Endovascular Techniques for Visceral Artery Aneurysm Treatment

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Disclosure

Speaker name:
.....Stefan Müller-Hülsbeck..........................................................

I have the following potential conflicts of interest to report:

☒ Consulting: Terumo, Boston Scientific, Eurocor Tech
☐ Employment in industry
☐ Stockholder of a healthcare company
☐ Owner of a healthcare company
☐ Other(s)

☐ I do not have any potential conflict of interest
Indication for treatment I
- due to a higher risk of rupture

- elective repair is preferable in the appropriately chosen patient

I. splenic artery aneurysms measuring 2 cm or larger and those found in women of childbearing age, > 4 cm cirrhotic patients
II. persons undergoing liver transplantation
III. Hepatic artery aneurysms 2 cm or larger
IV. Superior Mesenteric Artery + non-symptomatic Renal Artery > 1 to 1.5 cm)
V. those that are multiple or non-atherosclerotic in nature

Indication for treatment II
- due to a higher risk of rupture

• treatment indicated regardless location or measure
  I. visceral artery pseudoaneurysms

(increasing incidence / iatrogenic / pancreatitis)


• reperfusion is an important complication of endovascular management

Access – transbrachial, left

- proper stability of the vascular access platform
- triaxial system
  I. reinforced vascular sheath (90 cm)
  II. 6-F guiding or 5-F diagnostic angled catheter
  III. microcatheter + .014 / .018 inch guidewire
Endovascular treatment options

- **Stent-graft**
  - Main branches, easily accessible, proximal
  - Atrium V12 (.035+.014), Viabahn (.035+0.018), Fluency, Wallgraft, ...

- **Aneurysm with coils**
  - Narrow neck
  - Numerous detachable: Concerto, Retracta, Azur, Ruby, ...

- **Blocking of inflow and outflow**
  - Ruptured aneurysm
  - Coils, AVP, ...
Endovascular treatment options

• **BMS (open-cell, SES) neck support**
  Coiling through • Solitaire, Expert, ...
  = wide neck

• **Flow-diverter**
  = preservation of side branches

• **Glue**
  N-Butyl-2-cyanoacrylate (Histoacryl)
  Ethylene Vinyl Alcohol Copolymer (Onyx)
  = peripheral locations

Aneurysm

Blood vessel
Narrow neck – dens packing technique (>24%)

• Packing density >24%

“... correlation between packing density and incidence of coil compaction or recanalization”

Comparing coils

VOLUME ADVANTAGE

<table>
<thead>
<tr>
<th>Coil</th>
<th>Thickness</th>
<th>4 mm Coil</th>
<th>8 mm Coil</th>
<th>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 x 35 cm</td>
<td>8 mm x 60 cm</td>
<td>12 mm x 60 cm</td>
</tr>
<tr>
<td><strong>Medtronic Concerto™</strong></td>
<td>.0115&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 x 10 cm</td>
<td>8 mm x 30 cm</td>
<td>12 mm x 30 cm</td>
</tr>
<tr>
<td><strong>Boston Scientific Interlock™</strong></td>
<td>.012&quot;</td>
<td>6½ coils = 1 Ruby</td>
<td>8 coils = 1 Ruby</td>
<td>5½ coils = 1 Ruby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 mm x 15 cm</td>
<td>8 mm x 20 cm</td>
<td>12 mm x 30 cm</td>
</tr>
<tr>
<td><strong>Terumo Azur® CX</strong></td>
<td>.014&quot; - .015&quot;</td>
<td>5½ coils = 1 Ruby</td>
<td>4½ coils = 1 Ruby</td>
<td>3 coils = 1 Ruby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 mm x 13 cm</td>
<td>8 mm x 28 cm</td>
<td>12 mm x 38 cm</td>
</tr>
</tbody>
</table>

a. Data on file at Penumbra, Inc. Coil volumes were calculated using cylindrical volume, \( \pi r^2 h \), where radius is equal to half of the coil thickness and height is equal to coil length. Using calculated coil volumes, quantity of competitor coils required to equal a single Ruby coil was determined. Results may not be indicative of clinical performance.
Chronic Pancreatitis – bleeding from Pseudoaneurysm I
Transbrachial access
7F – 90cm
Spartacore .014
MP 5F
Before
Viabahn™ 8x50mm

After
Viabahn™ 8x50mm

at 6 months
Endovascular Treatment of Visceral Artery Aneurysms and Pseudoaneurysms in 100 Patients: Covered Stenting vs Transcatheter Embolization

Massimo Venturini, MD¹, Paolo Marra, MD¹, Michele Colombo, MD¹, Marco Alparone, MD¹, Giulia Agostini, MD¹, Luca Bertoglio, MD²,

Abstract

Purpose: To retrospectively report a large single-center experience of visceral artery aneurysms (VAAs) and pseudoaneurysms (VAPAs) treated with covered stenting (CS) as the first therapeutic option vs transcatheter embolization (TE). Methods: One hundred patients (mean age 59±14 years; 58 men) underwent 59 elective and 41 emergent endovascular procedures to treat 51 VAAs and 49 VAPAs. Seventy patients had TE and 30 received CS (27 Viabahn and 3 coronary stent grafts). Both TE and CS were performed in 10 cases. Results: Technical success was 96% (97% CS, 96% TE), and 30-day clinical success was 83% (87% CS, 81.4% TE). Four major complications occurred; 30-day mortality was 7%, mainly due to septic shock following pancreatic surgery. The midterm follow-up was 20.8 months in the total population and 32.8 months in the CS group. More than 6 months after CS all aneurysms remained excluded; stent patency was achieved in 88%. Twelve CS patients with >3 years’ follow-up had maintained stent patency. Conclusion: In endovascular treatment of visceral aneurysms, covered stenting was feasible in 30%. CS showed a slightly better efficacy than TE and good midterm patency. The Viabahn covered stent seems to be suitable for endovascular repair of tortuous visceral arteries affected by true or false aneurysms.
Splenic artery aneurysm – flow diverter
Splenic artery aneurysm – flow diverter

