD,^a Matthias Müller– Eschner, MD,^b
Alexander Hyhlik-Dürr, MD,^a and Dittmar Böckler, MD, PhD,^a *Heidelberg, Germany*

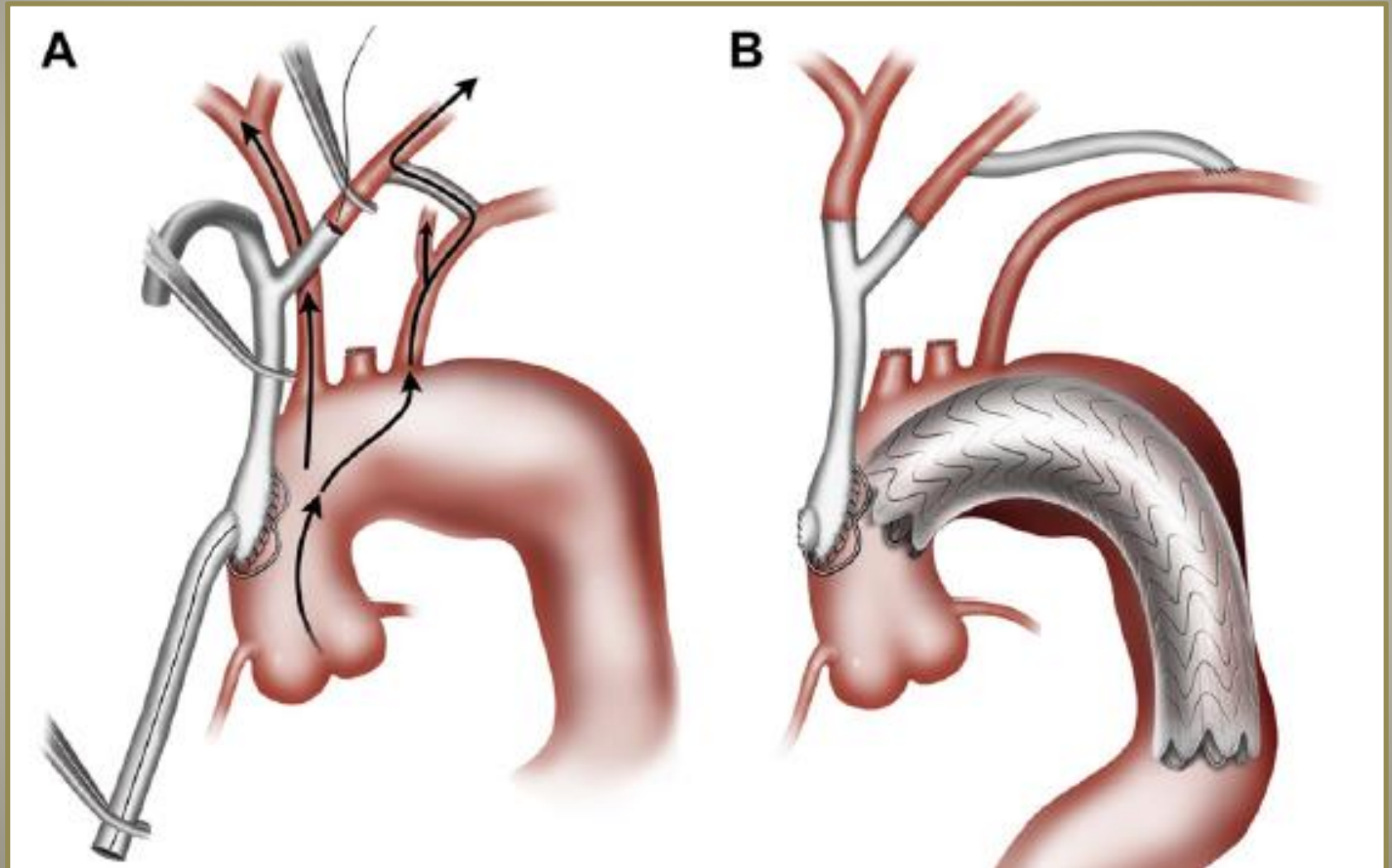
- 1997-2009; 47 patients with hybrid arch repair
- Complete debranching: 15 pat.; partial debranching: 23 pat.; subclavian artery transposition: 9 pat.
- Hospital mortality: 19%; (27% after complete; 15.6% after partial); retrograde AD: 6,3%; stroke rate: 6,3%; paraplegia: 6%; reintervention rate: 27,6%; endoleak:15%
- Conclusion:
- Hybrid aortic arch repair in high risk patient is associated with relevant morbidity, mortality and re-intervention rate
- Indication should be limited to patients not suitable for conventional surgery

(J Vasc Surg 2011;53:935-41.)

