Full surgical repair of the aortic arch – what is best practice?

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Disclosure

Speaker name: Martin Misfeld

- I do not have any potential conflict of interest
Brain protection
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A meta-analysis of deep hypothermic circulatory arrest alone versus with adjunctive selective antegrade cerebral perfusion

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### Table 1 Expert consensus on classifications of hypothermia in circulatory arrest during aortic arch surgery

<table>
<thead>
<tr>
<th>Category</th>
<th>Nasopharyngeal temperature</th>
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<tbody>
<tr>
<td>Profound hypothermia</td>
<td>≤ 31 °C</td>
</tr>
<tr>
<td>Deep hypothermia</td>
<td>14.1-20 °C</td>
</tr>
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A meta-analysis of deep hypothermic circulatory arrest alone versus with adjunctive selective antegrade cerebral perfusion

permanent neurological deficit

mortality

DHCA = deep hypothermic circulatory arrest

A meta-analysis of deep hypothermic circulatory arrest versus moderate hypothermic circulatory arrest with selective antegrade cerebral perfusion

David H. Tian¹, Benjamin Wan¹, Paul G. Bannon¹,², Martin Misfeld³, Scott A. LeMaire⁴,⁵, Teruhisa Kazui⁶, Nicholas T. Kouchoukos⁷, John A. Elefteriades⁸, Joseph Bavaria⁹, Joseph S. Coselli⁴,⁵, Randall B. Griepp¹⁰, Friedrich W. Mohr³, Aung Oo¹¹, Lars G. Svensson¹², G. Chad Hughes¹³, Tristan D. Yan¹,²

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A meta-analysis of deep hypothermic circulatory arrest versus moderate hypothermic circulatory arrest with selective antegrade cerebral perfusion

permanent neurological deficit

mortality

DHCA = deep hypothermic circulatory arrest
MHCA = moderate hypothermic circulatory arrest

Extra-anatomic revascularization for preoperative cerebral malperfusion due to distal carotid artery occlusion in acute type A aortic dissection†

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Abstract

OBJECTIVES: Management of patients with acute aortic dissection type A (AADA) and cerebral malperfusion secondary to occlusion or stenosis of the left common carotid artery (LCCA) or right common carotid artery (RCCA) is a significant challenge. The aim of this study is to present our institutional strategy and postoperative results for this high-risk patient cohort.

METHODS: Between November 2005 and July 2013, 23 of 354 consecutively operated AADA patients [median age: 66.3; interquartile range (IQR): 55.2–69.9] suffered from cerebral malperfusion due to bilateral (n = 1) or unilateral occlusion of the LCCA/RCCA (n = 22). AADA repair comprised hemi- (n = 14) or total (n = 9) arch replacement in combination with aortic valve repair (n = 7) or replacement (n = 11), root replacement (n = 15) and coronary bypass (n = 3). Extra-anatomic aorto-carotid bypass was performed in all patients. Aorto-carotid bypass was performed at the beginning of the procedure to allow for unilateral selective cerebral perfusion (n = 17; 73.9%) or during the procedure if persisting malperfusion was suspected by near-infrared spectroscopy (n = 6; 26.1%).

RESULTS: The median follow-up was 15.2 months (IQR: 4.8–34.1) and 100% complete. Median hospital stay and ICU stay were 16.0 (IQR: 12.5–26.0) and 13.7 (IQR: 2.0–16.5) days, respectively. Rethoracotomy for haemorrhage or cardiac tamponade was performed in 6 (26.1%) patients. Other postoperative complications comprised low cardiac output with extracorporeal membrane oxygenation (n = 2; 8.7%), sepsis (n = 4; 17.4%), respiratory insufficiency (n = 10; 43.5%), renal failure with temporary dialysis (n = 7; 30.4%) and visceral malperfusion (n = 2; 8.7%) requiring stent grafting (n = 1) or laparotomy with intestinal resection (n = 1). New stroke with or without permanent sensory or motor deficit was diagnosed in 8 (34.8%) patients. Temporary neurological deficits were seen in 9 (39.1%) individuals. Hospital and 1-year mortality rates were 13.0 and 30.4%, respectively. Overall survival after 36 months of the 23 patients (Group I = Extra-anatomic bypass) versus the remaining 331 AADA patients without distal RCCA/LCCA occlusion (Group II = no extra-anatomic bypass) was 69.6% (n = 16) in Group I vs 72.5% (n = 240) in Group II (P = 0.90).

