Requirements for a Durable Endo-repair in Aortic Arch

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Disclosures

- Research support, Consulting
  - Cook Medical, GE Healthcare, Bentley
Global experience with an inner branched arch endograft

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Background: Branched endografts are a new option to treat arch aneurysms in high-risk patients.

Methods and results: We performed a retrospective multicenter analysis of all patients with arch aneurysms treated with a new branched endograft designed with 2 inner branches to perfuse the supra aortic trunks. Thirty-eight patients were included. The median age was 71 years (range, 64-74 years). An American Society of Anesthesiologists score of 3 or 4 was reported in 89.5% (95% confidence interval [CI], 79.7-99.3) of patients. The 30-day mortality rate was 13.2% (95% CI, 2.2-24.2). Technical success was obtained in 32 patients (84.2% [95% CI, 72.4-95.9]). Early secondary procedures were performed in 4 patients (10.5% [95% CI, 0.7-20.3]). Early cerebrovascular complications were diagnosed in 6 patients (15.8% [95% CI, 4.0-27.6]), including 4 transient ischemic attacks, 1 stroke, and 1 subarachnoid hemorrhage. The median follow-up was 12 months (range, 6-12 months). During follow-up, no aneurysm-related death was detected. Secondary procedures during follow-up were performed in 3 patients (9.1% [95% CI, 0.0-19.1]), including 1 conversion to open surgery. We compared the first 10 patients (early experience group) with the subsequent 28 patients. Intraoperative complications and secondary procedures were significantly higher in the early experience group. Although not statistically significant, the early mortality was higher in the early experience group (30% [95% CI, 0.0-60.0]) versus the remainder (7.1% [95% CI, 0.0-16.9]; P = .066). Being part of the early experience group and ascending aortic diameter ≥38 mm were found to be associated to higher rates of combined early mortality and neurologic complications.

Conclusions: Our preliminary study confirms the feasibility and safety of the endovascular repair of arch aneurysms in selected patients who may not have other conventional options. Clinical trial registration information: Thoracic IDE NCT00583817, FDA IDE# 000101. (J Thorac Cardiovasc Surg 2014; 148:1-8)
Early neurologic events:
2 major and one minor strokes (11%)

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

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WHAT THIS STUDY ADDS
This study reports early outcomes following endovascular repair of arch aneurysms in patients unfit for open surgery and is the first evaluation of arch aneurysm endovascular repair performed after the initial learning curve.
Inner Branched Arch Endografts following Ascending Open Repair

- 70 patients
- In-hospital combined mortality and stroke rate was 4% (n=3)
  - one minor stroke, one major stroke causing death, and one death following multi-organ failure.
- Technical success rate was 97%
<table>
<thead>
<tr>
<th>Institution</th>
<th>Patients included</th>
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<tbody>
<tr>
<td>CHU Lille and Hôpital Marie Lannelongue, France</td>
<td>21</td>
</tr>
<tr>
<td>German Aortic Center, Hamburg, Germany</td>
<td>20</td>
</tr>
<tr>
<td>Skåne University Hospital, Malmö, Sweden</td>
<td>6</td>
</tr>
<tr>
<td>Uppsala University, Uppsala, Sweden</td>
<td>5</td>
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<tr>
<td>Cleveland Clinic Foundation, Cleveland, United States</td>
<td>4</td>
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<tr>
<td>Casa de Saúde São José, Rio de Janeiro, Brazil</td>
<td>3</td>
</tr>
<tr>
<td>Maastricht University Medical Center, Maastricht, The Netherlands</td>
<td>3</td>
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<td>St Thomas’ Hospital, London, United Kingdom</td>
<td>2</td>
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<tr>
<td>Department of Vascular Surgery, University of Regensburg, Regensburg, Germany</td>
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<td>University Hospitals Birmingham NHS Foundation Trust, Birmingham, United Kingdom</td>
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<td>Department of Surgery, The University of Hong Kong, Hong Kong</td>
<td>1</td>
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<tr>
<td>CHU de Nantes, Nantes, France</td>
<td>1</td>
</tr>
<tr>
<td>Medical University of Warsaw, Warsaw, Poland</td>
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</tr>
</tbody>
</table>
Reduce Stroke Risk
Risk Factors for Stroke