Results with an algorithmic approach to hybrid repair of the aortic arch

Nicholas D. Andersen, MD,^a Judson B. Williams, MD, MHS,^a Jennifer M. Hanna, MD, MBA,^a Asad A. Shah, MD,^a Richard L. McCann, MD,^b and G. Chad Hughes, MD,^a *Durham, NC*

- 2005-2012: 87 pat. underwent hybrid arch repair; follow up 28,5 month;
- **30-day mortality: 14,9%**; 13% re-intervention rate: type I endoleak (n=4), type 2 endol. (n=6), type 3 endol. (n=1)
- Out of 27 pat. with endograft placement in ascending aorta, **11% experienced retrograde type A dissection !!!!**
- Survival at 1,3 and 5 years: 73%, 60% and 51%
- **Conclusion:** the native ascending aorta appears to be a hostile location for endograft placement !



(J Vasc Surg 2013;57:655-67.)

Supra-aortic Transposition for Combined Vascular and Endovascular Repair of Aortic Arch Pathology

Roman Gottardi, MD, Martin Funovics, MD, Nella Eggers, Alexander Hirner, MS, Marion Dorfmeister, MD, Johannes Holfeld, Daniel Zimpfer, MD, Maria Schoder, MD, Konstantin Donas, MD, Ernst Weigang, MD, Johannes Lammer, MD, Michael Grimm, MD, and Martin Czerny, MD

- 1996-2007; 73 patients with hybrid arch repair
- Subclavian artery transp.: 24 pat; double transposition: 36 pat.; total transposition: 13 pat.
- Hospital mortality: 6,8%; double transp.: 5,5%; total transposition: 15,7%; endoleak rate: 5,5%
- Conclusion:
 - Results are promising
 - Hybrid procedures substantially augment the therapeutic options

(Ann Thorac Surg 2008;86:1524–9)