CONCLUSION: Extra-anatomic bypass for LCCA or RCCA occlusion allows for early selective cerebral perfusion during AADA repair, and may reduce the risk of neurological complications in patients with preoperative cerebral malperfusion.
Extra-anatomic revascularization for preoperative cerebral malperfusion due to distal carotid artery occlusion in acute type A aortic dissection†
Figure 5: Postoperative survival of patients with common carotid artery occlusion with cerebral malperfusion (Group 1) versus all other patients with acute aortic dissection type A (Group 2); intra-operative deaths excluded from analysis.
right common carotid artery graft
right subclavian artery graft
left common carotid artery graft
left subclavian artery graft
saphenous vein graft
aortic arch prosthesis
Postoperative changes in the distal residual aorta after surgery for acute Type A aortic dissection: impact of false lumen patency and size of descending aorta

Freedom from aortic dilatation $\geq 10$ mm

Freedom from aorta-related reoperation

Log rank $p = 0.012$

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

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Abstract

OBJECTIVES: The E-vita Open hybrid stent graft is intended to achieve one-stage treatment of the proximal and distal thoracic aorta down to the mid-thoracic level in cases of acute (AAD) or chronic (CAD) type I aortic dissection and complex thoracic aortic aneurysm (TAA). We report our long-term results up to 10-year experience.

METHODS: From February 2005 until March 2015, 178 consecutive patients (mean age 59 ± 11 years) underwent surgery using the E-vita Open hybrid graft for AAD (n = 96), CAD (n = 43) or TAA (n = 39). Pre-, intra- and postoperative variables, influential procedural improvements and follow-up data including aortic remodelling analyses are presented.

RESULTS: Overall 30-day mortality was 10%, 10% for AAD, 7% for CAD and 13% for TAA. Univariable analysis identified low left ventricular ejection fraction, peripheral arterial disease, chronic obstructive pulmonary disease and severely compromised haemodynamics as risk factors for in-hospital death. Logistic regression analysis defined compromised haemodynamics and duration of cardiopulmonary bypass as significant. After 7 years, estimated survival was 55% for AAD, 74% for CAD and 73% for TAA patients. Freedom from aorta-related late death was 94%, 91% in AAD, 100% in CAD and 97% in TAA. Positive or stable aortic remodelling down to the stent graft end was achieved in 92% AAD, 82% in CAD and full aneurysmal exclusion in 88%. Further downstream, negative remodelling was observed in 27% of the AAD, 41% of the CAD and 22% of the TAA patients. Freedom from endovascular intervention downstream was 96% in AAD, 75% in CAD and 74% in TAA patients. Freedom from thoraco-abdominal surgery was 97%, 65% and 93%, respectively.

CONCLUSIONS: The E-vita Open hybrid stent graft renders durable long-term performance without any proximal endoleakage or graft failure over time and represents the ideal landing or docking zone for either thoracic endovascular thoracic repair or thoraco-abdominal surgery, if required. No reinterventions were necessary down to the end of the stent graft, proving that the disease is overcome along the hybrid graft down to mid-thoracic level.
Long-term experience with the E-vita Open hybrid graft in complex thoracic aortic disease

AAD = acute aortic dissection
CAD = chronic aortic dissection
TAA = thoracic aortic aneurysm

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

AAD = acute aortic dissection
CAD = chronic aortic dissection
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Conclusions

- Cerebral perfusion and hypothermia should be used in aortic arch surgery
- Supra-aortic vessels should be reconstructed, depending on their pathology and/or the underlying disease
- “Elefant trunk” techniques should be used liberal to address descending pathologies and/or to prepare for further interventions
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