Causes Of Aortic Endograft Limb Occlusion: What Are The Best Treatment Strategies?

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EVAR or Open Surgical Repair (OSR) for AAA?

EVAR vs OSR

Less short term complications
Higher incidence of late complications requiring re-intervention

Endograft limb occlusion:
One of the most common complications after EVAR

• Series report rates of 2.6% (at 1 year) – 5.5% (at 3 years)
• It usually requires intervention to restore limb perfusion

Time to limb occlusion

Cumulative number (%) of patients with limb occlusion; n=33 pts

Almost half of the limbs occluded before the 1st month

Device related risk factors predisposing to limb occlusion

Lack of device support predisposes to angulation and kinking with resulting stenosis and thrombosis of the graft

Baum RA et al. J Vasc Interv Radiol 2003


Cochener F. et al. Eur J Vasc Endovasc Surg, 2007
Anatomical risk factors predisposing to limb occlusion

- Narrow distal aorta and bifurcation

Stavroulakis N. et al., J Vasc Surg 2006

Anatomical risk factors predisposing to limb occlusion: Iliac Tortuosity

Pelvic artery index of tortuosity (PAI):
PAI = length of 1/length of A

Common iliac artery index of tortuosity (CAI):
CAI = length of 2/length of B

Taudorf M. et al., Eur J Vasc Endovasc Surg. 2014

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Anatomical risk factors predisposing to limb occlusion

- Other causes
  - Calcified and narrowed aortic bifurcation
  - Stenosis or angulation of proximal common iliac artery
  - Tortuosity iliac artery anatomy
  - Twisting of graft limb
  - Arterial dissection
  - Compromised runoff

Woody J. et al., Semin Vasc Surg. 2004

Risk stratification based on predictors of limb occlusion to classify high vs low risk pts

High Risk
- IIA Diameter
- PAI

Low Risk
- IIA Diameter
- PAI

Faure E. et al., J Vasc Surg 2015

Anatomical risk factors predisposing to limb occlusion

- January 2010 to June 2013
- 439 elective EVAR using bifurcated endografts

- 1 EVAR pt. with endograft limb occlusion
- 3 pts. with EVAR and NO endograft limb occlusion

Mantas G, Liapis C.. et al., Eur J Vasc Endovasc Surg. 2015

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Independent Predictors of limb occlusion

1) Iliac angulation ≥ 60°
2) Iliac calcification ≥ 50%
3) Endograft limb oversizing ≥ 15%

Mantas G, Liapis C.. et al., Eur J Vasc Endovasc Surg. 2015
**Treatment options for endograft limb occlusion**

- **Thrombectomy / thrombolysis + Balloon angioplasty**

- **Thrombectomy / thrombolysis + Stenting**
  - Deeba et al. Tech Vasc Interventional Rad, 2005

**Table 1. Treatment options and outcomes of graft limb occlusions**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Patients with occluded limb (%)</th>
</tr>
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<tbody>
<tr>
<td>Endovascular</td>
<td></td>
</tr>
<tr>
<td>Thrombectomy + stent</td>
<td>50%</td>
</tr>
<tr>
<td>Thrombolysis + stent</td>
<td>90%</td>
</tr>
<tr>
<td>Surgery</td>
<td>90%</td>
</tr>
<tr>
<td>Femoral-femoral bypass</td>
<td>78%</td>
</tr>
<tr>
<td>Anterograde Bypass</td>
<td>7%</td>
</tr>
<tr>
<td>Conservative</td>
<td>10%</td>
</tr>
</tbody>
</table>

**The majority of patients required femoral / axillo – femoral BPG**


**Novel methods:**

- Catheter-delivered Transducer-tipped Ultrasound assisted Thrombolysis

**Prevention of Graft Limb Occlusion**

- An ounce of prevention is worth a pound of cure. — Benjamin Franklin

- High index of suspicion
- Thorough completion evaluation
- Multiplanar angiography
- Intravascular ultrasonography
- Pullback pressure measurement
- Liberal use of angioplasty / stenting

**Conclusions I**

- Graft limb occlusion after EVAR occurs in a significant number of patients
- Anatomical risk factors include common iliac artery diameter, calcification, angulation and presence of thrombus
- Procedure-related risk factors include endograft oversizing and use of EIA as landing zone
Conclusions II

- Endovascular treatment options include CD thrombolysis and balloon angioplasty / stenting
- Some cases may require traditional surgical treatment (femoral / axillo – femoral BPG)
- Prevention: better patient /endograft selection, search for graft limb compromise followed by liberal primary BMS relining

Thank you very much for your attention