Double Transposition

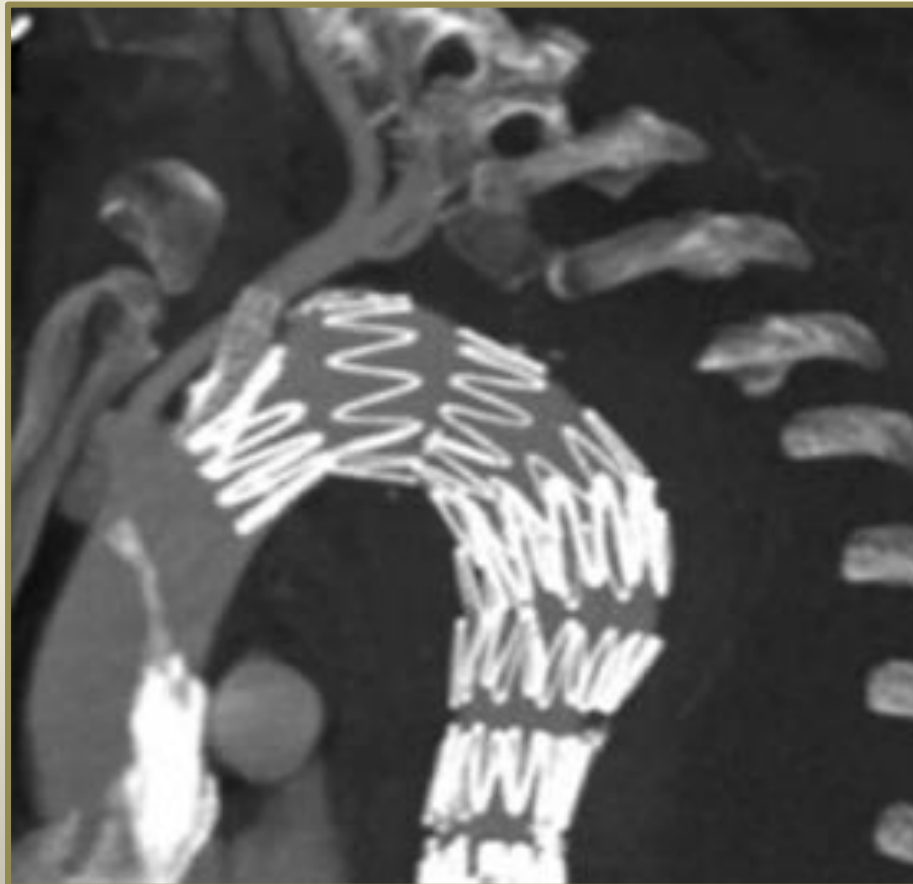


European Multicenter Registry for the Performance of the Chimney/Snorkel Technique in the Treatment of Aortic Arch Pathologic Conditions

Michel J. Bosiers, MD,* Konstantinos P. Donas, MD,* Nicola Mangialardi, MD, Giovanni Torsello, MD, Vincent Riambau, MD, Frank J. Criado, MD, Frank J. Veith, MD, Sonia Ronchey, MD, PhD, Stefano Fazzini, MD, and Mario Lachat, MD

- 2002-2014: 95 pat. undergoing endovascular treatment of the aortic arch using the chimney technique were evaluated
- 21 pat. underwent arch debranching before chimney graft implantation
- Technical success: 89,5%; 30-day mortality: 9,5%; Type 1a endoleak: 10,5%; major stroke: 2%; re-intervention: 5,2%
- **Conclusion:** the chimney technique proved highly and predictable successful

Chimney/Snorkel Technique



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

R. Spear ^a, S. Haulon ^{a,*}, T. Ohki ^b, N. Tsilimparis ^c, Y. Kanaoka ^b, C.P.E. Milne ^a, S. Debus ^c, R. Takizawa ^b, T. Kölbel ^c

^aAortic Centre, CHRU Lille, France

^bVascular Surgery, Jikei University, Tokyo, Japan

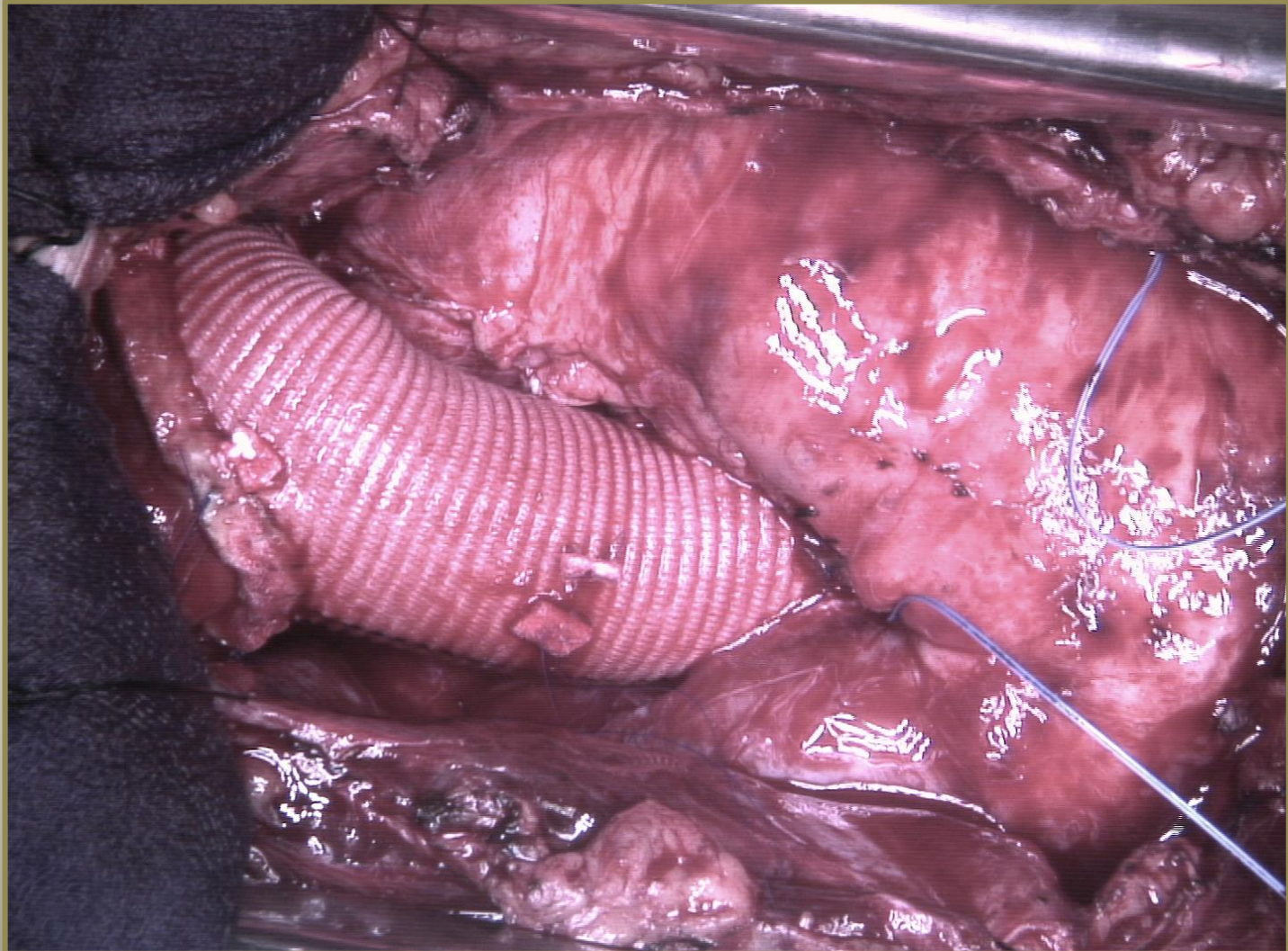
^cGerman Aortic Center, University Heart Center Hamburg, Germany

