Disclosures

• EVERYTHING is OFF-Label...

• Investigator
  • Gore
  • Medtronic
  • Cook
  • Edwards
  • Abbott

• Speaking Honoraria:
  • Abbott
  • Gore
  • Medtronic
  • Terumo Vascutek
  • Edwards
Who does NOT need Ascending /Arch TEVAR: Congential Aortic Syndromes – Ascending only pathology

<2% Mortality/Stroke for straight forward Ascending/Hemiarch +/- Root in experienced centers
Who is Eligible for Branched Graft Therapies in the Aortic Arch?

- Residual Dissection after Type A repair
- Saccular Arch Aneurysm
- Distal Arch Aneurysm
- Mega aorta – intact ascending LZ
- Residual Dissection after Type A repair

Zone 0/1
Current treatment outcomes for Complex aortic arch

- **Open surgical repair**
  - Longer hospital stays
  - Younger, healthier patients

- **Endovascular Repair** (parallel, branched, and fenestrated)
  - High risk for open repair
  - Not intended use of devices

- **Hybrid Repair**
  - High risk for open repair
  - Not intended use of devices

**Perioperative mortality**
- Open = 8.6% (Leshnower, 2011)
- Parallel device = 4.8% (Moulakakis, 2013)
- Hybrid = 10.8% (Cao, 2012)

**Stroke/neurological events**
- Open = 8.2% (Hiraoka, 2014)
- Parallel devices = 4% (Moulakakis, 2013)
- Hybrid = 6.8% (Cao, 2012)

**Reinterventions**
- Open = 9% (Sundt III, 2008)
- Parallel = 30.8% (Mangialardi, 2014)
Extending TEVAR to Zone 2: Coverage of the Left Subclavian Artery

- Extension of the proximal landing zone
  - Proximal aneurysm extent
  - Angulated arch
  - Traumatic aortic injuries
  - Type B dissection

- Downsides of C-S Bypass:
  - 2 procedures
  - 1-4% stroke rate, carotid manipulation
  - Mandates GA
  - Longer LOS – neck drain
  - Cosmetic - Incision

Kuratani ACTS 2014
GORE® TAG® Thoracic Branch Endoprosthesis
Gore TBE EARLY FEASIBILITY: Summary of Early Results

• 31 Zone 2, 9 Zone 0
• 100% Technical success
• 100% Survival at 1 month

• Peri-Procedural Stroke
  • 3.3% (1/31) Zone 2
  • 22.2% (2/9) Zone 0/1

• Side Branch Patency
  • 1/31 Zone 2 patency loss
  • No loss of patency in Zone 0

• NOW in PIVOTAL
Zone 2 Branched TEVAR
Gore TBE – Residual Type A

Residual Dissection After Zone 2 Arch
Four Arch Strategies

Standard Hemiarch

- Simple, can be done by most surgeons
- Short HCA – can use RCP
- May have poor late TEVAR options, residual malperfusion, Arch dissection

Hemiarch + Antegrade FET

- Simple Hemiarch anastomosis
- More hemostatic, may improve malperfusion
- May have residual Arch/supra-aortic dissection
- May place stent unnecessarily – paraplegia risk
Four Arch Strategies

Zone 2 Arch with delayed TEVAR (branched)

- Simpler Distal Anastomosis than Zone 3
- Can address most complex arch tears and eliminate flap in proximal head vessels
- Definitive TEVAR options
- Less risk of Recurrent laryngeal nerve injury than Zone 3

AATS Aortic Symposium 2018

Zone 2 Arch
Short Circ arrest
Lower stroke/death
Better long-term survival
Medtronic Valiant Mona LSA Early Feasibility

Delivery System
- Two wire system
  - Main/primary aortic tracking wire
  - LSA cannulation wire
- Pre-cannulated LSA cuff
- Tip capture for precise MSG delivery
Zone 0/1 Landing

Saccular Mid Arch

Residual Type A s/p repair

“Classic” Debranching

Type I

Type II

Type III
Gore TBE – Single Branch in Zone 0
Proximal Arch Saccular Aneurysm

Pre-Op

30 Days Post Op
Zone 0 TBE Residual Type A Dissection
(3 previous sternotomies!!)

59 Yo Male
Previous Ascending repair of Type A
Previous REDO bio-AVR

Large fenestration in prox DTA

>7CM DTA
Bolton Relay® Dual Branch – Early Feasibility

- “Off-the-shelf” (various proximal diameters, standard branch position and endograft length)
- Large single window for ease of cannulation of 2 internal tunnel(s)
- Innominate and LCCA

