Why 3xFEVAR has replaced 2xFEVAR and FEVAR better than CHEVAR?

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Disclosures

• William Cook Europe/Cook Inc.
  – Research Grants & Consulting

• Atrium Maquet
  – Consulting

• Bentley
  – Consulting
Lay-Out

- Introduction
- Evolution in Nuremberg
- Technical advantage of 3xFEVAR over 2xFEVAR
- Overall risk of the SMA
- Comparison with CHEVAR
2x, 3x, or 4x FEVAR
Choice According to Landing Zone
Standard (2x) FEVAR

- Short neck AAA
- Juxtarenal AAA
Complex (3x-4x) FEVAR

- Juxtarenal AAA
- Suprarenal AAA
- (Some type IV TAAA)
Complex FEVAR vs. Standard FEVAR

Theoretical Advantages

• Proximal sealing
  – Longer length
  – Healthier aortic wall

• Long term durability
  – Patients with longer life expectancy
Proximal Sealing Zone

• The longer the better?
  – Up to a limit
    • Landing below major intercostal arteries!
Comparison of outcomes for double fenestrated endovascular aneurysm repair versus triple or quadruple fenestrated endovascular aneurysm repair in the treatment of complex abdominal aortic aneurysms

Athanasios Katsargyris, MD, a Kyriakos Oikonomou, MD, a George Kouvelos, MD, a Hozan Mufty, MD, a Wolfgang Ritter, MD, b and Eric L. G. Verhoeven, MD, PhD, a Nuremberg, Germany

• Standard (2x) FEVAR

vs

• Complex (3x-4x) FEVAR
Nuremberg Experience

• **454 Consecutive pts**
  – Short neck, Juxtarenal, Suprarenal AAA
Nuremberg Series

• January 2010 – April 2018
  – Early: 1\textsuperscript{st} half of the series
    • Jan 2010-Feb 2014
  – Late: 2\textsuperscript{nd} half of the series
    • Mar 2014-Apr 2018

• FEVAR as first line treatment
  – Short neck, Juxtarenal, Suprarenal AAA

• Prospective Database
Nuremberg Series

- 454 patients
  - 412 male (90.7%)  
  - Mean age 72.5 ± 8 years
    - Early: 234 patients  
    - Late: 220 patients
Evolution of Stent-graft Design

↑ Use of Complex FEVAR over the years...
Stent-graft Design

<table>
<thead>
<tr>
<th></th>
<th>EARLY</th>
<th>LATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ Use</td>
<td>69.7%</td>
<td>19.1%</td>
</tr>
<tr>
<td></td>
<td>(163/234)</td>
<td>(42/220)</td>
</tr>
<tr>
<td>↓ Use</td>
<td>30.3%</td>
<td>80.9%</td>
</tr>
<tr>
<td></td>
<td>(71/234)</td>
<td>(178/220)</td>
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</table>

P < 0.001
Sealing Zone Length

<table>
<thead>
<tr>
<th>EARLY</th>
<th>LATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 mm</td>
<td>43 mm</td>
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</tbody>
</table>

$P < 0.001$

↑ Sealing zone length over the years...
Intraoperative data

<table>
<thead>
<tr>
<th></th>
<th>EARLY</th>
<th>LATE</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure Time (min)</td>
<td>151</td>
<td>159</td>
<td>0.121</td>
</tr>
<tr>
<td>Blood loss (ml)</td>
<td>286</td>
<td>264</td>
<td>0.262</td>
</tr>
<tr>
<td>Contrast (ml)</td>
<td>152</td>
<td>130</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fluoroscopy time (min)</td>
<td>50</td>
<td>51</td>
<td>0.87</td>
</tr>
</tbody>
</table>

↑ Complexity of FEVAR stent-graft design
→ Does not increase radiation/contrast
## Postoperative outcomes

