Multicenter data on the usage of large covered stents in aortic blisters/PAU instead of an EVAR device

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University Aortic Center of Ludwig Maximilian University Hospital Munich
Penetrating Aortic Ulcers (PAUs)

- Focal disruption of the intima & elastic lamina extending into the media from erosion of an atherosclerotic plaque.
- Calcification of part of the wall generates limited distensibility → focal lesions (≠ AAS)
- Accounts for 2-7% of AAS
- Increasing incidence

LOCATION:
- Aortic Arch ≈ 10%
- Descending Aorta ≈ 60%
- Abdominal Aorta ≈ 30%

PAU and IHM. Oderich et al CardioVasc Intervent Radiol 2018
- Primary Objective: Prevention of progression to aortic rupture and aortic dissection.

<table>
<thead>
<tr>
<th>Recommendation 20</th>
<th>Class</th>
<th>Level of evidence</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncomplicated type B intramural haematoma and penetrating aortic ulcer should be treated medically, and followed by serial imaging surveillance</td>
<td>I</td>
<td>C</td>
<td>121,122</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Recommendation 114</th>
<th>Class</th>
<th>Level</th>
<th>References</th>
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</thead>
<tbody>
<tr>
<td>In uncomplicated penetrating aortic ulcer, dissection, or intramural haematoma of the abdominal aorta, serial imaging surveillance is recommended.</td>
<td>I</td>
<td>C</td>
<td>[499,579]</td>
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<table>
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<tr>
<th>Recommendation 115</th>
<th>Class</th>
<th>Level</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>In patients with complicated penetrating aortic ulcer, dissection, or intramural haematoma, and in pseudoaneurysm in the abdominal aorta, repair is recommended.</td>
<td>I</td>
<td>C</td>
<td>[499,579]</td>
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<table>
<thead>
<tr>
<th>Recommendation 117</th>
<th>Class</th>
<th>Level</th>
<th>References</th>
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</thead>
<tbody>
<tr>
<td>In patients with complicated penetrating aortic ulcer, dissection, intramural haematoma, or pseudoaneurysm of the abdominal aorta, endovascular repair should be considered as a first option.</td>
<td>IIA</td>
<td>C</td>
<td>[45,216,217,301,499,691]</td>
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</table>
Case of infrarenal aortic PAU

- 70 year-old male
  - Sigmadiverticulitis
  - Pending sigmalesection surgery

**INDICATION:**
- >2cm
  - Pending open abdominal surgery
Treatment Options:
- Open repair
- **EVAR**: w/ standard bifurcated devices
  (large Fr, heavy calcification, narrow bifurc)
- **Straight Grafts**: Iliac Limbs, thoracic endografts,
  BeGraft aortic

**BeGraft® aortic**
- **Available ø**: 12 – 24mm
  (post-dilation ≈ 30mm)
- **Available lengths**: 19mm – 59mm
- **Sheath Compatibility**:
  ........ 9 F  Ø 12 mm
  ........ 11 F  Ø 14 and 16mm
  ........ 14 F  Ø 18 - 24 mm
BeGraft aortic

initial diameter

max. diameter**

12
9F

14
11F

16
11F

18
14F

20
14F

22
14F

24
14F

9F

24

30

all sizes in mm
Symptomatic aortic PAU

BeGraft aortic
22x48mm

Proximal Postdilatation to 26mm
Post–Op CTA

6 months: complete remodeling
Technical aspects – Balloon Shoulder

BGA Ø 12mm
Patient Cohort
- BeGraft® Aortic stent-graft in 9 European centers from 2017 to 2020
- 40 Patients, mean age of 74 years
- 63% male

Indication for treatment
- size/morphology of the iPAU (67.5%); mean diameter of 19± 12mm
- presence of symptoms (27.5%); mean diameter of 19± 11mm
- contained ruptures (5%); mean diameter of 23 ± 3mm
Results