<table>
<thead>
<tr>
<th>Center</th>
<th>Investigator</th>
<th>City</th>
<th>Country</th>
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<tbody>
<tr>
<td>Ospedale San Camillo Forlanini</td>
<td>Prof. Can</td>
<td>Roma</td>
<td>Italy</td>
</tr>
<tr>
<td>Ospedale G. Brotzu</td>
<td>Dr. Campari</td>
<td>Cagliari</td>
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<td>Hospital Rangueil</td>
<td>Prof. H. Rousseau</td>
<td>Toulouse</td>
<td>France</td>
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<tr>
<td>Osaka University Hospital</td>
<td>Dr. Kuratsi</td>
<td>Osaka</td>
<td>Japan</td>
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<tr>
<td>UMC Utrecht</td>
<td>Prof. F. Meil – Dr. Van Herwaarden</td>
<td>Utrecht</td>
<td>Netherlands</td>
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<tr>
<td>Hospital George Pompidou</td>
<td>Dr. J. M. Allou</td>
<td>Paris</td>
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<tr>
<td>Hospital UCA de Oviedo</td>
<td>Dr. M. Alonso</td>
<td>Oviedo</td>
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<td>St. Mary’s Hospital - London</td>
<td>Dr. M. Hamadly</td>
<td>London</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Linköping University Hospital</td>
<td>Dr. C. Forsell</td>
<td>Linköping</td>
<td>Sweden</td>
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<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
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<tbody>
<tr>
<td>N</td>
<td>26</td>
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<tr>
<td>Male</td>
<td>69,2%</td>
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<tr>
<td>Mean Age</td>
<td>72y</td>
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<td>TAA</td>
<td>80,8%</td>
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<td>PMI</td>
<td>3,8%</td>
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<td>Type B Dissection</td>
<td>15,4%</td>
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<td>Procedure completed</td>
<td>100%</td>
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<tr>
<td>Freedom from endoleak</td>
<td>92,3%</td>
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<td>Perioperative overall death</td>
<td>11,5%</td>
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<tr>
<td>Perioperative procedure related death</td>
<td>3,8%</td>
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Cook TX2 Arch Graft (2-3 branch): PS-IDE

Table 3. Comparative analysis (median [Q1—Q3] or n [%]).

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Group 1 (n = 38)</th>
<th>Group 2 (n = 27)</th>
<th>p</th>
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<tbody>
<tr>
<td>Length (min)</td>
<td>250 (210–330)</td>
<td>295 (232–360)</td>
<td>.35</td>
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<tr>
<td>X-ray time (min)</td>
<td>46 (32–84)</td>
<td>39.3 (34–61)</td>
<td>.07</td>
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<tr>
<td>Volume of contrast (mL)</td>
<td>150 (95–207)</td>
<td>183 (120–290)</td>
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<tr>
<td>Early post-operative events</td>
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<tr>
<td>Endoleaks</td>
<td>11 (28.9%)</td>
<td>3 (11.1%)</td>
<td>.08</td>
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<tr>
<td>Secondary procedures</td>
<td>4 (10.5%)</td>
<td>4 (14.8%)</td>
<td>.61</td>
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<tr>
<td>Cerebrovascular complications</td>
<td>6 (15.8%)</td>
<td>3 (11.1%)</td>
<td>.60</td>
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<td>Systemic complications</td>
<td>17 (44.7%)</td>
<td>13 (43.3%)</td>
<td>.79</td>
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<tr>
<td>Mortality</td>
<td>5 (13.2%)</td>
<td>0 (0%)</td>
<td>.05</td>
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<tr>
<td>Follow up (n = 33)</td>
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<td></td>
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<tr>
<td>Endoleaks</td>
<td>3 (9.1%)</td>
<td>2 (7.4%)</td>
<td>.82</td>
</tr>
<tr>
<td>Secondary procedures</td>
<td>3 (9.1%)</td>
<td>2 (7.4%)</td>
<td>.82</td>
</tr>
<tr>
<td>Mortality</td>
<td>4 (12.1%)</td>
<td>1 (3.7%)</td>
<td>.24</td>
</tr>
<tr>
<td>Overall mortality</td>
<td>9 (23.6%)</td>
<td>1 (3.7%)</td>
<td>.02</td>
</tr>
</tbody>
</table>


Spear, R., et al. (2016). Editor's Choice - Subsequent Results for Arch Aneurysm Repair with Inner Branched Endografts. EJVES, 51(3), 380–385
Zone 0 Landing:
The problem of TEVAR in the proximal Aorta

Systolic-diastolic motion

• at the root base 4-7mm
• at the brachiocephalic trunk 3-4 mm
• Systolic-diastolic twist of 6°

Robicsek et al. 2004
Conclusions

• Branched graft solutions for Zone 0-2 Arch pathology are rapidly evolving

• Rigorously controlled studies must be done to appropriately study these procedures, particularly related to stroke

• Strong Collaboration between multidisciplinary teams is needed for optimal results:
  • Imaging, CT surgery, Vascular Surgery, Interventional Cardiology, Neurology, Anesthesia, Critical care