TEVAR for Embolizing Lesions of the Aorta

Michel S. Makaroun MD
Co-Director, UPMC Heart and Vascular Institute
Professor and Chair, Division of Vascular Surgery
University of Pittsburgh, School of Medicine
Disclosure

Speaker name: MICHEL MAKAROUN, M.D.

- **No Financial Compensation**

*I have the following potential conflicts of interest to report:*

- WL Gore: Scientific Advisory Board / Research Grants
- Medtronic: Study PI and Research Grants
- Cordis: Study PI and Research Grant
- Research grants from Cook, Trivascular, Lombard, Bolton, Endologix
Arterial Embolization
Blue Toe Presentations

Severe bilateral with previous amps from Embolization
Palpable Pedal Pulses
After the blue toe: Prognosis of noncardiac arterial embolization in the lower extremities

Kara H. V. Kvilékval, MD, Jonathan P. Yunis, MD, Robert A. Mason, MD, and Fabio Giron, MD, PhD, Stony Brook and Northport, N.Y.

<table>
<thead>
<tr>
<th>Embolization Source:</th>
<th>Thoracic</th>
<th>Abdominal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrence</td>
<td>60%</td>
<td>8%</td>
</tr>
<tr>
<td>Mortality</td>
<td>60%</td>
<td>11%</td>
</tr>
<tr>
<td>Amputation</td>
<td>40%</td>
<td>17%</td>
</tr>
</tbody>
</table>

- Surgical treatment reduces embolization: 7 vs 36%

*J Vasc Surg 1993;17:328-35*
Athero-Embolic Renal Disease

- Can be Spontaneous although increasingly iatrogenic
- Results in Renal Failure / Progressive with recurrence
- Specific treatment is lacking
- Dismal outlook !!
# Clinical Features of Athero-Embolic Renal Disease

<table>
<thead>
<tr>
<th></th>
<th>Fine</th>
<th>Lye</th>
<th>Thadhani</th>
<th>Belenfant</th>
<th>Scolari</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>221</td>
<td>129</td>
<td>52</td>
<td>67</td>
<td>52</td>
</tr>
<tr>
<td><strong>% Spontaneous</strong></td>
<td>69</td>
<td>40</td>
<td>0</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td><strong>% Iatrogenic</strong></td>
<td>31</td>
<td>60</td>
<td>100</td>
<td>96</td>
<td>79</td>
</tr>
<tr>
<td><strong>% Post Anticoagulation</strong></td>
<td>14</td>
<td>13</td>
<td>37</td>
<td>76</td>
<td>21</td>
</tr>
<tr>
<td><strong>% Skin lesions</strong></td>
<td>35</td>
<td>43</td>
<td>50</td>
<td>90</td>
<td>96</td>
</tr>
<tr>
<td><strong>% GI involvement</strong></td>
<td>10</td>
<td>10</td>
<td>29</td>
<td>33</td>
<td>8</td>
</tr>
<tr>
<td><strong>% Retinal emboli</strong></td>
<td>6</td>
<td>10</td>
<td>25</td>
<td>22</td>
<td>8</td>
</tr>
<tr>
<td><strong>% Eosinophilia</strong></td>
<td>73</td>
<td>71</td>
<td>22</td>
<td>59</td>
<td>62</td>
</tr>
<tr>
<td><strong>% Dialysis</strong></td>
<td>28</td>
<td>40</td>
<td>44</td>
<td>61</td>
<td>35</td>
</tr>
<tr>
<td><strong>ONE YR MORTALITY</strong></td>
<td>81</td>
<td>64</td>
<td>87</td>
<td>23</td>
<td>31</td>
</tr>
</tbody>
</table>
Aortic Athero-Emboli: The Shaggy Aorta

Stent Graft Coverage may be an Resonable Option to Reduce Embolization and avoid Surgical Aortic Replacement If it can be done safely
Aortic Athero-Emboli: The Shaggy Aorta

