RUBY™

Large Volume Detachable Coil
RUBY
NEW SOLUTIONS IN PERIPHERAL THERAPY

THE “PERFECT” DEVICE FOR VISCERAL ANEURYSMS

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The “Mission is possible”

Deliver coils large as 0,035”

…through microcatheter

… with more softness
Coils Physical Properties

Structural Properties

**Material**
- Pure
- Alloy
  - Platinum
  - Tungsten
  - Nickel

**Detachment System**
- Uncontrolled
- Controlled
  - electrolytic
  - hydraulic
  - mechanical
  - electrothermal

**Others**
- Fibered
- Non fibered
Physical Properties of Coils

Stiffness/Softness

**Stiffness** = \( \frac{D_1^4 \cdot G}{8 \cdot D_2^3 \cdot n} \)

- \( D_1 \) = Diameter of the stock wire (primary structure)
- \( D_2 \) = Diameter of the first coiling (secondary structure)
- \( D_3 \) = Diameter of the second coiling (tertiary structure)

**G** = Shear modulus (almost constant for metal used)

**n** = number of wraps per unit distance
The Importance of $D_2$

Stiffness = \[ \frac{D_1^4 \cdot G}{8D_2^3 n} \]

With the same stock wire....

- Stiffness - 57% ↓
- Packing Attenuation +43% ↑
- More volume filling

The D2 also significantly impacts both coil softness and packing attenuation
Penumbra Coil Advantages
Softness & Filling

$D_1 = 0.0015$ inch.

$D_2 = 0.020$ inch.

- Stretch resistant nitinol wire
- Inner structural shape memory coil
RUBY™
Large Volume Detachable Coil

• Similar in size to 035 Coils (“Macrocoils”)
• Microcatheter deliverable
• Enhanced softness
  – Complex Standard – “Frame”
  – Complex Soft – “Fill”
• Longer Lengths ( up to 60 cm) Embolization Coil
• Large Volume Filling & High Packing Density
• 1-click Mechanical Detachment
SOFTNESS

• Multiple softness levels (Standard & Soft)

• Superior and controlled packing

• Prevents catheter kick-out
<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>
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<tbody>
<tr>
<td><strong>Penumbra Ruby™ Coil</strong></td>
<td>.020&quot;</td>
<td>1 Ruby 4 mm x 35 cm</td>
<td>1 Ruby 8 mm x 60 cm</td>
<td>1 Ruby 12 mm x 60 cm</td>
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<tr>
<td><strong>Covidien Concerto™ / Axium™</strong></td>
<td>.0125&quot;-.0145&quot;</td>
<td>9 coils = 1 Ruby 4 mm x 10 cm</td>
<td>4 coils = 1 Ruby 8 mm x 30 cm</td>
<td>3½ coils = 1 Ruby 12 mm x 30 cm</td>
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<td><strong>Boston Scientific Interlock™</strong></td>
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<td>6½ coils = 1 Ruby 4 mm x 15 cm</td>
<td>8 coils = 1 Ruby 8 mm x 20 cm</td>
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<td><strong>Terumo Azur® CX Hydrocoil</strong></td>
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<td>5½ coils = 1 Ruby 4 mm x 13 cm</td>
<td>5 coils = 1 Ruby 8 mm x 24 cm</td>
<td>3 coils = 1 Ruby 12 mm x 34 cm</td>
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<td><strong>Codman Helipaq®</strong></td>
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<td>7 coils = 1 Ruby 4 mm x 10 cm</td>
<td>4 coils = 1 Ruby 8 mm x 30 cm</td>
<td>4 coils = 1 Ruby 12 mm x 30 cm</td>
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</table>
VOLUME ADVANTAGE

Ruby™ Coil
High Flow Microcatheter
Penumbra PX SLIM™

Interlock™ 35 Coil
035 Diagnostic Catheter

NOT microcatheter compatible
VOLUME ADVANTAGE

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

ONE 8x30 cm RUBY™ Coil

ONE 30 cm Conventional Detachable Coil
COMPLETE CONTROL

• Fully retractable and re-sheathable coil
• 1-click Active mechanical detachment

Penumbra Detachment Handle

Instant 1-click detachment
Ruby Detachment Handle
RUBY™ SIZE MATRIX

- Widest range of coil sizes ranging from 2 mm x 1 cm to 32 x 60 cm

- Complex Standard – FRAME coil

- Complex Soft – FILL coil

“the use of complex shaped coils allow higher packing density....”
“...a reduced incidence of recanalization was observed after endovascular embolization with complex-shaped bare platinum coils”
## SIZE MATRIX

### Frame
- Complex Standard

### Fill
- Complex Soft

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# MICROCATHERETE COMPATIBILITY

