Popliteal Artery Aneurysms: Diagnosis and Repair Options
• No Disclosures
Popliteal Artery Aneurysms (PAAs)

• Male Predominance
• Most common peripheral Aneurysm (70%)
• 30-50% have AAA
• 50% have bilateral PAA
• ~50% develop another aneurysm in 10 years
  – Lifelong surveillance
PAAs

• Rarely Rupture
  – 2%
• Acute/Chronic Ischemia Secondary to embolization and/or thrombosis
• Compressive symptoms
  – Leg swelling, DVT
  – Nerve compression irritation
Natural History of PAAs

- Dawson et al. – 71 PAA/51 patients
- 25 observed
  - Complications
    - 12/21 (57%) asymptomatic
    - 2/4 (50%) symptomatic
  - ↑ 74% at 5 years
Natural History of PAAs

• Szilagy et al –
  - Only 32% of non-treated PAAs remained without LE complications at 5 years
Treatment of PAAs

• PAAs $\geq 2.0$ cm
  – 30-40% risk of ischemia
  – High rate of limb loss

• All Symptomatic Patients
Treatment of PAA

• Decision and Technique for repair must be individualized
  – Co-morbidities
  – Anatomy
  – Degree of ischemia
Imaging of PAAs

• CTA or MRA (Abdomen to feet)
  – Extent of disease (AAA?)
  – Anatomy/Size/Tortuosity of vessels/Thrombus
• Digital Subtraction Angiography
  – Runoff vessels
• Duplex Ultrasonography (DUS)
Repair of PAAs

• Acute Threatening Ischemia
  – 3-4 x Mortality; Higher Limb loss
    • Fix PAA before thrombosis or embolization
  – Heparin $\rightarrow$ CTA $\rightarrow$ OR
  – Angio/Lysis/Thrombectomy
  – Open or Endovascular Repair
Repair of PAAs

• Asymptomatic/Chronic Ischemia
  – Medical/Cardiac Assessment
  – Imaging – CTA/Angiogram
  – Open vs. Endovascular vs Observation?
Open Repair of PAAs

- Requires General Anesthesia
  - Posterior Approach
    - Interposition Graft
  - Medial Approach
    - Exclusion and Bypass
Posterior Approach

• Patient prone
• Relieve compressive symptoms
• Limited proximal/distal dissection
• GSV harvest more difficult
  – Can use SSV if size OK
• Advantage- debulk and ligate collaterals
  – Prevent type 2 leaks
Posterior Approach
Medial Approach

- Easier GSV harvest
- Can extend proximally and distally (tibial vessels)
- PAA exclusion without collateral ligation – PAA can grow/rupture (Type 2 leak)
Medial Approach
Popliteal Artery Aneurysm Repair
Open Repair - Outcomes

• 5 year Patency (all comers): 64-75%

• Elective
  – Autologous
    • GSV: primary 80%; secondary – 90%

  – Synthetic
    • PTFE: primary – 50%; secondary – 63%
Endovascular Treatment of PAAs (EPAR)

- Alternative to Open Repair
- Local Anesthesia
- “Off-Label use” of Stent Graft
EPAR

• First reported PAA Repair
  – Homemade Graft – Marin, Veith et al 1994 Montefiore
EPAR

- NYU
  - Retrospective review of consecutive EPAR patients at NYU
  - 26 PAA in 21 patients
## Patient/Aneurysm Characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean Age (years)</strong></td>
<td><strong>74 ± 9</strong></td>
</tr>
<tr>
<td>Male Gender</td>
<td>19/21 (90.5%)</td>
</tr>
<tr>
<td>Bilateral Popliteal</td>
<td>10/21 (48%)</td>
</tr>
<tr>
<td>aneurysms</td>
<td></td>
</tr>
<tr>
<td>History of AAA</td>
<td>11/21 (52%)</td>
</tr>
<tr>
<td>Median Diameter (cm)</td>
<td>2.89 ± 1.0</td>
</tr>
<tr>
<td>Percentage Asymptomatic</td>
<td>16/26 (62%)</td>
</tr>
</tbody>
</table>
Strict Anatomic Selection Criteria

- 2 cm landing zones
- 10-15% luminal oversize
- Minimal proximal/distal size discrepancy
- Lack of extensive vessel tortuosity
Anatomic Selection Criteria