- 2013-2014: 27 pat. with aortic arch aneurysms > 55 mm and judged unfit for open surgery were included in this study (3 centers)
- Inner branches were designed for reperfusion of the innominate and the left subclavian artery; Technical success 100%
- 30-day mortality: 0%; major strokes: 7,4%; early re-intervention: 14,8% (sternotomy in 2 patients); type 2 endoleak: 11,1%
- **Conclusion:** early outcomes are favorable, branched endografts of aortic arch aneurysm should be considered in patients unfit for open surgery

Total Endovascular Repair



Conventional Surgery Evidence



Outcome of open total arch replacement in the modern era

Fabrizio Settepani, MD, Antioco Cappai, MD, Alessio Basciu, MD, Alessandro Barbone, MD, and Giuseppe Tarelli, MD, *Rozzano, Milan, Italy*

- Meta-analysis on open total aortic arch repair published in the last 10 years
- 21 relevant studies, analyzing outcome data of 2880 patients
- Mean age: 66,5±11,9; 69,1% male patients; urgent: 23,4%
- Moderate Hypothermia: 80%; ASCP: all but one study
- Pooled overall mortality: 5,3%; PND: 3,4%; TND: 5,2%; SCI: 0,6%
- Sub-analysis mortality: elective: 2,9%; urgent: 8,8%
- Conclusion: results for open TAR are extremely satisfactory, arch reconstruction can be performed safely; Triple or double ASCP, mod. hypothermia and selective re-implantation of head vessels

Cannulation Site Evidence

Which cannulation (axillary cannulation or femoral cannulation) is better for acute type A aortic dissection repair?

A meta-analysis of nine clinical studies

Zongli Ren, Zhiwei Wang*, Rui Hu, Hongbing Wu, Hongping Deng, Zhen Zhou, Xiaoping Hu and Wanli Jiang

Department of Cardiothoracic Surgery, Renmin Hospital of Wuhan University, Wuhan, Hubei, China

