Lower extremity ischemia due to unusual causes
Non-atherosclerotic disease and dissection

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- Surmodics
- Volcano/Philips
- Proteon

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Lower Extremity Ischemia Due to “Inflow Compromise”

- Causes that are “non-standard” (i.e. Not related directly to PAOD)
- Symptoms and presentation
- How to diagnose and treat
CASE

• 20 year old male college student on cycling scholarship
• Competitive cyclist, 30-110 miles/ride
• Lt leg “aching” during exercise x years
• 2 mos of Lt leg “weakness” w/maximal exertion
  – Starts in groin, extends to thigh
  – Resolve 2-10 minutes w/rest
• Vascular Exam - Normal
Physical Exam (cont.)

• Vascular:
  – 2+ C, R, B, A, F, P, PT, DP bilaterally
  – No carotid bruits
  – No radio-radial or radio-femoral delays
  – +Lt femoral systolic bruit
  – No right femoral or pelvic bruit
  – No change in pedal pulses with knee or hip flexion
  – No elevation pallor or dependent rubor
Bicyclist - Resting ABI

1.15

Brachial Artery
P 118 mm Hg
Gain 21%

Brachial Artery
P 115 mm Hg
Gain 21%

Right Ankle
P 137 mm Hg, ABI 1.15
Gain 30%

Right Metatarsal
Gain 20% Amplitude

Right DP (Ankle) Artery
P 137 mm Hg
Index 1.15, 112 mm Hg
Gain 30%

Left Ankle
P 133 mm Hg, ABI 1.12
Gain 20% Amplitude

Left Metatarsal
Gain 30%

Left DP (Ankle) Artery
P 115 mm Hg
Index 0.97

1.12
Post Cycle Ergometry

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>Rt BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Rest</td>
<td>119</td>
</tr>
<tr>
<td>Time Interval 1</td>
<td>189</td>
</tr>
<tr>
<td>Time Interval 2</td>
<td>143</td>
</tr>
<tr>
<td>Time Interval 3</td>
<td>144</td>
</tr>
<tr>
<td>Time Interval 4</td>
<td>135</td>
</tr>
</tbody>
</table>

0.65  0.31

284 cm/sec
CT Angiogram Abd/Pel/Run-off

Mild stenosis
Post-stenotic dilation
46 yo F, amateur runner with left thigh claudication

Saw in past 4 yrs:
• chiropractor
• Acupuncturist
• sports medicine physician
• Neurologist

• Clinical evaluation
• electromyography
• muscle biopsy

Neg hx for athero
Exam normal
Resting PVR/ABI normal
Exercise → absent Lt pedal signal
Endofibrosis of Iliac Artery

• Pathophysiology
  – repeated stretching/compression of ext iliac
  – extrinsic compression by hypertrophic psoas
  – enhanced shear force from supra-physiological flow

• Epidemiology
  – Rare
  – Mostly cyclists; occas runners
Treatment

• Conservative
  – Activity modification

• Surgical options
  – Endofibrosectomy with patch angioplasty
  – Reconstruction with interposition graft

• Percutaneous options
  – IVUS/translesion pressure gradient
  – Angioplasty +/- stent
46 yo F, amateur runner with left thigh claudication
Iliac endofibrosis in a runner: 9 year follow up post-stent

2006

2015
### “Other” Aorto-iliac Causes of Lower Extremity Ischemia

<table>
<thead>
<tr>
<th>Atypical causes of PAOD</th>
<th>Non-atherosclerotic PAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Pseudoxanthoma elasticum</td>
<td>– External Iliac Artery Endofibrosis</td>
</tr>
<tr>
<td>– “Coral reef” pathology</td>
<td>– Iliac Artery FMD</td>
</tr>
<tr>
<td></td>
<td>– Medium and Large Vessel Vasculitis</td>
</tr>
<tr>
<td></td>
<td>• Takayasu’s arteritis (TA)</td>
</tr>
<tr>
<td></td>
<td>• Giant cell arteritis (GCA)</td>
</tr>
<tr>
<td></td>
<td>• Behcet disease</td>
</tr>
<tr>
<td></td>
<td>– Mid-Aortic Syndrome</td>
</tr>
<tr>
<td></td>
<td>– Aortic Dissection</td>
</tr>
</tbody>
</table>
Iliac Artery Fibromuscular Dysplasia

- “string of beads”
- 5% of all FMD cases
- Renal/carotid FMD often present
- Often accompanied by PAOD
- Rx PTA (+/- stent)
Non-Atherosclerotic Causes of Lower Extremity Ischemia (Aorto-iliac level)

What features make one think of non-atherosclerotic causes?

