Prophylactic embolization during EVAR to prevent Type 2 Endoleak: Routine, selective, sac-focused?
The Leipzig strategy: Technical details and results

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Disclosure

Speaker name: Daniela Branzan, MD

I have the following potential conflicts of interest to report:
  • Grants and Speaking Fees from:
    – Artivion
    – Bentley Innomed GmbH
    – Cook Medical
    – Cydar Medical
    – Endologix
AAA sac behavior and outcomes

AAA sac regression is a new paradigm for success after EVAR

Aneurysm sac expansion is independently associated with late mortality in patients treated with endovascular aneurysm repair

Aneurysm sac failure to regress after endovascular aneurysm repair is associated with lower long-term survival
Predictors of AAA sac enlargement

- JACSM Registry 2006 – 2015
- N=17 099 pts.
Endoleak Typ II - Treatment

Only indicated in case of sac enlargement.

Several treatments are available:

• Embolization
• conversion to open repair
• laparoscopic clipping

-> Recurrence of T2EL after 3 years: 50.0%

Patients need to be continuously monitored after EVAR to detect aneurysm growth and endoleaks, which increases the overall cost of AAA treatment.
### Table 3. Pooled ORs for association of commonly studied risk factors with Type II endoleak.

<table>
<thead>
<tr>
<th>Potential risk factors</th>
<th>No. of studies</th>
<th>Total no. of participants</th>
<th>Pooled OR</th>
<th>95% CI</th>
<th>P value</th>
<th>I²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>8</td>
<td>6278</td>
<td>0.37</td>
<td>0.31–0.43</td>
<td>&lt;0.001</td>
<td>99.0</td>
</tr>
<tr>
<td>Male</td>
<td>12</td>
<td>11775</td>
<td>0.83</td>
<td>0.67–1.02</td>
<td>0.059</td>
<td>46.4</td>
</tr>
<tr>
<td>Smoking</td>
<td>14</td>
<td>20477</td>
<td>0.71</td>
<td>0.55–0.92</td>
<td>&lt;0.001</td>
<td>86.4</td>
</tr>
<tr>
<td>Diabetes</td>
<td>10</td>
<td>7303</td>
<td>0.91</td>
<td>0.76–1.09</td>
<td>0.251</td>
<td>20.9</td>
</tr>
<tr>
<td>Hypertension</td>
<td>10</td>
<td>7281</td>
<td>0.98</td>
<td>0.85–1.12</td>
<td>0.484</td>
<td>0</td>
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<tr>
<td>Hyperlipidemia</td>
<td>7</td>
<td>5522</td>
<td>1.12</td>
<td>0.83–1.49</td>
<td>0.814</td>
<td>74.7</td>
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<tr>
<td>Chronic renal insufficiency</td>
<td>10</td>
<td>9201</td>
<td>0.85</td>
<td>0.53–1.36</td>
<td>0.600</td>
<td>85.3</td>
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<tr>
<td>COPD</td>
<td>10</td>
<td>5745</td>
<td>0.84</td>
<td>0.69–1.03</td>
<td>0.135</td>
<td>34.1</td>
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<td>Polytetrafluoroethylene-based endografts</td>
<td>7</td>
<td>8396</td>
<td>0.88</td>
<td>0.65–1.18</td>
<td>0.390</td>
<td>70.8</td>
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<tr>
<td>Anticoagulants</td>
<td>5</td>
<td>3758</td>
<td>1.27</td>
<td>0.97–1.67</td>
<td>0.537</td>
<td>0</td>
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<tr>
<td>Antiplatelet</td>
<td>5</td>
<td>3758</td>
<td>1.09</td>
<td>0.79–1.51</td>
<td>0.220</td>
<td>65.6</td>
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<tr>
<td>Patent IMA</td>
<td>3</td>
<td>4353</td>
<td>1.98</td>
<td>1.06–3.71</td>
<td>0.012</td>
<td>77.6</td>
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<tr>
<td>Number of patent lumbar arteries</td>
<td>2</td>
<td>758</td>
<td>3.07</td>
<td>2.81–3.33</td>
<td>&lt;0.001</td>
<td>99.8</td>
</tr>
<tr>
<td>Maximum aneurysm diameter</td>
<td>7</td>
<td>4858</td>
<td>0.23</td>
<td>0.17–0.30</td>
<td>&lt;0.001</td>
<td>98.0</td>
</tr>
</tbody>
</table>

Guo Q et al, PLOS ONE 2017
Prevention of Type-2-Endoleaks

Sac-Embolization


Pre-emptive embolization of side branches of the aneurysm sac

Sac embolization - Disadvantages

- No immediate T2EL exclusion

The artefacts produced by the coils on subsequent CT scans, potentially limiting the detection of endoleaks, especially smaller ones

An updated systematic review and meta-analysis of pre-emptive aortic side branch embolization to prevent type II endoleaks after endovascular aneurysm repair

Hok Yee Harry Yu, MBBS, FRCS (Edin), FHKAM (Surg), David Lindström, MD, PhD, FEBVS, Anders Wanhainen, MD, PhD, Gustaf Tegler, MD, Giuseppe Asciutto, MD, PhD, and Kevin Mani, MD, PhD, FEBVS, Uppsala, Sweden

ABSTRACT

Objective: Pre-emptive embolization of aortic side branches may be effective in preventing type II endoleaks (T2EL) based on a previous systematic review and meta-analysis by our group. Data up to 2019 was, however, only based on retrospective studies. The aim of the current study was to update the meta-analysis and evaluate the current evidence on this treatment strategy.