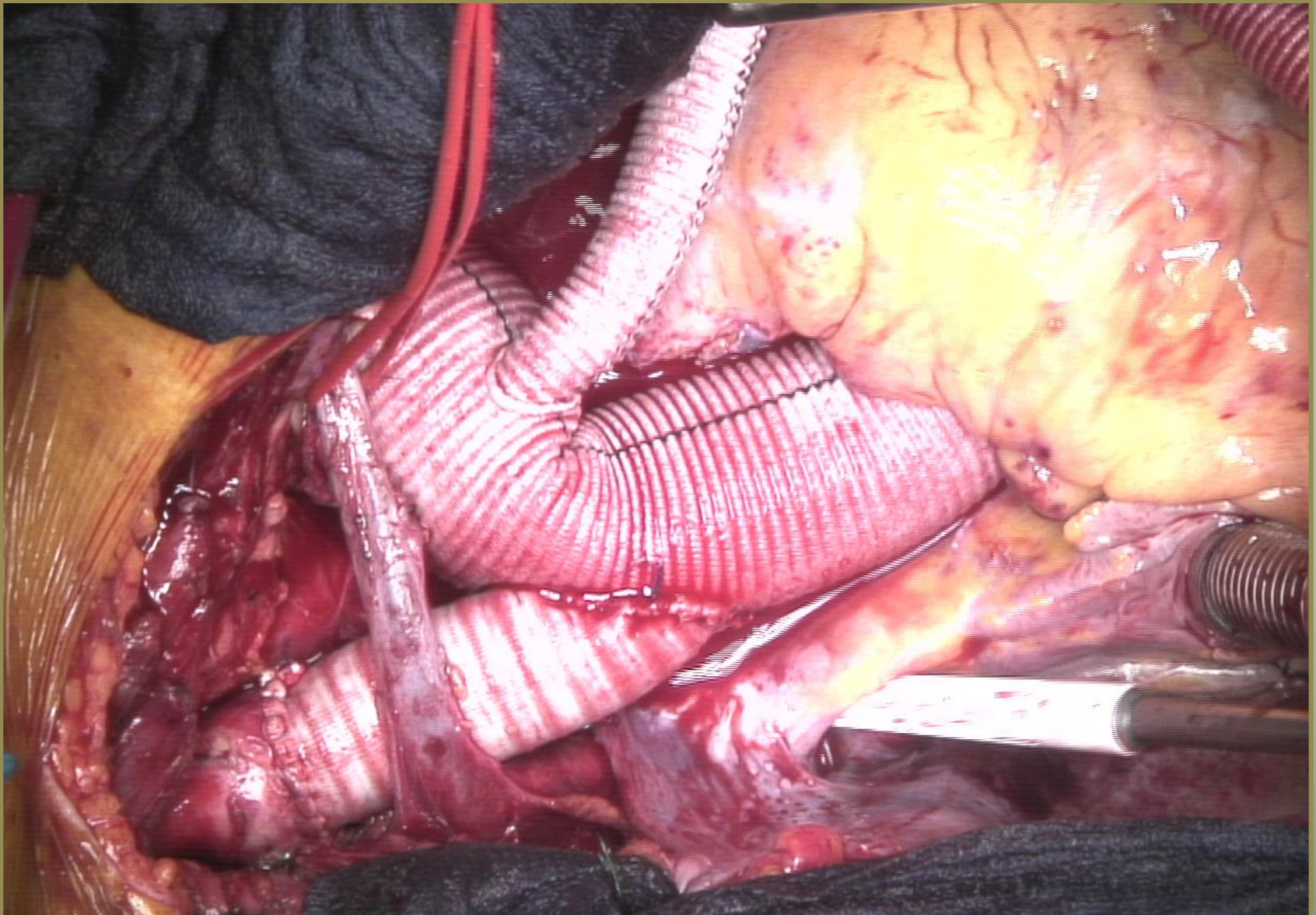
- Meta-analysis comparing the outcome of axillary artery (AXC) with femoral artery (FAC) cannulation; 9 studies comprising 715 Pat. (1992-2011)
- Short-term mortality, neurological dysfunction and malperfusion were analysed
- **Significant lower incidence** of mortality (6,7% vs. 21,6%) and neurological dysfunction (14,3% vs. 26,4%) in the AXC-group; malperfusion did not differ (5,7% vs. 6,6%)
- **Conclusion:** AXC may reduce mortality and neurologic dysfunction in patients undergoing acute AAD repair. The superior results of AXC seem to be attributed the antegrade cerebral perfusion through the whole procedure

Temperature Management Cerebral Protection Evidence

Visceral organ protection in aortic arch surgery: safety of moderate hypothermia[†]

Davide Pacini^{a,*}, Antonio Pantaleo^a, Luca Di Marco^a, Alessandro Leone^a, Giuseppe Barberio^a, Giacomo Murana^a, Sebastiano Castrovinci^a, Sandra Sottili^b and Roberto Di Bartolomeo^a