- **Predictors:**
  - LSCA/Zone 2 coverage
  - History of prior stroke (OR 9.4, p 0.002)
  - Extensive arch atheroma (OR 14.8, p 0.0016)

- Stroke was associated with 33% in-hospital mortality

Reduce Stroke Risk

- Patient selection
- Absolute CI
- « Center line » navigation
  - Fusion
  - Steerable sheaths / robotic
Embolic Protection

- Embrella
- Sentinel
- TriGuard
Sheath in the RCC
Reduce Stroke Risk

- Aggressive anticoagulation
- 100 UI/kg
- Monitoring ACT>300s
Endograft Delivery System through the Arch
Reduce Stroke Risk

- Reduce Introducer profile
- Stiff double curved wire into LV
- Trans apical or trans septal
An Externalized Transseptal Guidewire Technique to Facilitate Guidewire Stabilization and Stent-Graft Passage in the Aortic Arch

Tilo Köbel, MD; Thomas Rostock, MD; Axel Larena-Avellaned, MD; Hendrik Treede, MD; Olaf Franzen, MD; and Eike Sebastian Debus, MD

University Heart Center Hamburg Eppendorf, Germany.
Completion Angiogram and post
Catheterization

Endovascular Aortic Repair - Edited by Gustavo Oderich, Springer
Catheterization
Inserting Bridging Stent

Endovascular Aortic Repair - Edited by Gustavo Oderich, Springer
Inserting Bridging Stent
Inserting Bridging Stent

• Direct route from RCC & LCC
• Clamp RCC & LCC
• Fusion mask
Preoperative measurements with CPR on workstation
PROXIMAL SEAL - No Compromise!

- Prox neck length > 25mm
- Asc Aorta diam < 38mm
Previous Ascending Repair

Table 2. Ascending Aorta (Proximal Landing Zone) Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>No.</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
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<tbody>
<tr>
<td>Measurements</td>
<td></td>
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<tr>
<td>Maximum diameter of graft in AA, mm</td>
<td>73</td>
<td>33.4</td>
<td>3.2</td>
<td>26–42</td>
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<tr>
<td>Length from coronary sinus to</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Distal anastomosis, mm</td>
<td>73</td>
<td>42.1</td>
<td>20.4</td>
<td>2–85</td>
</tr>
<tr>
<td>IA, mm</td>
<td>73</td>
<td>52.3</td>
<td>19.7</td>
<td>9–99</td>
</tr>
<tr>
<td>Median Q1, Q3 Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length from distal anastomosis to</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IA, mm</td>
<td>73</td>
<td>7</td>
<td>0</td>
<td>0–54</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Landing zone characteristics</th>
<th>Yes</th>
<th>No. (%)</th>
<th>No.</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable proximal landing zone?</td>
<td>52</td>
<td>71.2</td>
<td>21</td>
<td>28.8</td>
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<tr>
<td>Reasons for unsuitability</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>AA graft too short (&lt;40 mm)</td>
<td>15</td>
<td>71.4</td>
<td>21</td>
<td>28.8</td>
</tr>
<tr>
<td>Major kink (≥90 degrees) in AA graft</td>
<td>5</td>
<td>23.8</td>
<td>21</td>
<td>28.8</td>
</tr>
<tr>
<td>AA graft diameter too large (&gt;38 mm)</td>
<td>1</td>
<td>4.8</td>
<td>21</td>
<td>28.8</td>
</tr>
</tbody>
</table>

AA = ascending aorta; IA = innominate artery; Q1 = quartile 1 (25th percentile); Q3 = quartile 3 (75th percentile); SD = standard deviation.

Distal Seal?
Failure to Remodel in Chronic Dissection

- Perfusion and pressure unchanged in false lumen
- Presence of Intercostals originating from false lumen
- False lumen back flow to Intercostals

Courtesy Tilo Kölbel
Dissection of the SAT
Conclusions

- Patient selection
- No compromise landing zones
- Staged procedures