Management of Thrombus Within Native Aorta And Endografts

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Disclosures
None

Aortic Thrombus ≠ Endograft Thrombus

This thrombus in native aorta is rarely causing embolic events

- Intraluminal thrombus in aneurysm
- Thrombus in intramural hematoma
- Thrombus in aortic dissections

This thrombus in native aorta is causing embolic events

- Aortic Mural Thrombus
- Shaggy Aorta
- Macro-embolization
- Athero(micro)-embolization

Idiopathic Aortic Mural Thrombus (AMT)

- Develops in the absence of pre-existing aortic disease
- Pedunculated versus sessile

AMT is uncommon

Aortic mural thrombus: An occult source of arterial thromboembolism

60,671 consecutive autopsies from 1955 - 1983.
- 48 cases of non-aneurysmal aortic mural thrombus (0.45%)
- 8 (17%) cases had distal embolization
- In 3 (6%) cases embolization was considered the cause of death
Management of Idiopathic Aortic Mural Thrombus

• Idiopathic aortic mural thrombus is uncommon, but must be considered in the differential diagnosis of embolic events.

• Imaging of the complete aorta and a hyper-coagulability workup should be done in every (both symptomatic and asymptomatic) patient with AMT.

50% Coagulation Disorders in AMT

- Malignancy 10%
- Anticoagulant 10%
- Protein C deficiency 5%
- Lupus anticoagulant 10%
- Polysplenia 5%
- Polycythemia 5%
- Protein S deficiency 40%
- Negative 40%
- Awaited 10%

Risk of Embolization

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Symptomatic Group (n = 8)</th>
<th>Asymptomatic Group (n = 9)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>53.3 ± 12.7 years</td>
<td>59.1 ± 14.6 years</td>
<td>0.025</td>
</tr>
<tr>
<td>Gender</td>
<td>Male (n = 3)</td>
<td>Male (n = 3)</td>
<td>1.0</td>
</tr>
<tr>
<td>Age</td>
<td>52 (33.3)</td>
<td>60 (44.4)</td>
<td>1.0</td>
</tr>
<tr>
<td>Smoking</td>
<td>Yes (n = 3)</td>
<td>Yes (n = 2)</td>
<td>0.62</td>
</tr>
<tr>
<td>History of thrombosis</td>
<td>Yes (n = 3)</td>
<td>No (n = 6)</td>
<td>0.033</td>
</tr>
<tr>
<td>Malignancy</td>
<td>Yes (n = 3)</td>
<td>No (n = 6)</td>
<td>0.029</td>
</tr>
<tr>
<td>Polycythemia</td>
<td>Yes (n = 3)</td>
<td>No (n = 6)</td>
<td>0.033</td>
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</tr>
</tbody>
</table>

Management of Idiopathic Aortic Mural Thrombus

• In symptomatic AMT, treat emboli first and subsequently aorta.

• Risk of embolization of asymptomatic AMT is higher in female patients, younger patients, with mobile thrombus and non-calcified insertion site.
**Management of Idiopathic Aortic Mural Thrombus**

- In symptomatic AMT, treat emboli first and subsequently aorta.
- Open aortic surgery has lower recurrence and embolization rate than anticoagulation.
- TEVAR (and EVAR) performs best.
- Primary (interventional) treatment can be considered for asymptomatic AMT.

**Anticoagulation vs. Open Aortic Surgery**

<table>
<thead>
<tr>
<th></th>
<th>Anticoagulation</th>
<th>Open Aortic Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=112)</td>
<td>(n=88)</td>
<td></td>
</tr>
<tr>
<td>Persistent/recurrent AMT</td>
<td>26.4%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Recurrent emboli</td>
<td>25.7%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Mortality</td>
<td>6.2%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Complications</td>
<td>27%</td>
<td>17%</td>
</tr>
<tr>
<td>Major amputation</td>
<td>9%</td>
<td>2%</td>
</tr>
</tbody>
</table>

**Management of Idiopathic Aortic Mural Thrombus**

- In symptomatic AMT, treat emboli first and subsequently aorta.
- Open aortic surgery has lower recurrence and embolization rate than anticoagulation.
- TEVAR (and EVAR) performs best.
- Anticoagulation should be reserved for high-risk patients or anatomical difficult thrombus locations.
Management of Endograft Thrombus

• Mural thrombus in endografts is common (11-33%) and mostly develops in the first year post EVAR.

