Type I and II endoleak management

Marcus Treitl, MD, EBIR
Disclosure

Speaker name:

Marcus Treitl

I have the following potential conflicts of interest to report:

✔ Consulting: Medtronic, Abbott, Endoscout, C4 biomedical
Challenges of EL embolization

• Neighbourhood to vital structures
• Endoleaks have inflow and outflow ➔ risk of non-target embolization (e.g. ischemic colitis / spinal ischemia)
• Large and irregular cavities to fill
  – Often larger than they seem in CT scan!!
• Sometimes difficult access / complex anatomy
• High blood flow velocities / turbulent flow
Embolization of Endoleaks: Which embolic agent?

- **Coils**
  - Broadly available, easy, safe
  - Unable to fill complex endoleak cavities completely
  - Recanalization, limited control

- **Thrombin**
  - Broadly available, easy
  - Requires experience, limited control, high risk of non-target embolization
  - Highest rates of recanalization

- **Cyanoacrylate glue**
  - Lower cost
  - Requires even more experience, risk of catheter encasement
  - High rates of recanalization, limited availability
Why Onyx as embolic for endoleaks?

- **Liquid embolic agent**
  - Excellent visualization even in CT fluoro
  - Flow directed
    - Expansion of embolic cast follows blood flow
  - Different viscosities
    - Even in high-flow conditions
  - Slowly hardening embolic agent
    - Shapeable, fills endoleak cavity completely
  - Excellent control
    - Stop of injection = Stop of embolization
- Compatible with ePTFE
- Very low recanalization rate
- Lower risk of catheter occlusion or encasement
Drawback of the standard formula

- Tantalum for radiopacification
  - strong CT beam hardening artifacts
  - Metallic foreign body in radiography
- Onyx™ 34L
  - Less tantalum, less streak artifacts on CT
Type 1 endoleaks: insufficient sealing at the landing zones

- Systolic blood pressure in aneurysm sack supposedly high risk for growth / rupture

Treatment options:
- Repeat stenting / stent-grafting / ballooning / endostapling
  - in case of insufficient landing zone / stent disconnection
- Endovascular embolization:
  - During or post EVAR
  - Type 1 endoleaks: insufficient sealing at the landing zones
Avoid combination of coils and Onyx to fill large endoleak cavities:
- Coils will prevent Onyx from filling the endoleak cavity completely
  ➢ High risk of re-perfusion!
CTA prior to embolization

CTA after the embolization

9/15
Type 2 endoleaks: reverse blood flow in side branches

- **Typical findings:**
  - Fed by inferior mesenteric artery
  - Fed by lumbar arteries via ilio-iliaic artery
Type 2 endoleaks: treatment strategies

• **Follow-up surveillance**
  – as long as there is no growth of the aneurysm sack
    • 40% occlude spontaneously
  – 2 potential treatment patterns
    • Trans-arterial via superficial mesenteric artery / hypogastric artery
      – can be complex
      – reaching the endoleak cavity essential
        » Otherwise high recurrence rate!
    • Trans-lumbar direct puncture
      – e.g. CT-guided
Type 2 endoleak following EVAR
Type 2 endoleak, fed by lumbar arteries.

Introduction of microcatheter into catheter needle after withdrawal of steel core by use of Y-adaptor.
**Meta-Analysis:**

Sidlof DA, et al. 2013

### Table 3: Outcomes of translumbar embolizations to treat type II endoleaks after endovascular repair

<table>
<thead>
<tr>
<th>Reference</th>
<th>No. of interventions</th>
<th>Clinical success</th>
<th>Persistent or recurrent leak</th>
<th>Secondary reinterventions</th>
<th>Sac decreased or stable</th>
<th>Complications</th>
<th>Conversion</th>
<th>Rupture</th>
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<tbody>
<tr>
<td>Stavropoulos et al.</td>
<td>9</td>
<td>6</td>
<td>3</td>
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<td>8</td>
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<td>Martin et al.</td>
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<td>13</td>
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<td><strong>Massis et al.</strong></td>
<td><strong>24</strong></td>
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</tr>
</tbody>
</table>

