FOR WHICH TAAA PATIENT IS NO REPAIR THE BEST OPTION?

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Natural history of untreated TAAAs

RISK X BENEFIT

SHOULD I DENY THE OPERATION?

- What is the risk of rupture?
- What is the risk of open or endo repair (in your institution)?
- Is the patient an anatomical candidate for endovascular repair?
- What is the anticipated survival with a successful repair?

FACULTY DISCLOSURE

Gustavo S. Oderich MD
- Consulting, DSMB, CEC*
  Cook Medical Inc., WL Gore, Lombardi
- Honoraria
  WL Gore, Endologix
- Research grants*
  Cook Medical Inc., WL Gore, Atrium Maquet

* All consulting fees and grants paid to Mayo Clinic
Risks of Aortic Events within 1-Year Based on Initial Aortic Diameter vs Early Surgical Mortality of Elective TAAA Surgery

Early surgical mortality

Possible event

Definite event

Probability of aortic event within 1 year

Maximal aortic diameter, mm

TREATMENT RISK

Endo

No repair

Hybrid

Possible event

Definite event

Early surgical mortality

TAAA REPAIR

Mayo Clinic Results (2007-2014)

<table>
<thead>
<tr>
<th></th>
<th>Open n=121</th>
<th>F-BEVAR n=145</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>62±16</td>
<td>73±9</td>
<td>.01</td>
</tr>
<tr>
<td>30-day mortality</td>
<td>9%</td>
<td>4%</td>
<td>.12</td>
</tr>
<tr>
<td>30-day Major Adverse Event</td>
<td>49%</td>
<td>20%</td>
<td>.001</td>
</tr>
<tr>
<td>Cardiac</td>
<td>17%</td>
<td>3%</td>
<td>.0001</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>34%</td>
<td>4%</td>
<td>.0001</td>
</tr>
<tr>
<td>Renal</td>
<td>21%</td>
<td>12%</td>
<td>.24</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>7%</td>
<td>4%</td>
<td>.12</td>
</tr>
<tr>
<td>Stroke</td>
<td>3%</td>
<td>1%</td>
<td>.45</td>
</tr>
<tr>
<td>Bowel ischemia</td>
<td>2%</td>
<td>2%</td>
<td>.9</td>
</tr>
<tr>
<td>30-day re-intervention</td>
<td>17%</td>
<td>6%</td>
<td>.01</td>
</tr>
</tbody>
</table>

EXPERIENCE TEAM APPROACH

PATIENT SELECTION

WHO SHOULD BE DENIED?

Medical reasons
- Limited survival (<2 yrs)
- Advanced malignancy
- End-stage pulmonary, cardiac, renal disease

Anatomical reasons
- Diffuse ‘shaggy’ aorta
- Unsuitable targets for reconstructions
- Excessive angulation in the visceral segment
- Difficulties created by prior repair

RISK STRATIFICATION

Clinical

Low

High

Anatomic
WHAT MAKES FOR A POOR ENDO CANDIDATE?

- Excessive angulation
- Multiple, small renal arteries

SHAGGY AORTA

- Mesenteric ischemia and mortality
  Patel SD et al. Eur J Vasc Endovasc Surg 2014
- Stroke and silent stroke after TEVAR and TVAR
  Kahler P et al. Circulation 2010
- Spinal cord ischemia during eTAAA repair
- Renal deterioration and other effects

THE PROBLEM OF SMALL RENAL ARTERIES (<4MM)

- Covered stents → disruption
- Bare-metal stents → endoleaks
- Questionable durability

RENAITAL ANATOMY

<table>
<thead>
<tr>
<th>Anatomical criteria</th>
<th>n = 320</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifurcation &lt;13mm</td>
<td>42 (9%)</td>
</tr>
<tr>
<td>Diameter &lt;4mm</td>
<td>28 (5%)</td>
</tr>
<tr>
<td>aRA with &gt;40% renal parenchyma</td>
<td>28 (5%)</td>
</tr>
<tr>
<td>Any issue</td>
<td>92 (18%)</td>
</tr>
</tbody>
</table>


PUSHING THE LIMITS

Durability?

