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

Double Transposition
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
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
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
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, Antonio Pantaleo, Luca Di Marco, Alessandro Leone, Giuseppe Barberio, Giacomo Murana, Sebastiano Castrovinci, Sandra Sottili and Roberto Di Bartolomeo

- 334 pat. underwent elective aortic arch surgery using ASCP
- **Group A ≤ 25°C 194 pat.; Group B > 25°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
423 consecutive pat. underwent TAR using ASCP (2002-2012); acute dissection (19,1%); urgent surgery (31,9%);

Tympanic temperature: 21-23°C; rectal temperature: < 30°C

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
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%, SCI: 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
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.
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