Diagnosis and Management of Aortic Dissection

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Where is the heart?
Perspectives

- Aortic Disease – 13\textsuperscript{th} most common cause of death
- Incidence is increasing with maturing population age
- Not even a body organ – a conduit
Ruptured Abdominal Aortic Aneurysm - 1955
Aortic Dissection created the Great United State of America!

- 1760. King George II (of England and American Colonies) died of acute aortic dissection during BM
- Dr. Nichols, King George II’s physician – “intravasation of blood between (the) coats” of the aorta
- King George III (mentally unstable grandson) succeeded and passed the Law of Taxes on the American Colonies
- Led to American Revolution and the American War of Independence
Aortic Disease — What is what?

- Aortic Aneurysm
- Dissecting aneurysm – Chronic state
- Acute Aortic Syndrome – Penetrating Ulcer, Intramural Hematoma and
- Dissection – Type A or B
- Aneurysmal dissection – Acute state
Ascending

Thoraco-
Abdominal

Arch

Descending

Abdominal
Terminology – Aortic Wall Pathology

Aortic Dissection
Penetrating Ulcer
Intramural Hematoma
Acute Intramural Hematoma
Dissecting Aneurysm – always chronic
Chronic Dissecting Aneurysm
Chronic Dissecting Aneurysm
Acute Aneurysm Dissection
Acute Type B Aortic Dissection
Aortic Dissection – Stanford Type A and B
Acute Type A Aortic Dissection – Acute MI, Acute aortic incompetence
Acute Type A Aortic Dissection – Branch vessel malperfusion, Stroke, Visceral and Limb Ischemia
Acute Type A Aortic Dissection — Rupture, Tamponade, Acute AI/CHF
Aortic Dissection
Figure 4. 30-day mortality by dissection type and intervention. Adapted from Nienaber and Eagle 7. Reprinted with permission from Lippincott, Williams and Wilkins.
Type A versus Type B

Kaplan Meier survival curve of non-operated type A and type B dissections. Perko et al. Reprinted with permission from the Society of Thoracic Surgeons.
Mortality for Treatments of Type A and B dissection

- Acute Type A aortic dissection - mortality of 1% to 2% per hour after symptom onset. Without surgery, mortality exceeds 50% at 1 month.

- Uncomplicated (type B) descending dissections have a 30-day mortality of 10% and may be managed medically or by stent grafting.

- IMH of the ascending aorta has a prognosis similar to type A dissection. Conversely, IMH of the descending aorta has a prognosis similar to type B dissections.
Survival & Natural History

- 5 year survival (Bickerstaff et al)
  - Matched population control: 75 %
  - Dissecting aneurysm: 7 %
  - Non-dissecting aneurysm: 19 %
Risk of rupture or dissection

Age
Pain as symptom
Smoking COPD
Hypertension
Non use of beta-blockers.
Risk of rupture/dissection

![Graph showing the risk of rupture/dissection for 50-year-olds based on COPD and pain status. The x-axis represents the descending thoracic aortic diameter (cm), and the y-axis represents the probability of rupture within 1 year (%). The graph includes four lines representing different conditions: COPD (-) pain (-), COPD (+) pain (-), COPD (-) pain (+), and COPD (+) pain (+).]
Risk of rupture/dissection

b. 60-year-old

![Graph showing the risk of rupture/dissection in 60-year-old patients based on descending thoracic aortic diameter and presence of COPD and pain.](image)
Risk of rupture/dissection

c. 70-year-old

Probability of rupture within 1 year (%) vs. Descending thoracic aortic diameter (cm)

- copd (-) pain (+)
- copd (+) pain (-)
- copd (-) pain (+)
- copd (+) pain (-)
Yearly Risk of Rupture, Dissection & Death - TAA

- Risk of Rupture
- Risk of Dissection
- Risk of Death
- Risk of all of above

Yale University Aortic Surgery Database
Lifetime Complications – Ascending Thoracic Aneurysm

Lifetime complication risk
Lifetime Complications - Descending Thoracic Aneurysm
Indications for TAA Repair

- Prophylactic – prevent rupture when risk of rupture or dissection > risk of co-morbidities
- Healthy asymptomatic pts.
  - Aneurysm diameter > 2X dia. of normal
  - Aneurysm diameter > 5.5 aTAA, 6.5 dTAA
  - Rate of growth > 1 cm/year
Indications for TAA Repair - Marfan’s, Ehler-Danlos, Bi-cuspid AV

- Prophylactic
  - Aneurysm diameter > 2X of normal
  - Aneurysm diameter > 5cm aTAA, 6cm dTAA
  - Rate of growth > 0.5 cm/year

Normal Aortic root diameter (Henry et al)
24(BSA m²)¹/³ + 0.1(age) – 4.3 or
11.8(wt. kg)⁰.²¹³ + 0.1(age) – 4.3

