Volume advantage matters

Clinical techniques utilizing Ruby™ coil and POD™ occlusion device

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Coil Embolization

- Microcoils – extremely important device for huge range of interventions
- Many different microcoils on the market
- Fibered, unfibered
- Catheter fixed (interlock mechanism) or pushable
- True Coil diameter between 0.012” and 0.015”
- Different lengths and configurations

Does Volume Matter?
Does Volume Matter?

- 62 y/o male patient
- SIRT planned
- Embolization GDA
Does Volume Matter?

- 69 y/o male patient
- Diffuse HCC
- SIRT planned
- GDA coil embo with 3 fibered standard microcoils

1 week later
Does Volume Matter?

- Coils in a good position
- Not only one coil but many coils
- In both cases – GDA not occluded after coil placement

What might be the problem in both cases?

- There are coils in the vessel – yes
- But they do not block the lumen
- Not enough coil volume
- Confidence in other mechanisms
  - Fibers
  - Slower blood flow
  - Occlusion after hours, days, weeks
Does Volume Matter?

- Many different microcoils on the market
- Fibered, unfibered
- Catheter fixed (interlock mechanism) or pushable
- Diameter between 0.012” and 0.015”
- Different lengths and configurations

YES, Volume Matters!
Volume Matters!

How do you create Volume?

\[ V \ (\text{mm}^3) = \pi \times \left(\frac{d}{2}\right) \times l \times 10 \]

\( V \) = volume in mm\(^3\)
\( d \) = coil diameter in mm
\( L \) = coil length in cm
# Volume Matters!

## How do you create Volume?

<table>
<thead>
<tr>
<th>Ruby™ Coil</th>
<th>High-Flow Microcatheter Penumbra PX SLIM™</th>
<th>60 cm Max Length</th>
<th>0.020&quot;</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Competitor A Coil</th>
<th>18 Catheter</th>
<th>60 cm Max Length</th>
<th>0.012&quot;</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Competitor B Coil</th>
<th>18 Catheter</th>
<th>30 cm Max Length</th>
<th>0.0135&quot;</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Competitor C Coil</th>
<th>18 Catheter</th>
<th>30 cm Max Length</th>
<th>0.015&quot;</th>
</tr>
</thead>
</table>
# Volume Matters!

<table>
<thead>
<tr>
<th>Coil</th>
<th>Coil Thickness</th>
<th>Longest 4 mm Coil</th>
<th>Longest 8 mm Coil</th>
<th>Longest 12 mm Coil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Penumbra Ruby Coil</strong></td>
<td>.020&quot;</td>
<td>1 Ruby</td>
<td>1 Ruby</td>
<td>1 Ruby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 mm × 35 cm</td>
<td>8 mm × 60 cm</td>
<td>12 mm × 60 cm</td>
</tr>
<tr>
<td><strong>Competitor A</strong></td>
<td>.0125&quot;-.0145&quot;</td>
<td>9 coils = 1 Ruby</td>
<td>4 coils = 1 Ruby</td>
<td>3½ coils = 1 Ruby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 mm × 10 cm</td>
<td>8 mm × 30 cm</td>
<td>12 mm × 30 cm</td>
</tr>
<tr>
<td><strong>Competitor B</strong></td>
<td>.012&quot;</td>
<td>6½ coils = 1 Ruby</td>
<td>8 coils = 1 Ruby</td>
<td>3½ coils = 1 Ruby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 mm × 15 cm</td>
<td>8 mm × 20 cm</td>
<td>12 mm × 50 cm</td>
</tr>
<tr>
<td><strong>Competitor C</strong></td>
<td>.014&quot;-.015&quot;</td>
<td>5½ coils = 1 Ruby</td>
<td>5 coils = 1 Ruby</td>
<td>3 coils = 1 Ruby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 mm × 13 cm</td>
<td>8 mm × 24 cm</td>
<td>12 mm × 34 cm</td>
</tr>
<tr>
<td><strong>Competitor D</strong></td>
<td>.014&quot;</td>
<td>7 coils = 1 Ruby</td>
<td>4 coils = 1 Ruby</td>
<td>4 coils = 1 Ruby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 mm × 10 cm</td>
<td>8 mm × 30 cm</td>
<td>12 mm × 30 cm</td>
</tr>
</tbody>
</table>
Volume Matters!

