Basic biology, mechanisms, and treatment of aortic aneurysms

Bonus Conference
6/12/13
History

- Aneurysma (Greek) – “widening”
- 1550 BC – “tumor of arteries” in Eber Scrolls of ancient Egypt
- 2nd century AD – Galen describes pseudoaneurysms in injured gladiators
Pioneers

- 2nd century AD – Roman surgeon, Antyllus, ligated arteries to repair aneurysms

- 1888 – Matas develops “endoaneurysmorrhaphy”

- 1953 – Dubost (Paris) and Cooley/DeBakey (Houston) repair AAA with homograft
Human aorta
Layers of arterial wall

- Tunica intima
- Tunica media
- Tunica adventitia
Aneurysms

- Permanent, localized dilation
- >1.5x normal diameter
- All 3 layers of vessel wall
- Classified by etiology/location
Etiology

- Inflammatory
  - Takayasu’s arteritis: large-vessel arteritis
  - Kawasaki disease: medium-vessel arteritis
  - Behcet’s disease: small-vessel arteritis
Etiology

- Infections
  - Syphilis
    - 1895 – Dohle describes syphilitic aortitis
    - Prior to antibiotics, syphilis caused 75% of aortic aneurysms
  - Mycotic aneurysms

Treponema pallidum
Mycotic aneurysms

- Septic embolus from heart
- Microbial arteritis (80%)
- Existing aneurysm gets infected
- Pseudoaneurysm gets infected

- #1 – Salmonella (40%), #2 – Staph
Mycotic aneurysms

- Leukocytosis, + blood cultures (50%)
- CT: atypical location, periaortic fluid/gas

Treatment:
- Long-term antibiotics, aneurysm resection
  - Cadaveric graft
  - Ligation of aorta with extra-anatomic bypass
  - Staged procedure: graft placement extra-anatomic bypass and graft removal
Etiology

• Degeneration
  • Atherosclerosis
  • Cystic medial necrosis/degeneration
    • Connective tissue disorders
      • Marfan’s syndrome
      • Ehlers-Danlos syndrome

• Trauma
Thoracic aortic aneurysms
Ascending

- Etiology: cystic medial necrosis/degeneration
- Diagnosis: CT chest
- Indications for repair: >5.5cm, >4.5cm in Marfan’s, symptomatic (aortic insufficiency, compression of RLN, bronchi, esophagus)
Aortic arch

- Etiology: atherosclerosis
- Diagnosis: CT chest
- Indications for repair: same as ascending aneurysms
Descending/Thoracoabdominal
TAA

• Descending (thoracoabdominal):
  • Etiology: atherosclerosis
  • Diagnosis: CT
  • Indications for repair: symptomatic, >6cm, >5.5cm in Marfan’s, >4cm in Turner’s
Abdominal aortic aneurysms
AAA

• Definition & natural history:
  • Normal aorta diameter: 2cm
  • Aneurysmal dilation: >3cm
  • Progressive enlargement (0.4cm/year) and rupture
  • 20,000 deaths annually
AAA

• Degenerative most common cause
  • Atherosclerosis
  • Degeneration of the medial layer

• Risk factors:
  • Old age, men, smoking, HTN, family hx
AAA

- Indications for repair:
  - Symptomatic
  - Hemodynamic instability/rupture
  - Greater than 5.5cm for men, 5cm for women
    - Life expectancy, co-morbidities, anatomic variation must also be considered
## Estimated annual rupture risk

<table>
<thead>
<tr>
<th>AAA diameter (cm)</th>
<th>Rupture risk (%/yr)</th>
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<tr>
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<tr>
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<td>7-8</td>
<td>20-40</td>
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<tr>
<td>&gt;8</td>
<td>30-50</td>
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</tbody>
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Brewster, et al. 2003
Preoperative evaluation

US: screening tool only

CT scan: diagnostic
  - AAA >4cm should be reimaged every 6 months with CT scan
AAA

Open or endovascular repair?
Open AAA repair
Open AAA repair

• Outcomes
  • Mortality: <5%
  • MI is leading cause of early and late death
  • Complications: 20-25%
    • Intra-op, ischemic colitis (1-2%), erectile dysfunction (10-25%), paraplegia (<1%)
  • Survival at 5 years: 65%
Thank you