Vascular Access Banding Techniques and Outcomes

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Vascular Surgery Dogma

- Banding is a poor option for treating dysfunctional vascular accesses
  - Difficult to modulate
  - Inconsistent results

Is this dogma true?
When should banding be used?
What is the preferred banding technique?
Can the disadvantages of banding be mitigated?

Disclaimer

- Basis of presentation
  - Personal experience/opinion
  - Small case series

Art is I. Science is we.
Claude Bernard 1850

Vascular access banding is used to treat:

- Arterial Steal
- High-output Heart Failure
- Venous Hypertension?

Banding Techniques

- Hemoclip
- PTFE, Dacron, Artegraft
Banding Techniques

- Hemoclip
- PTFE, Dacron, Artegraft
- Plication

Studies Supporting Surgical Dogma- “Banding is Bad”

<table>
<thead>
<tr>
<th>N</th>
<th>Technique</th>
<th>Patency</th>
<th>Clinical Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gupta 2011</td>
<td>22</td>
<td>Plication/PTFE Doppler/Pulse</td>
<td>81% (early)</td>
</tr>
<tr>
<td>Odland 1991</td>
<td>16</td>
<td>38% @ 1 yr</td>
<td>100% Cured/Improved</td>
</tr>
<tr>
<td>DeCaprio 1997</td>
<td>11</td>
<td>Ligation clips Finger PPGs (&gt;50 mm Hg)</td>
<td>9% @ 2 wks</td>
</tr>
</tbody>
</table>

Studies Refuting Surgical Dogma- “Banding is Good”

<table>
<thead>
<tr>
<th>N</th>
<th>Technique</th>
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<th>Clinical Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wang 2013</td>
<td>7</td>
<td>Dilator-assisted Doppler/pulse</td>
<td>100%</td>
</tr>
<tr>
<td>Miller 2010</td>
<td>114</td>
<td>Balloon-assisted</td>
<td>52% @ 3mo</td>
</tr>
<tr>
<td>Yaghoubian 2008</td>
<td>7</td>
<td>Plication Doppler/pulse</td>
<td>100%</td>
</tr>
<tr>
<td>Zanow 2006</td>
<td>78</td>
<td>Spredw/PTFE Flow-400cc AVF, 600cc AVG 91%/1 yr AVF 58%/1 yr AVG</td>
<td>91% Cured/Improved</td>
</tr>
<tr>
<td>Smith 2011</td>
<td>6</td>
<td>Dacron Finger PPG (&gt;80 mm Hg)</td>
<td>100%</td>
</tr>
</tbody>
</table>

Arterial Steal

Treatment Options

- Ligation
- Flow-reducing procedures
  - Banding
  - Tapering of arterial inflow
  - Graft interposition
- Bypass procedures
  - Distal Revascularization Interval Ligation (DRIL)
  - Proximalization of the arterial inflow (PAI)
  - Revision Using Distal Inflow (RUDI)

High Output Heart Failure

Treatment Options

- Ligation
- Flow-reducing procedures
  - Banding
  - Tapering of arterial inflow
  - Graft interposition
### Outcomes of Banding for High Output Heart Failure

<table>
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<tr>
<th>N</th>
<th>Technique</th>
<th>Patency</th>
<th>Clinical Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson 1976</td>
<td>3 Not described Flow &lt;700 cc/min</td>
<td>Not reported</td>
<td>3/3 Cured/Improved</td>
</tr>
<tr>
<td>Schneider 2006</td>
<td>20 T-band with PTFE None</td>
<td>90% @ 3 mos.</td>
<td>19/20 Cured/Improved</td>
</tr>
<tr>
<td>Miller 2010</td>
<td>69 Balloon-assisted</td>
<td>85% @ 6 mos.</td>
<td>69/69 Cured/Improved Multiple bands</td>
</tr>
<tr>
<td>Zanow 2006</td>
<td>17 Spindle/PTFE Flow-400cc AVF, 600cc AVG</td>
<td>91%/1 yr AVF</td>
<td>16/17 Cured/Improved</td>
</tr>
</tbody>
</table>

### Venous Hypertension

#### Treatment Options
- Ligation
- Central venous angioplasty + stenting
- Central venous bypass
- Vascular access flow-reducing procedure
  - Banding
  - Tapering of arterial inflow
  - Graft interposition

### Outcomes of Banding for Venous Hypertension

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<tr>
<th>N</th>
<th>Technique</th>
<th>Patency</th>
<th>Clinical Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jennings 2012</td>
<td>22 Balloon-assisted</td>
<td>20/22</td>
<td>22/22 Cured/Improved Resumed in 4 patients</td>
</tr>
</tbody>
</table>

Conclusions: Unlikely to be successful in:
- AVGs with flow rates < 800 cc/min
- AVFs with flow rates < 600 cc/min
- Central venous occlusions with few venous collaterals on fistulagram

### Banding

#### Mitigating the Disadvantages
- Use for “high-flow” accesses (>1000 cc/min)
- Intraoperative measurement of hand perfusion/access flow rates
  - Finger PPGs, Pressures
  - Return of pulse
  - Monophasic to biphasic Doppler signals
  - Electromagnetic flowmeter or Duplex-derived access flow measurements

### Conclusions
- Banding technique has less influence on outcomes than the intraoperative method used to gauge adequacy of banding.
- Banding outcomes seem to be best for high flow fistulas/grafts
- Banding outcomes seem to be dependent on treatment indications
  - High output heart failure: good outcomes
  - Arterial steal: inconsistent outcomes
  - Venous hypertension?