(for growing children and teenagers)
Diagnosis

- CT – Chest + Abdomen/Pelvis:
  - 25% of TAA & 10% AAA have > 1 aneurysm
  - Extent of dissecting flap or occlusion – involvement of peripheral cannulation site
  - Branch artery (Celiac, SMA, Renal) involvement
Ascending Thoracic Aneurysm
Marfan’s Syndrome – Valve Sparing Root Reimplantation
Porcine Root Replacement
Arch Aneurysm
Descending Thoracic Aneurysm
Total Aortic Replacement
<table>
<thead>
<tr>
<th>Disease</th>
<th>No. (Emergent)</th>
<th>Mortality</th>
<th>Spinal TIA</th>
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</thead>
<tbody>
<tr>
<td>Thoracic &amp; TAA aneurysm</td>
<td>24 (2)</td>
<td>1 (1)</td>
<td>1</td>
</tr>
<tr>
<td>Type A Dissection</td>
<td>(16)</td>
<td>(3)</td>
<td>0</td>
</tr>
<tr>
<td>Trauma</td>
<td>6</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>
Acute Type B Aortic Dissection

Rupture
Visceral malperfusion - Ischemic Bowel
Paraplegia
Acute renal failure
Limb ischemia
Persistent HTN
“Persistent Pain”
Degenerative vs Dissecting Aneurysm: Long term survival

Kaplan Meier survival curve of non-operated dissecting versus degenerative aneurysms. Adapted from Perko et al. Reprinted with permission from the Society of Thoracic Surgeons.
Acute Aortic Dissection Repair: Survival from onset

1 year – 69%
5 year – 57%
10 year – 39%
15 year – 23%

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Plot of actuarial late survival estimates for all patients with aortic dissection. Adapted from Fann, et al. Reprinted with permission from Lippincott, Williams and Wilkins.
Acute Aortic Dissection: Survival from discharge

1 year – 92%
5 year – 76%
10 year – 52%
15 year – 30%

Plot for all actuarial late survival estimates for all discharged patients with aortic dissection. Adapted from Fann et al. Reprinted with permission from Lippincott, Williams and Wilkins.
What Is the Best Treatment for Patients With Acute Type B Aortic Dissections—Medical, Surgical, or Endovascular Stent-Grafting?

Juan P. Umaña, MD, D. Craig Miller, MD, and R. Scott Mitchell, MD
Department of Cardiovascular and Thoracic Surgery, Stanford University School of Medicine, Stanford, California

Background. Controversy continues regarding treatment for patients with acute type B aortic dissection.

Methods. One hundred eighty-nine patients with acute type B aortic dissection managed over a 36-year period were analyzed retrospectively for three outcome endpoints: survival; freedom from reoperation, and freedom from late aortic-related complications or late death. Risk factors for death were identified using a multivariable Cox proportional hazards model. Then to account for patient selection bias, heterogeneity of the population, and continuous evolution in techniques, propensity score analysis was used to identify risk-matched cohorts (quintiles I and II) in which the results of medical (n = 110) or surgical (n = 311) therapy were compared more comprehensively.

Results. The two main determinants of death were shock (hazard ratio [HR] = 14.5, 95% confidence level [CI] 4.7–44.5; p < 0.0001) and visceral ischemia (HR = 10.9, 95% CI 3.9–30.3; p < 0.0001). Arch involvement, rupture, stroke, previous stentectomy, and coronary or lung disease roughly doubled the hazard. Female sex was also a significant but weaker independent predictor of death. Actuarial survival estimates for all patients were 71%, 60%, 55%, and 17% at 1, 5, 10, and 15 years, respectively, and were similar for the medical and surgical patients. The Marfan syndrome predicted reoperation and late aortic complications or late death. In a separate analysis of the 142 patients in quintiles I and II, survival, freedom from reoperation, as well as freedom from late aortic complications or death were almost identical in the medical and surgical subsets.

Conclusions. The poor long-term prognosis of patients with acute type B aortic dissection is determined primarily by dissection-related and patient-specific risk factors, which are not readily modifiable. Whether the outlook in the future will be improved using stent-grafts remains to be determined.
Type B dissection - Treatment

Acute type B dissection

Uncomplicated

? Endovascular stent graft aortoplasty

Medical management

Complicated

Complications

Surgical management

Regular follow-up

"Complication-specific" management of acute type B dissection.
Federal University of Sao Paulo, Brazil
Session 2: Aortic and Endoluminal Stents

Revolutionary treatment of aneurysms and dissections of descending aorta: the endovascular approach

Enio Buffolo, MD, PhD, José Honório Palma da Fonseca, MD, PhD,
José Augusto Marcondes de Souza, MD,
Claudia Maria Rodrigues Alves, MD, PhD
EVOLUÇÃO ANUAL
Dissection 85.5%

Aneurysm 72.7%
## IRAD database – Inhospital Rx & Outcome

<table>
<thead>
<tr>
<th>Definitive Rx</th>
<th>Overall</th>
<th>Survived</th>
<th>Died</th>
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<tbody>
<tr>
<td>Surgery (%)</td>
<td>15</td>
<td>68</td>
<td>32</td>
</tr>
<tr>
<td>Medical (%)</td>
<td>73</td>
<td>90</td>
<td>10</td>
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<tr>
<td>PI (Delayed stent, fenestration)</td>
<td>12</td>
<td>94</td>
<td>6</td>
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Kaplan-Meier Survival - acute type B aortic dissection IRAD database
Correction of type B aortic dissection with large false lumen under transesophageal echocardiography control

## Thoracic Endovasular Stentgraft - UMC

<table>
<thead>
<tr>
<th>Disease</th>
<th>No</th>
<th>Death</th>
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</thead>
<tbody>
<tr>
<td>Thoracic Aneurysm</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Trauma</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Dissection</td>
<td>0</td>
<td>0</td>
</tr>
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