- Younger age
- Absence of atherosclerotic risk factors, or athero in other vascular beds
- Inconsistencies between symptoms and imaging findings
- Sx to suggest inflammation…fever, sweats, etc. (mucosal lesions for Behcet’s)
Aortic Dissection-
Initial presentation

- Acute limb ischemia or sudden onset of claudication sx’s
- Pain: Chest, Back, Abdomen
- Limb pain, weakness, parasthesia, paralysis
- Pulse deficit or pulseless
- Compartment syndrome
- Bladder dysfunction
IRAD Registry – 17 year trends (12/95 → 2/13)

- 28 International Centers
- 4428 patients w/Acute Aortic Dissection
  - 67% type A
  - 33% type B
- Demographics
  - 2/3 men
  - 77% HTN
  - 4% Marfans

IRAD Registry – 17 year trends
Symptoms on presentation

<table>
<thead>
<tr>
<th></th>
<th>Type A (%)</th>
<th>Type B (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe pain (worst ever)</td>
<td>93</td>
<td>94</td>
</tr>
<tr>
<td>Chest pain</td>
<td>81</td>
<td>67</td>
</tr>
<tr>
<td>Back pain</td>
<td>43</td>
<td>70</td>
</tr>
<tr>
<td>HTN</td>
<td>28</td>
<td>66</td>
</tr>
<tr>
<td>Pulse deficit</td>
<td>31</td>
<td>19</td>
</tr>
</tbody>
</table>

## IRAD Registry – 17 year trends

### Management/Outcome

- Surgery (open)
- Medical Rx
- EndoRx (for distal malperf)
- Mortality in-hosp

<table>
<thead>
<tr>
<th></th>
<th>Type A (%)</th>
<th>Type B (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery</td>
<td>79→90</td>
<td>17→8</td>
</tr>
<tr>
<td>Medical Rx</td>
<td>75→57</td>
<td>7→31</td>
</tr>
<tr>
<td>EndoRx</td>
<td>&lt;5 (mortal-71)</td>
<td>12→14</td>
</tr>
<tr>
<td>Mortality</td>
<td>31→22</td>
<td></td>
</tr>
</tbody>
</table>

Mechanisms of Malperfusion Syndromes (LE and Visceral) 

**Static** Obstruction

Dissection extends into the branch vessel lumen
Distension of the false lumen compresses the true lumen and impairs its flow.
Thoracic Aortic Endovascular Stent-grafts for Non-surgical Management of Type B Dissection

- **Purpose:**
  - Close entry site (intimal tear)
  - Decompress false lumen/ promote its thrombosis
  - Relieve obstruction of branch arteries
Malperfusion Syndromes:
Surgical Fenestration of Affected Segment

Overall mortality 18%
Endovascular Techniques for Non-surgical Management of Acute Vascular Complications

- **Static obstruction:**
  - Stent affected arterial branch

- **Dynamic obstruction**
  - Balloon fenestrate intimal flap to decompress the false lumen and restore flow in true lumen

- In IRAD centers from 1996-2002:
  - 5% were treated with percutaneous stenting or fenestration procedures
Fenestration Procedure
Sequential 10→16mm dilation across fenestration
Palmaz 3010 deployed to 16mm immed below fenestration. Kissing balloons
Lt Iliac Stent → Final

- Post-procedure 2+ femoral & ankle pulses bilat
- Resolution of sx’s
Iatrogenic Causes

- Dissection or plaque disruption
- Stent malpositioning
- Atheroembolism
- Graft or stent thrombosis
- Closure device failure
Arteriotomy management → LE Ischemia

- Vascular Closure Devices
- Manual compression
- Fem-o-stop

Vascular Closure Devices (meta-analysis data)

• Limb ischemia…3 out of 1000 patients with closure device

Table III. Adverse events after isolated coronary angiography and percutaneous coronary angiography in studies published from 2000

<table>
<thead>
<tr>
<th>Outcome end points</th>
<th>Studies</th>
<th>Participants</th>
<th>Incidence VCDs versus controls</th>
<th>Statistical method and effect estimate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groin hematoma</td>
<td>14</td>
<td>2656</td>
<td>5.3% versus 5.2%</td>
<td>M-H, fixed RR 1.01 (0.74-1.38)</td>
</tr>
<tr>
<td>Groin bleeding</td>
<td>8</td>
<td>2160</td>
<td>4.0% versus 0.9%</td>
<td>M-H, random RR 3.49 (0.62-19.08)</td>
</tr>
<tr>
<td>Pseudoaneurysm</td>
<td>16</td>
<td>4106</td>
<td>0.7% versus 1.1%</td>
<td>M-H, fixed RR 0.69 (0.38-1.23)</td>
</tr>
<tr>
<td>Lower limb ischemia/arterial stenosis/device entrapment in the artery</td>
<td>11</td>
<td>2567</td>
<td>0.3% versus 0%</td>
<td>M-H, fixed RR 3.07 (0.50-18.83)</td>
</tr>
<tr>
<td>Groin infection</td>
<td>11</td>
<td>3686</td>
<td>0.2% versus 0.06%</td>
<td>M-H, fixed RR 2.56 (0.50-13.10)</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>12</td>
<td>2957</td>
<td>0.7% versus 0.8%</td>
<td>M-H, fixed RR 0.78 (0.35-1.71)</td>
</tr>
<tr>
<td>Vascular surgery</td>
<td>17</td>
<td>4337</td>
<td>0.6% versus 0.3%</td>
<td>M-H, fixed RR 1.76 (0.74-4.20)</td>
</tr>
<tr>
<td>Time to hemostasis</td>
<td>5</td>
<td>889</td>
<td>-</td>
<td>IV, random, mean difference −42.90 (−55.26 to −30.53)</td>
</tr>
</tbody>
</table>

Conclusion

- Non-Atherosclerotic Etiology for LE extremity ischemia is infrequent
- Clinician must be aware of these various entities, or will miss important diagnoses
Attend live, online

Visit our booth!

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