Preoperative Anatomic Characteristics

[Diagram showing anatomic characteristics with measurements]
Results

Perioperative Data

- 98% technical success
- One rupture due to extensive oversizing

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Median operation time</td>
<td>58 min (19 – 170 min)</td>
</tr>
<tr>
<td>Median fluoroscopy time</td>
<td>8 minutes (3 – 34 min)</td>
</tr>
<tr>
<td>Mean contrast volume</td>
<td>80 ± 7.8mL</td>
</tr>
<tr>
<td>Oversize used</td>
<td>50% mean oversizing of 16,2%</td>
</tr>
<tr>
<td></td>
<td>20% no oversizing</td>
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<tr>
<td></td>
<td>30% mean undersizing of 14,9%</td>
</tr>
<tr>
<td>Number of Stents used</td>
<td>1 Stent 45%</td>
</tr>
<tr>
<td></td>
<td>2 Stents 37,6%</td>
</tr>
<tr>
<td></td>
<td>3 or 4 Stents 17,4%</td>
</tr>
<tr>
<td>Additional procedures</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>5 CERAB</td>
</tr>
<tr>
<td></td>
<td>3 Proximal extensions</td>
</tr>
<tr>
<td></td>
<td>2 Angioplasty of the iliac artery</td>
</tr>
</tbody>
</table>
Results

Thirty-day outcomes
- No mortality
- No aortic re-interventions
- 2.5% general reintervention
  - Hematoma evacuation

Mid-term Results
- 14 months median follow-up time (2–39 months)
- no vascular reinterventions or vascular-related deaths were reported
- in four patients, a type II endoleak was observed
Conclusion

- The treatment of iPAU with the BeGraft® Aortic Stent Graft is feasible and safe

- Balloon-expandable stentgrafts offer the option to repair iPAUs with a simple technique and a shorter coverage of the aorta.

- The low-profile sheaths necessary enable the treatment through calcified access vessels and of small diameter aortic bifurcations
Thank you

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EXPERIENCE WITH ABDOMINAL PAU

<table>
<thead>
<tr>
<th>Study (reference)</th>
<th>Number of patients</th>
<th>Mean age (y)</th>
<th>Sex (male/female)</th>
<th>Risk</th>
<th>Treatment</th>
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</thead>
<tbody>
<tr>
<td>Lagaay [21]</td>
<td>3</td>
<td>58</td>
<td>3/0</td>
<td>HTN-CAD</td>
<td>ABI (2)-tube (1)</td>
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<tr>
<td>Cornud et al. [22]</td>
<td>1</td>
<td>53</td>
<td>1/0</td>
<td>CAD</td>
<td>Tube</td>
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<td>Barbier et al. [23]</td>
<td>1</td>
<td>73</td>
<td>0/1</td>
<td>NA</td>
<td>ABI</td>
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<td>Toda et al. [34]</td>
<td>2</td>
<td>70</td>
<td>2/0</td>
<td>HTN-CAD-PAD</td>
<td>Surgical interposition graft</td>
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<td>Farooq et al. [35]</td>
<td>2</td>
<td>68</td>
<td>2/0</td>
<td>HTN (2)-PAD</td>
<td>ABI (1)-tube (1)</td>
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<td>Ganaha et al. [12]</td>
<td>31</td>
<td>71</td>
<td>15/16</td>
<td>HTN</td>
<td>Interposition stent graft</td>
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<td>Sensí et al. [44]</td>
<td>11</td>
<td>76.7</td>
<td>10/1</td>
<td>HTN (9)-CKD (1)-CAD (6)</td>
<td>ABI (4)-tube (1)- EVAR (6)</td>
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<tr>
<td>Eggebrecth et al. [45]</td>
<td>22</td>
<td>69.1</td>
<td>16/6</td>
<td>HTN (2)-CKD (9)-CAD (12)</td>
<td>EVAR (22)</td>
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<td>Thalheimer et al. [46]</td>
<td>1</td>
<td>57</td>
<td>1/0</td>
<td>HTN-CAD-PAD</td>
<td>EVAR (2)</td>
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<td>Dalainas et al. [47]</td>
<td>2</td>
<td>68.6</td>
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<td>HTN (2)-CKD (2)-CAD (5)</td>
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<td>Piffaretti et al. [48]</td>
<td>13</td>
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<td>EVAR (4)</td>
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<td>Fyntanidou et al. [49]</td>
<td>4</td>
<td>67</td>
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<td>HTN (4)-CKD (1)-CAD (1)</td>
<td>EVAR (19)</td>
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<td>Lindblad et al. [50]</td>
<td>19</td>
<td>72</td>
<td>16/3</td>
<td>NA</td>
<td>EVAR</td>
</tr>
</tbody>
</table>

Total: 230 patients

Mean age: 49/164 (29.9%)

115/164 (70.1%)

- 298 abdominal PAU from 1974-2015
- Series > 10pt: rare
- 40.3% asymptomatic
- 43.8%: Abdominal pain
- 11.9%: Hypovolemic shock

PAU of the abdominal aorta: A case report and review of literature.