3-4mm bare-metal stents
3-mm bare-metal stent
**PRIOR AORTIC REPAIR**

- Visceral/renal artery stents
- Suprarenal fixation
- Kinked, narrowed or occluded iliac stents or grafts
- Short distance to bifurcation
- IIA embolization (= SCI)
- Failed multilayer, fenestrated or parallel stents

**WHO SHOULD BE DENIED?**

- Poor medical candidates
  - Limited life-expectancy (<2-years) who “don’t pass the eyeball test…or can’t handle a haircut”…
  - Poor anatomical candidates
  - Unsuitable landing zones not amenable to hybrid repair
    - “Shaggy” or “Trash Can” Aortas
    - Small renal arteries preventing stenting
    - Excessive tortuosity/angulation in the visceral segment
    - Prior aortic repair creating excessively difficult anatomy
    - Combinations of multiple (small) factors listed above
Our prime purpose in this life is to help others and if you can't help them, at least don't hurt them.

SURVIVAL AND RUPTURE RATE WITH NON-OPERATIVE TREATMENT OF TAAAs

<table>
<thead>
<tr>
<th>Study</th>
<th>n</th>
<th>Mean FU (months)</th>
<th>Survival</th>
<th>Rupture risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bikerstaff et al.</td>
<td>72</td>
<td>36</td>
<td>13% @ 5y</td>
<td>74%</td>
</tr>
<tr>
<td>Crawford S et al.</td>
<td>94</td>
<td>37</td>
<td>24% @ 2y</td>
<td>38% @ 2y</td>
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<tr>
<td>Cambria R et al. (Am J Surg 1995)</td>
<td>57</td>
<td>37</td>
<td>60%</td>
<td>32% @ 4y</td>
</tr>
<tr>
<td>Clovis D et al. (JAMA 1998)</td>
<td>133</td>
<td>60</td>
<td>56% @ 5y</td>
<td>20% @ 5y</td>
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<tr>
<td>Griego et al. (Ann Thorac Surg 1999)</td>
<td>165</td>
<td>-</td>
<td>62% @ 5y</td>
<td>20%</td>
</tr>
</tbody>
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Distributions of Maximal Aortic Diameters at Baseline

NECK ANGULATION

- 13% of patients have >60°
  - Misalignment
  - Stent kink, dislodgement
  - Branch occlusion
  - Endoleaks (type I, III)

WHICH PATIENTS IS WORTH INVESTING?
Factors associated with late death after repair

<table>
<thead>
<tr>
<th></th>
<th>HR (95% CI)</th>
<th>P value</th>
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<tbody>
<tr>
<td>Age</td>
<td>1.2 (1.1-1.3)</td>
<td>.0001</td>
</tr>
<tr>
<td>Aortic diameter (per 5mm increase)</td>
<td>1.1 (1.1-1.2)</td>
<td>.0002</td>
</tr>
<tr>
<td>Prior CHF</td>
<td>1.7 (1.2-2.2)</td>
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<tr>
<td>COPD</td>
<td>1.6 (1.2-2.2)</td>
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<tr>
<td>Use of oxygen</td>
<td>1.9 (1.3-2.9)</td>
<td>.001</td>
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<tr>
<td>Use of aspirin</td>
<td>0.7 (0.5-0.9)</td>
<td>.003</td>
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</table>

Mendes B et al. (J Vasc Surg 2015)
WHO SHOULD BE REPAIRED?
Factors associated with late death after repair


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<tr>
<th>Points</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
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<th>90</th>
<th>100</th>
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<tbody>
<tr>
<td>Age</td>
<td>50</td>
<td>55</td>
<td>60</td>
<td>65</td>
<td>70</td>
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<td>100</td>
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<tr>
<td>Aortic diameter</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
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<td>90</td>
<td>100</td>
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<tr>
<td>CHF</td>
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<td>3</td>
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<td>PVD</td>
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<tr>
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<td>5</td>
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<td>Oxygen</td>
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<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<td></td>
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<tr>
<td>Aspirin</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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</table>

Total points
2 yr survival
4 yr survival
8 yr survival

RISK X BENEFIT

Increase in risk of rupture for descending thoracic aneurysms

Veith Symposium;
Connecting the Vascular Community