Patient-related factors that are NOT associated with endograft thrombus

• Age
• Smoking
• Malignancy
• Anticoagulation or antiplatelet therapy
• Coagulation disorders?

Short and wide infrarenal neck is associated with endograft thrombus

• 68 EVAR patients with endograft thrombus (414 overall cohort)
  - Neck length < 15 mm (OR, 2.4; 95%CI, 1.3-4.2)
  - Neck diameter > 30 mm (OR, 2.4; 95%CI, 1.3-4.6)

Preoperative thrombus load is associated with endograft thrombus

• Proximal aneurysm neck thrombus (OR, 2.4; 95%CI, 1.3-4.2)

Polyester-coated devices are associated with higher incidence of endograft thrombus

• Thrombogenicity of Dacron bypass grafts is greater than of ePTFE
  - Hemodynamic properties causing turbulent or low flow are more common in polyester-coated devices (longer body length, smaller limb diameter)
Aorto-Uni-Iliac stentgraft configuration is associated with endograft thrombus

- Aorto-Uni-Iliac stentgraft (OR, 2.2; 95% CI, 1.9-5.5)
- In AUl devices large main body diameter and small outflow limb may cause flow deceleration and low flow regions inside main body leading to thrombus formation

Barrel-like configuration of main body is associated with endograft thrombus

- Barrel-like configuration of main body (> 50% increase in cross-sectional area) (OR, 6.9; 95% CI, 1.7-28.3)

Bell-bottom configuration is associated with endograft thrombus

- 20% thrombus formation in iliac limbs >24 mm versus 8% in smaller iliac limbs
- No difference in main body endograft thrombus

Management of Endograft Thrombus

- Mural thrombus in endografts is common (11-33%) and mostly develops in the first year post EVAR.
- Risk factors are aneurysm-related (neck, thrombus), graft-related (configuration, fabric) and possibly patient-related (check for coagulation disorders).

Is mural thrombus in endograft associated with thrombo-embolic complications?

- NO

Management of Endograft Thrombus

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- Risk factors are aneurysm-related (neck, thrombus), graft-related (configuration, fabric) and possibly patient-related (check for coagulation disorders).
- Endograft thrombus rarely leads to thromboembolic events or endograft occlusion.
- Thrombus lining in main body may be less harmful than in iliac limb.
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- Risk factors are aneurysm-related (neck, thrombus), graft-related (configuration, fabric) and possibly patient-related (check for coagulation disorders).
- Endograft thrombus rarely leads to thromboembolic events or endograft occlusion.
- Thrombus lining in main body may be less harmful than in iliac limb.
- If asymptomatic, no treatment advised, consider CTA follow-up.

Management of Endograft Thrombus

- If limb kinking, stenosis or outflow limitations, treatment is advised to prevent occlusion.

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- If symptomatic (claudication), anticoagulation or endograft relining may be considered.

Management of Endograft Thrombus

- 52 year old male
- Presents with ischemic limb L 2 years post-EVAR (Endurant, L limb 28 mm diameter)
- Antiplatelet agent
- No previous claudication

- Popliteal thrombectomy and started on warfarin
- 2nd stage relining of L iliac 28 mm limb with Endurant 16-20-93 limb, sealing in distal CIA
- Switched back to antiplatelets
Management of Endograft Thrombus

- If limb kinking, stenosis or outflow limitations, treatment is advised to prevent occlusion.
- If symptomatic (claudication), anticoagulation or endograft relining may be considered.
- If symptomatic (thromboembolic), endograft relining is advised.
- Consider endograft relining with less thrombogenic device.

THANK YOU