• Knee flexion > 90° (carpenters, gardeners)
• No contraindication to antiplatelet medication
  – Plavix predictor of success
<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Anesthesia</td>
<td>10/26 (38%)</td>
</tr>
<tr>
<td>Technical Success</td>
<td>25/26 (96%)</td>
</tr>
<tr>
<td>Crossing Knee Joint</td>
<td>24/25 (96%)</td>
</tr>
<tr>
<td>Number of Stents</td>
<td>1.8 ± 1.1</td>
</tr>
<tr>
<td>Distal Runoff (mean#)</td>
<td>1.96 ± 0.75</td>
</tr>
<tr>
<td>Length of Stay (days)</td>
<td>2.4 ± 2.4</td>
</tr>
<tr>
<td>Follow up (months)</td>
<td>22 ± 17</td>
</tr>
<tr>
<td>ASA and/or Plavix</td>
<td>26/26 (100%)</td>
</tr>
</tbody>
</table>
EPAR Procedure
• Always do Angiogram to show runoff pre and post stent deployment
Angiogram with Knee Bent
NYU – EPAR Outcomes

• Primary patency
  – 91% at 1 Year
  – 86% at 2 Years

• Secondary patency
  – 91% at 1 Year
  – 91% at 2 Years

• No Limb Loss
NYU- EPAR Outcomes

• 3 occlusions during follow up
  – 4, 14 and 26 months
  – All occlusion patients had single vessel runoff
# Predictors of Stent graft Occlusion

<table>
<thead>
<tr>
<th>Predictor</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>NS</td>
</tr>
<tr>
<td>Runoff</td>
<td>0.02</td>
</tr>
<tr>
<td>Number of stents deployed</td>
<td>NS</td>
</tr>
<tr>
<td>Sheath diameter</td>
<td>NS</td>
</tr>
<tr>
<td>Indication for repair</td>
<td>NS</td>
</tr>
</tbody>
</table>
Outcomes EPAR

• Maraglingo et al.
  – EPAR – 65 PAA in 57 patients
  – Runoff, DM, associated PTA
    • ↓ Patency Rates
Outcomes - EPAR

• Mohan et al.
  – 30 PAA – EPAR
  – 3 yr Primary, Secondary Patency – 75%, 83%
  – Similar to open surgery
    – Mohan et al. Endovascular popliteal aneurysm repair. Are the results comparable to open surgery? Eur J Vasc Endovasc Surg 2006. 32: 149-54
Outcomes - EPAR

• Tielliu et al
  – 73 PAA – EPAR
    • 5 yr Primary and Secondary patency
      – 70%, 76%
    • Primary patency ↑ 80%
      – Experience and Plavix

• Tielliu et al. Endovascular treatment of popliteal artery aneurysms: is the technique a valid alternative to open surgery? J Cardiovasc Surg (Torino) 2007; 48:275-9
Outcomes - EPAR

• Antonello et al.
  – 30 PAA – Open vs. EPAR
    • PROSPECTIVE RANDOMIZED
      – No difference in limb salvage/patency (4 year)
      – Operative time and LOS – EPAR

Outcomes

• Lovegrove et al
  – Meta-analysis – Open versus EPAR
    • No difference in long term patency
    • Decreased operative time, LOS – EPAR
    • EPAR – more likely to have thrombosis/re-intervention at 30 Days

• Lovegrove et al. Endovascular and open approaches to non-thrombosed popliteal aneurysm repair: a meta-analysis. Eur J Vasc Endovasc Surg 2008; 38:96-100

56 PAA
Conclusions

• Endovascular repair of PAAs is relatively safe with patency/limb salvage comparable to open repair in patients that have appropriate anatomy
Conclusions

• The decision, timing and technique to perform open or endovascular repair of PAA must be individualized
When to Bypass and When to Stent?

• Anatomy Good – Stent may be first choice
  – Higher operative risk patients
• Poor runoff – Bypass
• Young/ Knee Flex > 90°
  – Bypass
• Compression Symptoms
  – Decompress and Bypass
When to Bypass and When to Stent?

• Contraindication to antiplatelet/Plavix
  – Bypass

• Very High Medical Risk/Very old
  – Stent, local anesthesia or observation
• Questions?
• Thank You.