Follow-Up – 21.7M

- 28.5% unsuccessful
- Trans-lumbar > Trans-arterial
- 81% vs. 62.5%, p = 0.024
- Re-interventions in 16.4%

### Table 4: Outcomes of transarterial embolizations to treat type II endoleaks after endovascular repair

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<thead>
<tr>
<th>Reference</th>
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<tr>
<td>Sheehan et al.</td>
<td>19</td>
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<td>Kasirajan et al.</td>
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<td>Haulon et al.</td>
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<td>Renal dysfunction</td>
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<td>Solis et al.</td>
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<td>Mesenteric thrombosis</td>
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<td>Faries et al.</td>
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<td>Minor</td>
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<tr>
<td>Baum et al.</td>
<td>20</td>
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</table>

Follow-Up – 24.5M

*Includes data from type I endoleaks. MI, myocardial infarction; CHF, congestive heart failure.

- 51 pat. w type 2 EL, 65 interventions
  - 17 Onyx (trans-lumbar direct puncture)
  - 48 Non-Onyx embolizations: coiling, glue, etc.
  - Follow-up 13.7 mths

- Long term success:
  - 20% multiple interventions
- Onyx: significantly better long term success:
  - 91% vs. 23%, p < .001

**Table V. Multivariable logistic regression of long-term interventional success of initial secondary intervention**

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>95% CI</th>
<th>P value</th>
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<tbody>
<tr>
<td>Onyx glue</td>
<td>59.61</td>
<td>4.78-742.73</td>
<td>&lt;.001</td>
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<tr>
<td>Procedure year</td>
<td>0.83</td>
<td>0.63-1.08</td>
<td>.17</td>
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<tr>
<td>Coronary artery disease</td>
<td>2.11</td>
<td>0.37-12.12</td>
<td>.4</td>
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<tr>
<td>Age</td>
<td>0.95</td>
<td>0.84-1.08</td>
<td>.45</td>
</tr>
<tr>
<td>Hypercholesterolemia</td>
<td>0.69</td>
<td>0.11-4.14</td>
<td>.68</td>
</tr>
<tr>
<td>Clopidogrel</td>
<td>0.83</td>
<td>0.02-34.63</td>
<td>.92</td>
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</tbody>
</table>

CI, Confidence interval; OR, odds ratio.
Management of type 1 and 2 EL: own experience

- **High technical and clinical success rates**
  - Primary success: 88.9% / Secondary success: 94.4%
  - Permanent failure in one case

- **Role of additional coils**
  - Anchoring not necessary, even with high / turbulent flow
  - For occlusion of outflow vessels
  - Not to fill the main cavity
    - Maybe cause of revascularization

- **Drawbacks**
  - Time consuming
  - Injection pain: prepare patient
    - Pain stops when outflow vessels are occluded
  - CT beam hardening artefacts caused by Onyx
Summary: endoleaks

• **Type 1 endoleaks may require prompt therapy**
  – *Re-Stenting / ballooning gold standard*
  – *Endovascular embolization as a new promising treatment option*

• **Type 2 endoleaks**
  – *Intensive follow-up, combined with stop of antiplatelet therapy if possible (40% occlude spontaneously)*
  – *Otherwise endovascular or percutaneous embolization is a safe treatment alternative*
    • *Percutaneous embolization for lumbar artery fed endoleaks or if endovascular approach failed*
Conclusion: endoleak treatment with onyx

- **Liquid embolic agent Onyx, +/- aortic stentgrafting is**
  - Safe, fast, easy to use
  - High technical and clinical success rates
    - lower recanalization rate than other embolics
  - Tantalum causes CT artifacts, may complicate CT surveillance
    - Solution: Onyx light with less Tantalum content
  - Durability remains unknown
- **Leads not always to sac shrinkage!**
Thank you very much for your attention!

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