Courtesy of
Maria Antonella Ruffino, MD, EBIR
Vascular Radiology
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http://diako.de
Endovascular Repair of Peripheral and Visceral Aneurysms
With the Cardiatis Multilayer Flow Modulator: One-Year
Results From the Italian Multicenter Registry

Maria Antonella Ruffino, MD, and Claudio Rabbia, MD, on behalf of the
Italian Cardiatis Registry Investigators Group

Vascular Interventional Radiology, San Giovanni Battista Hospital, Turin, Italy.

**Purpose:** To assess the efficacy of the Cardiatis Multilayer Flow Modulator (CMFM), a bare cobalt alloy self-expanding stent, in the treatment of peripheral and visceral artery aneurysms.

**Methods:** In this multicenter (n=22) prospective, voluntary registry, 54 patients (47 men; mean age 88 years, range 19–87) who underwent CMFM deployment for peripheral (n=36) or visceral aneurysms (n=18) in a variety of target arteries were enrolled between June 2009 and June 2010. Among the 54 lesions, 44 had a total of 53 side branches. The main effectiveness endpoint was stent and side branch patency with no aneurysm rupture or reperfusion at 1, 6, and 12 months after stent implantation. Outcome measures were complete aneurysm thrombosis and sac shrinkage. The safety endpoint was freedom from complications (death, aneurysm rupture, endoleak, need for reintervention, stent foreshortening, stent occlusion, and access-site sequelae). Aneurysms were categorized as saccular (type I) or fusiform (type II) without a side branch or with branch(es) in the sac (subtype A), neck (subtype X), or both (subtype AX). Kaplan-Meier estimates were calculated for primary and secondary endpoints. Sac shrinkage was correlated to aneurysm morphology subtypes and presence/absence of mural thrombus.

**Results:** Technical success was achieved in all patients. Mortality at 1 year was 5.5% (n=3), including 1 perioperative death. Six patients were lost to follow-up. There was no aneurysm rupture. Six (11.1%) stents occluded over the 1-year period; 3 asymptomatic patients were not treated, 2 symptomatic patients had successful stent dilation to restore patency, and 1 symptomatic patient required bypass (the only side branch lost). Cumulative primary and secondary patency estimates were 96.9% and 90.7% at 1 year. The cumulative side branch patency was 96.1% and the freedom from all complications was 83.0% at 1 year. Complete aneurysm thrombosis was recorded in 42 (93.3%) of 45 patients at 1 year. Percent diameter reduction was 15.5%, 3.8%, and 11.0% at 1, 6, and 12 months (p<0.05, respectively). Presence of mural thrombus did not influence the time course of shrinkage (p>0.05), while complex lesion anatomy (presence of side branches) delayed shrinkage (p<0.05).

**Conclusion:** Results at 1 year show that CMFM can be safely used in the treatment of PAA and VAA, with good results in terms of freedom from rupture, patency of the stents and side branches, complete aneurysm thrombosis, shrinkage, and acceptable freedom from morbidity and mortality.


**n=54**

**MORTALITY @1 Y: 5.5%**
**PRIMARY PATENCY: 86.95**
**SECONDARY PATENCY: 90.7%**

**SIDE BRANCH PATENCY: 96.1%**

**COMPLETE ANEURYSM THROMBOSIS: 93.3%**

**% DIAMETER REDUCTION:**
- 15.5% at 1 month
- 3.8% at 6 months
- 11.0% at 12 months
Inferior mesenteric artery aneurysm – asymptomatic, 17mm
Transbrachial access

7F – 90cm

Progreat™

Stent support

Concerto™
5-20mm x 15-50cm

X1 Distanz: 17.99 mm
X2 Distanz: 13.31 mm
Chronic Pancreatitis – bleeding from Pseudoaneurysm II
Groin access

Cobra 4F
BES (Papyrus) 3.5x20mm @ 7 atm

Runway 6F

Spartacore .014

Papyrus™
3.5x20mm
Chronic Pancreatitis – bleeding from Pseudoaneurysm II

at 2 months
Re-angiography at 2 months

Papyrus™
3.5x20mm
Cobra 4F & Progreat™

Concerto™
5mm x 15cm, 8mm x 30cm, 9mm x 30cm
Conclusion –
Endovascular techniques for visceral artery treatment

- Non-invasive imaging: **CTA**, MRA
- Indication evaluation & appropriate patient selection
- Safe access – tri-axial - transbrachial, left
- Treatment options - aneurysms morphology
  - Stent grafts (feasible in ≈ 30%)
  - Coils, Flow diverter
  - SES + Coils, Plugs, Glue/Onyx

- In case of coiling - dens packing technique (>24%) required to avoid early reperfusion!
- In case of bleeding, covered stents may be the primary treatment option, when technical feasible
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