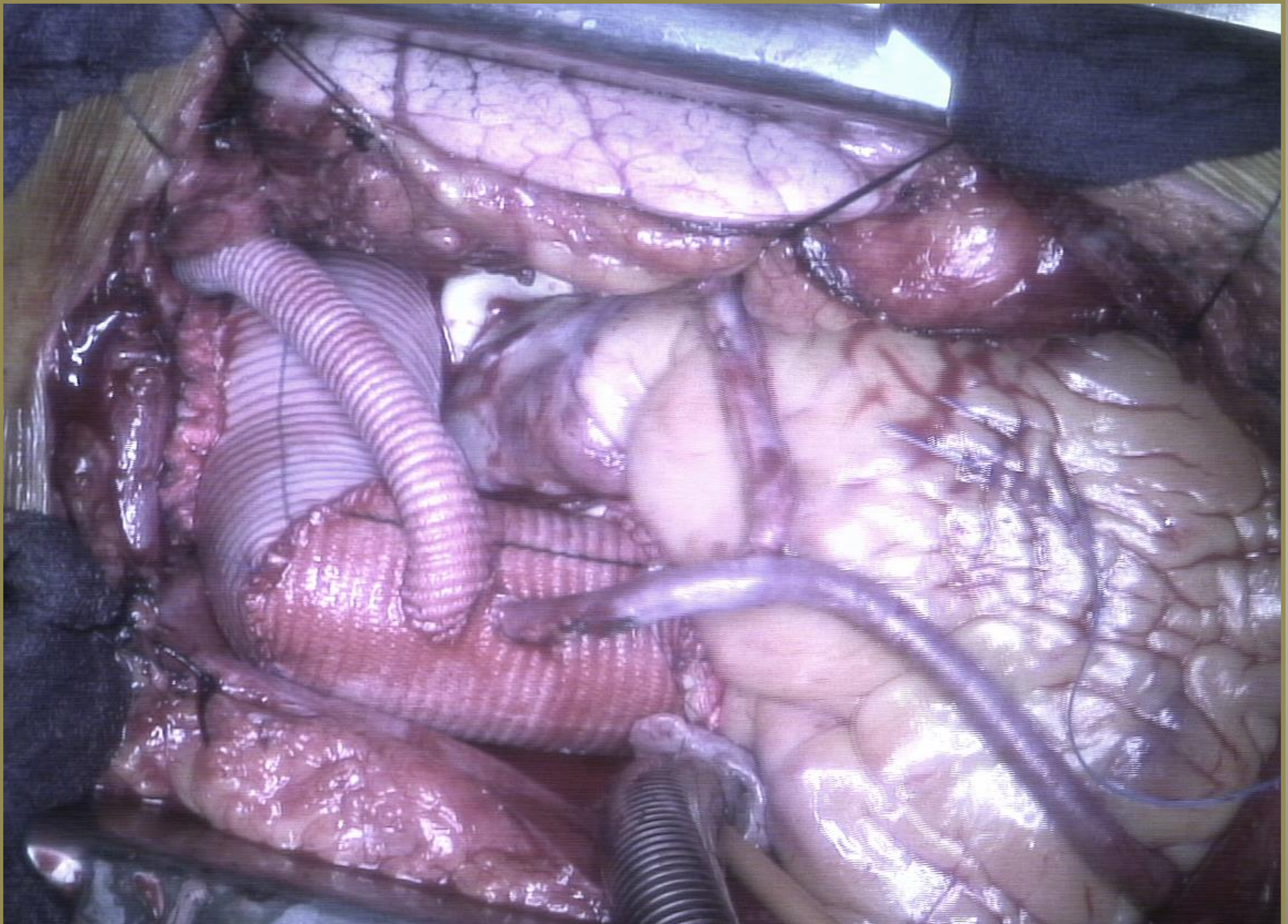
- 334 pat. underwent elective aortic arch surgery using ASCP
- **Group A** $\leq 25^{\circ}\text{C}$ 194 pat.; **Group B** $> 25^{\circ}\text{C}$ 110 pat.
- Mortality rate: **Group A**: 5,2%; **Group B**: 3,6%
- Permanent neurologic deficit: **A**: 7,2%; **B**: 3,6%
- Conclusion
 - Moderate hypothermia at 26°C is a safe method for brain protection
 - It offers good protection of visceral organs – kidney and liver dysfunction higher in group A - circulatory arrest periods below 60 minutes