Methods: A systematic literature search was performed with the same keywords and strategies used in the previous study. The complementary search included all articles published from January 1, 2019, through May 29, 2022. The incidence of aneurysm sac growth was the primary outcome of interest.

Results: Four new studies were identified, including one randomized controlled study and one nationwide registry-based retrospective study. Overall, the incidence of sac size enlargement was 4.3% in the embolization group compared with 6.8% in the control group (odds ratio [OR], 0.38; 95% confidence interval [CI], 0.26-0.55), the incidence of T2EL was 19.7% vs 37.4% (OR, 0.38; 95% CI, 0.30-0.47), and the incidence of reintervention for T2EL was 1.2% vs 11.2% (OR, 0.12; 95% CI, 0.06-0.23).

Conclusions: Current evidence confirms lower incidence of aneurysm sac growth, T2EL, and reinterventions when pre-emptive embolization of aortic side branches is performed in conjunction with endovascular aneurysm repair, compared with no embolization. However, a higher level of evidence is still required to support a broad change of practice, including data on cost-effectiveness and on the potential effect on rupture. (J Vasc Surg 2023;1-7.)

Keywords: Aortic aneurysm; Embolization; EVAR; IMA; Lumbar artery; Type II endoleaks

Yu HYH,. J Vasc Surg. 2022 Nov 15:S0741-5214(22)02532-0.
Occlusion of the ostial Segment of LA and IMA

Coils

Vascular Plug

No particles or fluids (CAVE: distal embolization)

Techniques for SA and IMA Embolization

- Superior packing density / occlusion
- Less procedure / radiation time
- Higher costs

'Standard’-Coils

3-D / Volume-Coils

e.g. Penumbra 400 Coil

MVP (Medtronic)

IMPEDE® Embolization Plug

- 0.021” ID-compatible

Shape Memory Polymer
4F (.038” min ID)
Preemptive embolization of Side branches of the aneurysm sac
Technical Aspects and Challenges

Very large aneurysms sac:

- "open" the angle of a diagnostic catheter with a guiding catheter to reach the aortic wall
Technical Aspects and Challenges

Very large aneurysms sac:

- Deflectable steerable guiding-sheath (Oscor)
Technical Aspects and Challenges

Kinked access vessels

- “reinforced tower of power” and buddy wire

12-French sheath

Lunderquist Superstiff GW

Tower-of-power: 6-Fr. guiding-catheter, 5-Fr. diagnostic-catheter, Microcatheter
Loss of coils

- Removed with a snare
Problematic Patients / Exclusion Criteria

- Urgent repair required
- Renal insufficiency (GFR < 30 ml/min)
- Severe iliac kinking / aortic elongation
- Adipositas per magna
Patients to be excluded from pre-EVAR coil-embolization:

- Urgent repair required
- Renal insufficiency
- LA to be covered with the stent graft (LA2)
Preemptive embolization of Side branches of the aneurysm sac

<table>
<thead>
<tr>
<th></th>
<th>Patent</th>
<th>Coiled</th>
<th>Open before EVAR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>LA</td>
<td>481</td>
<td>370</td>
<td>111</td>
</tr>
<tr>
<td>IMA</td>
<td>108</td>
<td>86</td>
<td>22</td>
</tr>
<tr>
<td>Median</td>
<td>5 (1-8)</td>
<td>3 (1-8)</td>
<td>1 (0-5)</td>
</tr>
</tbody>
</table>

Preemptive embolization of Side branches of the aneurysm sac

Aneurysm Sac Diameter (mm)

mean follow-up 1.9 ± 1.3 years

### AAA sac shrinkage compared to literature

<table>
<thead>
<tr>
<th></th>
<th>VQI</th>
<th>VSGN</th>
<th>ENGAGE Registry</th>
<th>Leipzig Cohort</th>
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</thead>
<tbody>
<tr>
<td>Follow-up (Y)</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1.9 ± 1.3</td>
</tr>
<tr>
<td>N</td>
<td>14 817</td>
<td>1 802</td>
<td>698</td>
<td>139</td>
</tr>
<tr>
<td>AAA – Regression (%)</td>
<td>40</td>
<td>52</td>
<td>57</td>
<td>86</td>
</tr>
<tr>
<td>AAA – Stable (%)</td>
<td>35</td>
<td>39</td>
<td>40</td>
<td>7</td>
</tr>
<tr>
<td>AAA – Expansion (%)</td>
<td>25</td>
<td>9</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

References:
- [J Vasc Surg 2018;67:157-64.](#)
- [J Vasc Surg 2020;71:780-9.](#)
Thank you!

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