SPLENIC ANEURYSM: SAVING OR EMBOLIZING THE VESSEL

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• **Speakers Bureau:** Bard Peripheral Vascular, W.L.Gore, Penumbra, Medtronic
Background

- 1770: Bauessier describes SAA at anatomy
- 1978: Probst reports first embo
- SAA are approx 60% of all visceral aneurysms
- 0.1-10.4% incidence at autopsy
- Rupture 3-01%; 20-100% mortality
- 2cm general rule for Rx, though observed growth and pregnancy prompt earlier therapy
To Occlude Or Not To Occlude..?
Specifics:

- All splenic aneurysms are not the same. At most a fraction might be treatable by S-G Pipeline-type device: $$
- Embolization (using modern tools), done well, is effective, safe (and may equally preserve patency)
- Stent devices are immature, unwieldy, have uncertain outcomes (long term)
Endo Approaches Abound

- Coils:
  - front and back with and without packing
  - aneurysm pack alone with or without parent vessel occlusion
- Liquids: glue, Onyx, combos with coils
- Stent grafts (preserve parent vessel)
- Stents with trans-mesh occlusion or flow diverting
- Plugs, esp reduced radiopacity platforms (e.g. MVP) may allow front/back embo and continued imaging assessment without artifacts
Pregnant patient: growing aneurysm

- 6.4min fluoro; pulsed fluoro 4 fps; no DSA
- Detachable 0.018” Azur hydrocoils, and Nester to finish
- No pain. “Occluded” by US at 2.5 years

Distal perfusion through pancreatic collaterals
OK...Let’s stent graft this???

- 6+ aneurysms.
Doing a job badly is not an excuse to abjure the therapy

Coil embolized
1 mo later, re-embo

Repeat CT/US showed aneurysm flow

More saccular than most realize
Single-Center Experience with Elective Transcatheter Coil Embolization of Splenic Artery Aneurysms: Technique & Midterm Follow-up

- 98% technically success: thrombosing the aneurysm at procedure
- Repeat intervention was performed in four of 47 patients (9%) because of continued aneurysm perfusion at follow-up.
- Mean time to repeat intervention was 125 days

16 days later. Described as re-perfusion

...Or wasn’t it a primary technical inadequacy? Highlights the importance of focus upon endpoints previously outside of our worldview

Patel et al. JVIR 2012
Packing Density is the Lingua Franca of Neuro, and starting to be, in Peripheral Embolization.

- 46 aneurysms: 26% recanalization, compaction in 4%
- No Recanalization at >24% pack density

Yasumoto et al. JVIR
These points do not dismiss the therapy, only need to do it well
Packing Density

Calibrate Aneurysm

Maximal diameter in mm: 8.9

Enter known value to calibrate

Compatability

Penumbra Neuron 070 MP - 95/6cm
Guide Inner Diameter: .070"
Room for another 0.027 / 2.1F device

Penumbra Neuron 070 MP - 95/6cm (not shown)
Boston Scientific Excelsior SL10 (.030 OD)
Codman Mass Transit 135 (.037 OD)
Add Device

Codman MPD
Guide Inner Diameter: .070"
Room for another 0.070 / 5.3F device

Codman MPD (.090" OD)

0.00 inches = 0.00mm = 0.0F

Implants

40.0cm from 4 coils: PD = 24%
Aneurysm: 128.3 mm³
Coil mass: 30.6 mm³
To achieve a packing density of 30%
requires an additional:
16.4cm of .010" coil
13.6cm of .011" coil
11.4cm of .012" coil
7.3cm of .015" coil

Implants Placed

Add Implant
Galaxy Complex Fill w/ TDL 5 x 10
Cashmere 14 Platinum 5 mm x 7 cm
Matrix29 360 Firm Coils 5 x 15
Axium Helix 4 x 8

Aneurysm Volume: 128.3 mm³
Packing Density: 24%

Case #2

8.9 x 5.5 x 5.4mm Left Pcomm aneurysm

History: Cranial Nerve Palsy
Treated on 09-19-2010 by Dr. Woodward

Working Projection: 87 LAO, 120 Cranial
Aneurysm Neck: 2.9 mm
Aneurysm Dome: 6.9 mm
Dome/Neck Ratio: 2.4