Total arch replacement using antegrade cerebral perfusion

Yutaka Okita, MD, PhD, Kenji Okada, MD, PhD, Atsushi Omura, MD, Hiroya Kano, CE, Hitoshi Minami, MD, PhD, Takeshi Inoue, MD, and Shunsuke Miyahara, MD

- 423 consecutive pat. underwent TAR using ASCP (2002-2012); acute dissection (19,1%); urgent surgery (31,9%);
- Tympanic temperature: 21-23⁰C; rectal temperature: < 30⁰C
- Hospital Mortality: 4,5%; PND: 3,3%; prolonged ventilation: 13,4%;
- Multivariate analysis for mortality: age (octogenarians); brain malperfusion, CPB-time
- 5- and 10-years survival: 79,6% and 71,2%, respectively.
- **Conclusion:** Current approach for TAR is associated with low-mortality and morbidity, thus leading to a favorable long-term outcome



Open aortic arch replacement in high-risk patients: the gold standard^T

Mauro Iafrancesco^{a,b}, Aaron M. Ranasinghe^a, Vamsidhar Dronavalli^a, Donald J. Adam^{a,b}, Martin W Claridge^{a,b}, Peter Riley^c and Ian McCafferty^c, Jorge G. Mascaro^{a,*}

^a Department of Cardiothoracic Surgery/Thoracic Aortic Multidisciplinary Team, Queen Elizabeth University Hospital NHS Foundation Trust, Birmingham, UK

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- 58 pat. with median log. Euro Score of 27,4 and median age of 76 years underwent total arch replacement (2000-2013)
 - COPD: 31%, CAD: 22,4%, peripheral vascular disease: 48,3%, prev. stroke: 5,2%
- In-hospital mortality: 6,9%, stroke: 1,7%, SCl: 0%
- 1 year, 5 year and 10 year survival: 82,7%, 70% and 37,8%
- **Conclusion:** Open arch replacement can be performed with low mortality and morbidity and excellent long-term results even in high-risk patients

Contemporary comparison of aortic arch repair by endovascular and open surgical reconstructions

Paola De Rango, MD, PhD,^a Ciro Ferrer, MD,^b Carlo Coscarella, MD,^b Francesco Musumeci, MD,^c Fabio Verzini, MD, PhD, FEBVS,^a Gabriele Pogany, MD,^b Andrea Montalto, MD,^c and Piergiorgio Cao, MD, FRCS,^b *Perugia and Rome, Italy*

- Endovascular arch repair (71 pat.) was compared to surgical total arch repair (29 pat.) between 2007 and 2013
- Pat. in surgical group (SG) were younger and exhibit less comorbidities as compared to the EVG

Outcomes	Total, No. (%)	Endovascular (group 1), No. (%)	Open (group 2), No. (%)	OR (95% CI)	P value
Death	10 (10)	6 (8.5)	4 (13.8)	1.73 (0.45-6.66)	.47
Stroke	5 (5)	4 (5.6)	1 (3.4)	0.6 (0.06-5.59)	1
Stroke/death	13 (13)	8 (11.3)	5 (17.2)	1.64 (0.49-5.51)	.51
Spinal cord ischemia	2 (2)	2 (2.8)	0 (0)		.5
Retrograde dissection	3 (3)	3 (4.2)	—		
Type I endoleak	3 (3)	3 (4.2)	—		
Bleeding	2 (2)	0 (0)	2 (6.9)		
Wound dehiscence	2 (2)	0 (0)	2 (6.9)		

CI, Confidence interval; OR, odds ratio.

Conclusion

- **Surgical arch replacement** can be performed with excellent results even in higher risk-patients
- **Moderate hypothermia, selective antegrade perfusion and axillary artery cannulation** are the cornerstones of aortic arch surgery in Europe
- **Endovascular techniques and results** of aortic arch repair are improving – **excellent solution for patients deemed unfit** for conventional surgery
- **Hybrid- or complete endovascular techniques** have to demonstrate at least similar results to verify their qualification in intermediate risk patients

Thank you for your attention!