<table>
<thead>
<tr>
<th></th>
<th>EARLY</th>
<th>LATE</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Success</td>
<td>96.6%</td>
<td>97.7%</td>
<td>0.578</td>
</tr>
<tr>
<td>Early Mortality</td>
<td>0.9%</td>
<td>0.5%</td>
<td>1</td>
</tr>
<tr>
<td>Major Complications</td>
<td>12%</td>
<td>9.5%</td>
<td>0.451</td>
</tr>
<tr>
<td>Spinal Chord Ischemia</td>
<td>0%</td>
<td>0.9%</td>
<td>0.502</td>
</tr>
<tr>
<td>Hospital Stay</td>
<td>8.4</td>
<td>8.1</td>
<td>0.671</td>
</tr>
<tr>
<td>Days ICU</td>
<td>0.5</td>
<td>0.6</td>
<td>0.754</td>
</tr>
</tbody>
</table>

↑ Complexity of FEVAR stent-graft design
→ Does not increase perioperative M&M
Technical Advantage
3xFEVAR over 2xFEVAR

• Planning feasibility
• DW (20mm) scallop
Technical Advantage
3xFEVAR over 2xFEVAR
Risk of adding SMA Fenestration

- Catheterization failures: $N=0$
- Bleeding/Perforation: $N=1$ (0.04%)
  - Coilembolization
- SMA stent occlusion: $N=1$ (0.04%)
  - (and also one in 2xFEVAR...)
- Dissection: $N=1$ (0.04%)
  - Spontaneous resolution
- Reinterventions: $N=2$ (0.08%)
  - One dissection and one distal stenosis
  - (also one in 2xFEVAR)
Comparison with CHEVAR

• In my opinion no comparison possible...
  – Why CHEVAR if suitable for FEVAR?

• Always situations where CHEVAR an option
  – Acute/Anatomical/Set-up
The PROTAGORAS study to evaluate the performance of the Endurant stent graft for patients with pararenal pathologic processes treated by the chimney/snorkel endovascular technique

Konstantinos P. Donas, MD, Giovanni B. Torsello, MD, Gianluca Piccoli, MD, Georgios A. Pitoulias, MD, Giovanni Federico Torsello, MD, Theodosios Bisdas, MD, Martin Austermann, MD, and Daniele Gasparini, MD, Münster, Germany; Udine, Italy; and Thessaloniki, Greece

- 2009-2013, 2 centers (Münster, Udine)
- 128 pts, 187 Chimneys
- Created neck length: $18.7 \pm 6.3\text{mm}$
Collected World Experience About the Performance of the Snorkel/Chimney Endovascular Technique in the Treatment of Complex Aortic Pathologies

The PERICLES Registry

Konstantinos P. Donas, MD,* Jason T. Lee, MD,† Mario Lachat, MD,‡ Giovanni Torsello, MD, PhD,§ and Frank J. Veith, MD;¶ on behalf of the PERICLES investigators


• Retrospective and selected Data!

• Created Neck length: 21mm
Collected World Experience About the Performance of the Snorkel/Chimney Endovascular Technique in the Treatment of Complex Aortic Pathologies

The PERICLES Registry

Konstantinos P. Donas, MD,* Jason T. Lee, MD,† Mario Lachat, MD,‡ Giovanni Torsello, MD, PhD,§ and Frank J. Veith, MD;¶ on behalf of the PERICLES investigators

Response From J.T. Lee:

We agree that the more snorkel/chimneys, the increasing risk for gutter type Ia endoleak. Basically, 1 snorkel graft works nearly perfectly every time, with minimal displacement of the main body endograft and a good seal. For us, 2 is probably the maximum that the approach consistently works well. When we’ve ventured into using 3 or 4 snorkels, you need to consider right-sided arm access, conduit placement in the left arm, increasing stroke issues, and need for longer snorkel grafts. In our series and others, the overall complication rate with 3 and 4 was higher both in the immediate term and in the follow-up compared to 1 or 2 snorkels.

→ 2 Chimneys Maximum!!
Take Home Message

• In Nuremberg 2xFEVAR replaced by 3xFEVAR

• CHEVAR only in cases were FEVAR not “possible”
Why 3xFEVAR has replaced 2xFEVAR and FEVAR better than CHEVAR?

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