Follow-up of Aortic Dissection: How, How Often, Which Consequences
Euro Echo 2011

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Disclosure

My husband, Barry J. Goldstein MD, PhD is VP for research in diabetes and metabolism at Merck Research Labs
Aortic Dissection

- Increasing number of survivors world wide
- Increase prevalence?
- 5-10/million/year
- Survival has improved over previous historical mortality
60 yo woman with severe chest pain followed by collapse while vacationing in Paris
Underwent emergency repair

- AV resuspension
- Ascending aortic graft
- Stent right carotid
- Hospitalized for 10 days
- Developed L leg swelling and found to have deep venous thrombosis
- Anticoagulated with warfarin
Aortic dissection

- 30 day survival - 81± 2%
- 1 yr - 74 ± 3%
- 5 yr - 63 ± 3%
- Survival depends on co-morbidities and age
- Features of residual aortic pathology
  - Residual tears in arch
  - Type B dissections
Aggressive medical therapy

- Beta blockers
- BP < 130/80
  - Lower for Marfan’s patients
- No weight lifting, bench pressing etc
- Aggressive imaging cannot replace aggressive medical therapy
Guidelines for follow-up

- 1, 3, 6, 9 and 12 month follow-up
- Then annually if stable
- Imaging modality dependent on institutional expertise
- CT vs MRI
Indications for surgery

• Aortic size > 5 cm Marfan’s patient
• Aortic size > 6 cm other patients
• Suspicion of leak or pseudoaneurysm
• Rapid expansion
• Endoleak?
Does echocardiography have a role in surveillance

- Series of acute aortic dissections diagnosed with 3D TTE (Htay - Echocardiography 2011)
- Evangelista European Journal of Echo 2011
  - Compared CT to 2D and 3D TEE in stable patients
  - 3D superior to 2D
  - Comparable to 3D in size of entry tear, thrombosis
  - Superior in assessing additional tears
  - Superior in assessing architecture of complicated (spiral) dissections
4.5 years before presentation
Descending aorta 4.1 cm
Residual false lumen

- Fully thrombosed false lumen carries best prognosis
  - More likely female and older
  - Decreasing size of aorta more common
- Other factors that may portend worse prognosis
Ulcer like projections

160 patients followed with Type B dissection

- 30.6% thrombosed false lumen
- 32.5% ulcer like projections into intramural hematoma
- 36.9% patent or partially thrombosed
- All late ruptures occurred on ULP or patent groups
- Younger age, diameter >4 cm at initial scan and lumen status predicted complications
Aortic event free survival by false lumen status

Miyhara et al J Thorac Cardiovasc Surg. 2011
<table>
<thead>
<tr>
<th></th>
<th>THR</th>
<th>ULP</th>
<th>PAT</th>
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</thead>
<tbody>
<tr>
<td>N</td>
<td>N=49</td>
<td>N=52</td>
<td>N=59</td>
<td></td>
</tr>
<tr>
<td>Diam Δ</td>
<td>-0.016 ± .23</td>
<td>0.40 ± 0.91</td>
<td>0.44 ± 0.49</td>
<td>.0024</td>
</tr>
<tr>
<td>mm/mo</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>% with</td>
<td>38.8</td>
<td>80.7</td>
<td>96.9</td>
<td>&lt;.0001</td>
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<tr>
<td>Enlargement</td>
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Miyhara et al J Thorac Cardiovasc Surg. 2011
ULP carries poor prognosis

- Kitai et al Circ 2010
- 170 pt with acute Type B thrombosed false lumen (IMH)
  - 62 patients showed ULP within 30 days
  - Initial aortic diameter and ULP predicted poor prognosis
    - 10/62 pt with ULP required late surgery
    - 4/108 without
3.5 years before presentation
routine surveillance
Anticoagulation discontinued

- Descending thoracic aorta 5.1 cm
- Maximal abdominal aorta 5.9 cm
- Left renal and inferior mesenteric arteries from false lumen
- Patent false lumen
- Underwent open repair with bypass of left renal artery
Post surgical graft descending aorta - 3.2 years PTA
Open vs TEVAR

• Off label use of TEVAR in Type B dissections with complications
  – Malperfusion
  – Contained rupture
  – Continued pain

• Non randomized, 77 patients with complicated Type B dissection
Long Term Survival - TEVAR Vs Conventional Therapy

Cum Survival

Conventional Therapy
(Open surgical repair & Medical management)

P = 0.008

Years

N at Risk
TEVAR
45
31
26
17
9
2

Conventional Therapy
36
21
21
19
15
15
8
3
TEVAR operative mortality - 4%

- Obvious selection bias in non-randomized study
- TEVAR group had 79% survival at 5 years
- 77% of TEVAR group had complete thrombosis of false lumen AT THE LEVEL OF THE GRAFT - persistent patent false lumen below the graft
47,000 deaths in US/year