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<th>Product Name</th>
<th>Compatibility with RUBY™</th>
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<tr>
<td>Penumbra PX SLIM™</td>
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<td>Hi Flo Renegade</td>
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<td>Progreat 2.8 Omega</td>
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<td>Xcelsior XT 27</td>
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TECHNOLOGY HELPS TO OVERPASS OPERATOR LIMITS
CHOOSE HORSES FOR COURSES
Female, 56 years
CT occasional evidence of splenic artery pseudoaneurysm (28x20mm)
Splenic digital angiography with diagnostic catheter

High flow microcatheter inside the pseudoaneurysm

✓ visceral aneurysm: SPLENIC PSEUDOANEURYSM NEXT TO BIFORCATION
✓ visceral aneurysm: SPLENIC PSEUDOANEURYSM NEXT TO BIFORCATION

Splenic pseudoaneurysm embolization with Penumbra coils
Splenic pseudoaneurysm embolization with Penumbra coils
Splenic pseudoaneurysm embolization with Penumbra coils
✓ visceral aneurysm: SPLENIC PSEUDOANEURYSMS

Splenic pseudoaneurysm embolization with Penumbra coils
✓ visceral aneurysm: CELIAC TRUNK

CELIAC TRUNK embolization with Penumbra coils
✓ visceral aneurysm: CELIAC TRUNK

CELIAC TRUNK embolization with Penumbra coils
✓ visceral aneurysm: CELIAC TRUNK

CELIAC TRUNK embolization with Penumbra coils
✓ visceral aneurysm: SPLENIC ANEURYSM & RENAL ADK

Male, 45 years
Previous neurosurgical asportation infratentorial mass
CT occasional evidence of splenic artery aneurysm and renal ADK
✓ visceral aneurysm: SPLENIC ANEURYSM & RENAL ADK

Aortography with 5F Pigtail catheter, showing splenic artery aneurysm (3 cm)  

Selective of splenic artery with Cobra guiding catheter
Splenic aneurysm embolization with Penumbra coils
✓ visceral aneurysm: SPLENIC ANEURYSM & RENAL ADK

Splenic arteriography after splenic aneurysm embolization

- coils total length: 636 cm
- number of coils released: 16
- fluoroscopy time: 9'38"
- coil release rate: 1.1 cm/s
✓ visceral aneurysm: SPLENIC ANEURYSM & RENAL ADK

During the same procedure, renal mass pre-nephron sparing surgery embolization was performed with Onyx 18, with good deafferentation of the lesion.
✓ visceral aneurysm: SPLENIC ANEURYSM & RENAL STENOSIS

Male, 65 years
Recent decline of renal function and poor pressure control after a successful renal transplantation
CT occasional evidence of splenic artery aneurysm

Severe stenosis in the anastomosis of renal transplant artery
Splenic artery aneurysm (45x30mm)
✓ visceral aneurysm: SPLENIC ANEURYSM & RENAL STENOSIS

Selective renal transplant artery from right femoral artery approach

Arteriography after stenting renal transplant artery (Hercunlink 6.5x15mm)
✓ visceral aneurysm: SPLENIC ANEURYSM & RENAL STENOSIS

Splenic aneurysm embolization with Penumbra coils

- coils total length: 356cm
- number coils released: 6
- total releasing time: 18’
✓ visceral aneurysm: RENAL ANEURYSM 2

Male, 52 years
CT occasional evidence of renal aneurysm
✓ visceral aneurysm: RENAL ANEURYSM 3

Female, 63 years
CT evidence of renal aneurysm
✓ visceral aneurysm: RENAL ANEURYSM 3

Female, 63 years
CT evidence of renal aneurysm
✓ visceral aneurysm: RENAL ANEURYSM 3

Female, 63 years
CT evidence of renal aneurysm
Female, 52 years
CT occasional evidence of renal aneurysm
✓ visceral aneurysm: RENAL ANEURYSM

Renal artery selective with guiding catheter
✓ visceral aneurysm: RENAL ANEURYSM

Double Solitaire stent placement

Final control after Penumbra coils embolization
✓ visceral aneurysm: RENAL ANEURYSM

6 months follow up
✓ visceral aneurysm: SMA ANEURYSM IN ANATOMIC VARIANT

Male, 38 years
Motorbike crash during Paris-Dakar race
✓ visceral aneurysm: SUPERIOR MESENTERIC ARTERY ANEURYSM

Stentgraft superior mesenteric artery
✓ visceral aneurysm: SUPERIOR MESENTERIC ARTERY ANEURYSM

Penumbra coils embolization
✓ visceral aneurysm: SUPERIOR MESENTERIC ARTERY ANEURYSM

Final control
✓ visceral aneurysm PENUMBRA RUBY COILS

THANKS FOR YOUR ATTENTION
RUBY™
Large Volume Detachable Coil

Penumbra