Aneurysm Volume: 128.3 mm³
Packing Density: 24%

Treated with 4 coils.
Splenic embolization does not affect splenic function


- 60 pts after SAE, ~355d
- Spleen size smaller than in trauma control group w/distal embo. No H-J bodies.
- Distal location is not S-G location anyways

Pirasteh et al. Temporal Assessment of Splenic Function in Patients Who Have Undergone Percutaneous Image-Guided Splenic Artery Embolization in the Setting of Trauma. JVIR 2012 Jan;23(1):80-2

- 34 patients, SAE for trauma, ~4.4 yrs later.
- No hyposplenism. No H-J.

<table>
<thead>
<tr>
<th>Cohort</th>
<th>No. of Pts</th>
<th>Before Embolization</th>
<th>After Embolization</th>
<th>Median Change (%)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>60</td>
<td>349 ± 361</td>
<td>298 ± 309</td>
<td>~8 (~35 to 14)</td>
<td>.049</td>
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<tr>
<td>Nontrauma cohort</td>
<td>31</td>
<td>474 ± 495</td>
<td>399 ± 395</td>
<td>~8 (~28 to 4)</td>
<td>.068</td>
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<tr>
<td>Proximal embolization</td>
<td>20</td>
<td>494 ± 452</td>
<td>466 ± 434</td>
<td>~2 (~14 to 5)</td>
<td>.765</td>
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<tr>
<td>Distal embolization</td>
<td>11</td>
<td>436 ± 567</td>
<td>278 ± 298</td>
<td>~25 (~40 to 16)</td>
<td>.013</td>
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<tr>
<td>Trauma patients</td>
<td>29</td>
<td>224 ± 396</td>
<td>190 ± 95</td>
<td>~14 (~38 to 31)</td>
<td>.222</td>
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<tr>
<td>Proximal embolization</td>
<td>8</td>
<td>105 ± 65</td>
<td>215 ± 83</td>
<td>33 (8-56)</td>
<td>.051</td>
</tr>
<tr>
<td>Distal embolization</td>
<td>21</td>
<td>234 ± 92</td>
<td>180 ± 97</td>
<td>~27 (~54 to 9)</td>
<td>.034</td>
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<tr>
<td>Grade III injury</td>
<td>16</td>
<td>210 ± 105</td>
<td>202 ± 70</td>
<td>9 (~31 to 45)</td>
<td>.642</td>
</tr>
<tr>
<td>Grade IV injury</td>
<td>14</td>
<td>221 ± 73</td>
<td>176 ± 117</td>
<td>~20 (~59 to 10)</td>
<td>.140</td>
</tr>
</tbody>
</table>
ePTFE Stent Grafts

**Choices:** BX, SX

- 7mm device (5.5-6.5 SA) → 7Fr
  sheath 0.018” wire

- 7mm device (7mm SA) → 7Fr

- 7mm device (7mm SA) → 8Fr
  sheath 0.035” wire

Ziv J Haskal MD
Stent Graft Long Term results are sparse

- 18% clinically silent occlusions

Excessive Force: Pushing such sheaths deep into the splenic artery, around turns, potentially injuring, dissecting, damaging the vessel. Coils must be well-picked, matched to catheters. Stent grafts may be more cost effective when suitable.
Embolization (‘neuro-style’): 4Fr and Microcath

41 yo F, 2.6 cm aneurysm, arcuate ligament, celiac stenosis, failed attempt by VS

Parent vessel preservation: Occluded at 4 years
Conclusions

- THE MOST EFFECTIVE EXPEDIENT AND AVAILABLE THERAPY IS BEST
- S-Grafts have a role, esp as devices are selectively used in a minority of proximal and mid-splenic artery lesions.
- Splenic embolization actually, often capable of maintain parent vessel patency
Conclusion

- Approaches are myriad; Ideal is not defined
- Preservation of spleen perfusion is possible more than realized, using stents or framing/neuro-type approaches

- Preservation of spleen perfusion is possible more than realized, using stents or framing/neuro-type approaches
- Recognizing that ‘good enough’ and’ it’ll clot off’ is no longer suitable, given real chance of recanalization or unrecognized incomplete index embolization