**Diagnosis**
- Clinical suspicion essential
- CT scan with contrast is best if renal function allows
- TEE

**Endovascular Management**
- Minimal manipulation
- Minimize contrast use
- Intraoperative IVUS: localization of offending lesions
Stent Grafts for Athero-Embolism: JS

- 62 year old Truck driver
- March 2006: 2 Blue toes Left
  Renal dysfunction: CR = 1.7
- CT SCAN: Large Atheromas in the Thoracic Aorta with Renal Micro-emboli!
- May 2006: Blue toe Right
  CR = 2.4
62 year old Truck driver

March 2006: 2 Blue toes **Left**
Renal dysfunction: CR = 1.7

CT SCAN: Large Atheromas in the Thoracic Aorta with Renal Micro-emboli!

May 2006: Blue toe **Right**
CR = 2.4
Stent Grafts for Athero-Emboli: JS

- Thoracic Endograft June 06
- IVUS control. No contrast used
Stent Grafts for Athero-Embolism: JS

- 18 m later _ No recurrence _ Cr: 1.7  →  CT scan
  No new renal infarcts _ clean luminal surface
- FU 12/08 _ No recurrence _ CR: 1.5
- Returned with more embolizations Aug 2014 _ CR 2.7
Stent Grafts for Athero-Emboli: FN

Sources can be multiple
All Should be Treated if feasible
  - Repeated episodes of Left Blue toes
  - Weak but Palpable Left pedal pulses

Abdominal Thrombus  Thoracic Thrombus
Stent Grafts for Athero-Embolism: FN

Thoracic and Abdominal Aorta covered _ IVUS control

Before Coverage

After Coverage
Stent Grafts for Mobile Thrombus: TS

- Different Pathology
- Consequences similar
- Same principles apply
- TS: 44 year old Female
- Abdominal and flank pain
- Thoracic clot
- Splenic Infarcts
- Renal Infarct
- SMA embolus
Stent Grafts for Mobile Thrombus: TS

TREATMENT

- SMA Embolectomy
- Stent Graft Coverage of the Mobile thrombus
Stent Grafts for Mobile Thrombus: TS

TREATMENT

- SMA Embolectomy
- Stent Graft Coverage of the Mobile thrombus

- No Complications  _  No Recurrence
Stent Grafts for Mobile Thrombus: AD

- 57 year old Lady with Blue toes and splenic infarct
- S/P Sigmoid colectomy and Bilateral renal stents
Stent Grafts for Mobile Thrombus: AD
UPMC Experience 2006-2013  25 patients

- Mean Age: 65 years  16 women (64%)
- CKD Stages II or higher: 19 patients
- Clinical Presentation
  - 17 peripheral embolizations
  - 5 Acute ischemia
  - 6 Renal
  - 5 Abdominal pain and visceral emboli
  - 3 No current symptoms

*J Vasc Surg 2014;59:1256-64*
Anatomy

- Thoracic aorta only: 12 patients 48%
- Abdominal aorta only: 5 patients 20%
- Thoracic and abdominal: 8 patients 32%

Pathology

- Atherosclerotic plaque: 16 patients 64%
- Mobile isolated thrombus: 9 patients 36%
- AAA: 6 patients 24%

50% of patients tested have Hypercoagulable state
UPMC Experience 2006-2013

- Stent Graft coverage with IVUS – TEE in 25% of patients
  - Variety of Stent grafts used
  - One segment covered: 18 patients
  - Multiple: 7 patients
  - EVAR for suspected AAA source: 3 patients

- 3 adjunctive surgical thrombectomies
- No Operative Mortality
- One CKD stage V progressed to dialysis
- No Clinical Embolizations
Summary

- Early suspicion and prompt evaluation by CT and TEE can identify the problem.

- IVUS or TEE are best suited for intraoperative control and identifying the offending lesions for treatment.

- Stent coverage before end organ damage occurs can offer beneficial outcomes.
TEVAR for
Embolizing Lesions of the Aorta

Michel S. Makaroun MD
Co-Director, UPMC Heart and Vascular Institute
Professor and Chair, Division of Vascular Surgery
University of Pittsburgh, School of Medicine