Long-term Outcomes of Coil Packing for Visceral Aneurysms: Correlation between Packing Density and Incidence of Coil Compaction or Recanalization

Taku Yasumoto, MD, PhD, Keigo Osuga, MD, PhD, Hiroshi Yamamoto, MD, Yusuke Ono, MD, Maki Masada, MD, Koji Mikami, MD, Daigo Kanamori, MD, Masahisa Nakamura, MD, Kaisyu Tanaka, MD, Tetsuro Nakazawa, MD, PhD, Hiroki Higashihara, MD, PhD, Noboru Maeda, MD, PhD, and Noriyuki Tomiyama, MD, PhD

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- 46 true visceral aneurysms
- Mean packing density
  - lower in patients with coil compaction or recanalization 12 vs. 22% (p=0.00014)
  - Packing density ≥ 24% → no compaction, no recanalization
Ruby™ Coils

• Reduce the number of coils per case
• Reduce procedure time and radiation exposure
• Reduce the costs

ONE 8x30 cm RUBY™ Coil

ONE 30 cm Conventional Detachable Coil
- Penumbra Occlusion Device (POD™) is specifically designed to occlude vessels
- Distal Anchor Segment – to “anchor” in straight and high flow vessels!
- High Flow microcatheter compatible (.025”- .027”)
- Treats 3 mm to 8 mm vessels
- 4mm/30cm (3-4mm)
- 5mm/30cm (4-5mm)
- 6mm/50cm (5-6mm)
- 8mm/60cm (6-8mm)
Ruby® 4mm x 20cm

4mm non-tapered glass tube with flow
One POD5 Occluded the GDA Instantly

Dr. Ryan Majoria, Baton Rouge, LA
Case 1

- 31 y/o female patient
- Large aneurysmatic bone cyst with destruction of right os ilium/pubis
- Surgery planned with prior embolization
- One embolization session some weeks ago
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- 31 y/o female patient
- Large aneurysmatic bone cyst with destruction of right os ilium/pubis
- Surgery planned with prior embolization
- One embolization session some weeks ago
Case 1

8x conventional microcoil

5x Ruby
Case 1

- 31 y/o female patient
• Surgery without complications – no bleeding
Case 1

- Less coils for more embolization
- Vessel lumen immediately completely blocked
- Shorter intervention time
- Less radiation dose

8x microcoil

5x Ruby 0.020"

0.012"

0.012"
Case 2

- 54 y/o female patient
- 21mm true aneurysm of the splenic artery
- Very broad based neck
- Embolization planned
Case 2

- 6F transbrachial approach, 80cm 6F sheath, 5F multipurpose catheter
- Strategy: Stent protection – coil placement
Case 2

- 0.014” guidewire
- 4F self-expandable stent 6/60mm
Case 2

- 0.014” guidewire, Xpert 6/30 Stent hard to advance – but no chance to deploy due to high friction
- Change to Astron Pulsar 6/60

after deployment

Optimal position – aneurysm neck covered
Case 2

- 0.014” guidewire through stent struts → aneurysm – microcatheter → aneurysm

1st Ruby Coil 28/60
Case 2

- More and more Ruby coils....

... better and better packing density
Case 2

- Peripheral parts optimal – central parts suboptimal – but sufficient
Case 2

- Successful compete exclusion of the VAA
- 7 Ruby coils standard and soft
- No complications
- Splenic artery still perfused
- Spleen regular
Case 3

- 77 y/o male patient
- History of ACBP and LIMA-LAD Bypass
- PAU (=penetrating aortic ulcer) with large pseudo aneurysm in the ascending aorta
Case 3

Total volume 23ml
Embolization with 25 microcoils (standard fibered microcoils 0.012")
Case 3

- CT Scan 3 days later
- Aneurysm still perfused, insufficient packing density.
- At the moment no more embolization planned – wait and see
Case 3

- CT Scan 2.5 month later
- Aneurysm still perfused, new small PSA ascending aorta
Case 3

- Embolization of small aneurysm and further embolization of large aneurysm planned in order to exclude it completely
Case 3

- SW II 5 French Macro catheter, Penumbra PX Slim 90° Micro catheter
- 2 Coils, 18x57 Standard, 16x50 Soft
Case 3

- Side-Winder – no stable position in “configured” configuration
- “Unconfigured” – excellent position
Case 3

- Peripheral part of the aneurysm excluded – central part still perfused

before

after
Case 3

- PX Slim 90° Tip Microcatheter
- 2nd embolization: 11 coils
  - 3x 32x60 Standard
  - 20x60 Soft
  - 2x 8x60 Soft
  - 2x 28x60 Standard
  - 8x35 Soft
  - 8x60 Soft
  - 6x30 Soft
Case 3

- Excellent result
- No complications
- Both pseudoaneurysms completely excluded
✓ Volume Matters - \( V (\text{mm}^3) = \pi \times \left(\frac{d}{2}\right) \times l \times 10 \)

✓ Greater Diameter + Greater Length = More Volume

✓ More Volume \(\rightarrow\) immediate vessel/aneurysm occlusion

✓ More Volume means

\(\rightarrow\) less compaction

\(\rightarrow\) less recanalization
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