Multiple sites in US - Centers of Excellence

85 acute Type B with rupture or malperfusion

- TEVAR placed all patients
- 30 day mortality - 10.8%
- 29.4% mortality at one year
TEVAR for complicated Type B

- Sachs et al J Vasc Surg 2010
- 5002 Type B dissections with surgery
  - Open 3619; TEVAR 1381
  - TEVAR used for pts with worse co-morbidities
  - TEVAR mortality – 10.6 %, open 19%
Back to our patient 2 months after that operation

- Severe shortness of breath and chest pain
- Sister had died suddenly 1 week earlier
- Patient presented to clinic with vomiting, abdominal pain, chest pain and hypotension
- Sent to CT scanner emergently for concern re aortic catastrophe
Saddle pulmonary embolism
• Treated with anticoagulation
• IVC filter placed
• RV function stable
• Anticoagulation discontinued
7 months PTA (4.5 years after first presentation)
Prognosis

- Residual native aorta with partially thrombosed lumen
- BP well controlled
- No evidence of leak
- Left kidney now perfused
- Normal renal and cardiac function
Current presentation - severe unrelenting back pain
Open surgical repair

- Entire aorta now replaced with stent
- Left subclavian covered
- Right carotid stented
- Inferior mesenteric artery occluded
- Left renal artery bypassed
- No neurologic, GI or renal complications
Would prophylactic repair of residual dissection prevented this complication?
INSTEAD

• Randomized 140 patients with “stable” Type B 2 weeks after acute event
• Aggressive medical tx vs aggressive medical therapy + TEVAR
• Up to 20 cm of aorta stented with up to 3 grafts
INSTEAD 1 year mortality

Freedom from overall 1-year mortality

Medical group (66 pts.)
Stent-graft group (70 pts.)

Overall Survival (%)

p = 0.16

months

Nienaber J Thorac Cardiovasc Surgery 2010
INSTEAD 1 yr follow-up

INSTEAD: Freedom from progression and adverse events

Medical group (66 pts.)
Stent-graft group (70 pts.)

Event free survival (%)

p = 0.86
Periprocedure outcome - TEVAR group

- 2 deaths
- 1 retrograde dissection to Type A
- No conversions to open procedures
- 3 ancillary vascular procedures
- 2 paraplegia/paraparesis
- 1 major stroke
### INSTEAD aortic remodeling

<table>
<thead>
<tr>
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<th>Medical n=66</th>
<th>TEVAR n=70</th>
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<tbody>
<tr>
<td>Max Ao diam</td>
<td>45.5</td>
<td>44.7</td>
</tr>
<tr>
<td>True lumen diam</td>
<td>23.9*</td>
<td>31.8*</td>
</tr>
<tr>
<td>False lumen diam</td>
<td>24.7*</td>
<td>13.1*</td>
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### TABLE 4. Events within 1 year of randomization

<table>
<thead>
<tr>
<th></th>
<th>Medical</th>
<th>Stent graft</th>
<th>P value</th>
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<tbody>
<tr>
<td>Overall mortality, no. (%)</td>
<td>2 (3.0)</td>
<td>6 (8.6)</td>
<td>.28</td>
</tr>
<tr>
<td>Aorta-related mortality, no. (%)</td>
<td>2 (3.0)</td>
<td>4 (5.7)</td>
<td>.68</td>
</tr>
<tr>
<td>Secondary interventions, no. (%)</td>
<td>9 (13.6)</td>
<td>10 (14.3)</td>
<td>1.00</td>
</tr>
<tr>
<td>Crossover</td>
<td>7 (10.6)</td>
<td>0 (—)</td>
<td>.005</td>
</tr>
<tr>
<td>Conversion to surgical intervention</td>
<td>1 (1.5)</td>
<td>1 (1.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>Stent-graft extension</td>
<td>0 (—)</td>
<td>5 (7.1)</td>
<td>.058</td>
</tr>
<tr>
<td>Aortic bare stent extension</td>
<td>0 (—)</td>
<td>1 (1.4)</td>
<td>1.00</td>
</tr>
<tr>
<td>PTA/access vessel repair</td>
<td>1 (1.5)</td>
<td>3 (4.2)</td>
<td>.62</td>
</tr>
<tr>
<td>Adverse events, no. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent paraplegia/paraparesis</td>
<td>1 (1.5)</td>
<td>2 (2.9)</td>
<td>1.00</td>
</tr>
<tr>
<td>Major stroke</td>
<td>0 (—)</td>
<td>2 (2.9)</td>
<td>.50</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>0 (—)</td>
<td>0 (—)</td>
<td>—</td>
</tr>
</tbody>
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The P values were calculated by using the Fisher’s exact test. PTA, Percutaneous transluminal angioplasty.
Conclusions

- Surgical advances have produced a chronic syndrome of aortic disease
- Aggressive medical therapy still most important treatment for survivors
- Frequent imaging in the first year
- 3D TEE may have a role in surveillance
- More study needed on optimal imaging schema
Type 1 Endo leak - 2 weeks post repair
Thank you for your attention