Long-term outcomes of chimneys and periscopes in TAAA-repair

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Disclosures

- I do not have any potential conflicts of interest to report

- I have the following potential conflicts of interest to report:

  - Consulting: Cook, Shockwave
  - Employment in industry
  - Stockholder of a healthcare company
  - Owner of a healthcare company
  - Other(s)
Introduction

• Chimney technique first described in 2003 (Greenberg)

• To treat short necks (juxtarenal)

• Large data for JAA available (a.e. Pericles registry)

• Not much data for TAAA

• Achilles’ Heel: Type 1a (Gutter) Endoleak
# Chimney/Periscope/Sandwich in TAAA

## Total abdominal debranching hybrid thoracoabdominal aortic aneurysm repair versus chimneys and snorkels

Akiko Tanaka, MD, PhD, Gustavo S. Oderich, MD, and Anthony L. Estrera, MD

(JTCVS Techniques 2021;10:28-33)

## Summary

The table below presents outcomes after total endovascular thoracoabdominal aortic aneurysm repair. It includes data on immediate, late type I EL, reintervention for type I EL, and primary branch patency at 1 year. The values are presented as percentages unless otherwise noted.

### Table 2: Outcomes after total endovascular thoracoabdominal aortic aneurysm repair

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Mean age (y)</th>
<th>Urgent</th>
<th>Dissection</th>
<th>Extent I</th>
<th>Extent II</th>
<th>Extent III</th>
<th>Extent IVa</th>
<th>Operative death</th>
<th>Bowel ischemia</th>
<th>Acute renal failure</th>
<th>Permanent SCI</th>
<th>Immediate type I EL</th>
<th>Late type I EL</th>
<th>Reintervention for type I EL</th>
<th>Primary branch patency at 1 y (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobato et al. 2012</td>
<td>15</td>
<td>70</td>
<td>2 (13)</td>
<td>3 (20)</td>
<td>3 (10)</td>
<td>18 (62)</td>
<td>7 (24)</td>
<td>1 (3)</td>
<td>3 (20)</td>
<td>3 (20)</td>
<td>3 (20)</td>
<td>9 (60)</td>
<td>1 (7)</td>
<td>0 (0)</td>
<td>1 (7)</td>
<td>97.9</td>
</tr>
<tr>
<td>Schwoerer et al. 2014</td>
<td>32</td>
<td>70</td>
<td>16 (50)</td>
<td>5 (16)</td>
<td>7 (54)</td>
<td>2 (15)</td>
<td>2 (15)</td>
<td>2 (15)</td>
<td>2 (6)</td>
<td>1 (3)</td>
<td>2 (6)</td>
<td>1 (3)</td>
<td>5 (1.6)</td>
<td>NR</td>
<td>NR</td>
<td>92.5</td>
</tr>
<tr>
<td>Bin Jaber et al. 2016</td>
<td>51</td>
<td>77</td>
<td>31 (61)</td>
<td>1 (0.2)</td>
<td>0 (0)</td>
<td>8 (44)</td>
<td>7 (39)</td>
<td>2 (11)</td>
<td>5 (10)</td>
<td>1 (2)</td>
<td>NR</td>
<td>NR</td>
<td>5 (1.0)</td>
<td>2 (4)</td>
<td>4 (8)</td>
<td>95</td>
</tr>
<tr>
<td>Bannazadeh et al. 2020</td>
<td>26</td>
<td>67</td>
<td>11 (17)</td>
<td>0 (0)</td>
<td>9 (39)</td>
<td>5 (22)</td>
<td>9 (39)</td>
<td>0 (0)</td>
<td>4 (6)</td>
<td>2 (3)</td>
<td>5 (8.3)</td>
<td>0 (0)</td>
<td>NR</td>
<td>2 (5)</td>
<td>2 (5)</td>
<td>97.3</td>
</tr>
</tbody>
</table>

Values are presented as a percentage unless otherwise noted. EL, Endoleak; NR, not reported; SCI, spinal cord injury. *Supraaortic abdominal aortic aneurysm was included in extent I in thoracoabdominal aortic aneurysm. †Two of 3 cases presented with rupture. ‡Median.
Chimney/Periscope/Sandwich in TAAA

Results of chimney endovascular aneurysm repair as used in the PERICLES Registry to treat patients with suprarenal aortic pathologies (J Vasc Surg 2020;71:1521–7.)

Gergana T. Taneva, MD, a Frank J. Criado, MD, PhD, a Giovanni Torsello, MD, PhD, a Frank Veith, MD, PhD, a Salvatore T. Scali, MD, PhD, a Paul Kubilis, MD, PhD, a and Konstantinos P. Donas, MD, PhD, a on behalf of the PERICLES collaborators, Münster, Germany; Baltimore, Md; New York, NY; and Gainesville, Fla

- 67 patients
- 95.5% 3 chimneys & 4.5% 4 chimneys
- 204 chimney grafts
- Median FU 24m
- 30-day mortality: 6.1%
- Stroke: 2.9%
Chimney/Periscope/Sandwich in TAAA

- 67 patients
- 95.5% 3 chimneys & 4.5% 4 chimneys
- 204 chimney grafts
- Median FU 24m
- No SCI
- Sac Regression 70.5 – 66.9mm (p< .001)
Chimney/Periscope/Sandwich in TAAA

Outcome of visceral chimney grafts after urgent endovascular repair of complex aortic lesions

Adel Bin Jabr, MD, PhD, Bengt Lindblad, MD, PhD, Thorarinn Kristmundsson, MD, PhD, Nuno Dias, MD, PhD, Timothy Resch, MD, PhD, and Martin Malina, MD, PhD, Malmö, Sweden
(J Vasc Surg 2016;63:625-33.)

- 51 patients (43 EVAR, 8 TEVAR)
- 73 visceral CG
- Periscope 5 pt
- Median FU: 2.3y
- 30-d Mortality: 10%
- Primary EL1: 10%
- CG reintervention: 16%

A. Freedom chimney-related mortality
B. Type 1 EL
C. Aortic lesion-related mortality
D. All cause mortality

90.2% Juxta/pararenal

Insel Gruppe – Long-term outcomes of chimneys and periscopes in TAAA-repair
Chimney/Periscope/Sandwich in TAAA

Two-year evaluation of fenestrated and parallel branch endografts for the treatment of juxtarenal, suprarenal, and thoracoabdominal aneurysms at a single institution


- 38 patients with 107 snorkel/sandwich
- 32 pt FEVAR
- 30-day mortality: 2.6%
Chimney/Periscope/Sandwich in TAAA

- 38 patients with 107 snorkel/sandwich
- 32 pt FEVAR
- Reinterventions in FEVAR group: 15.6%
- Reinterventions in P/S group: 23.6%

Two-year evaluation of fenestrated and parallel branch endografts for the treatment of juxtarenal, suprarenal, and thoracoabdominal aneurysms at a single institution

Chimney/Periscope/Sandwich in TAAA

Two-year evaluation of fenestrated and parallel branch endografts for the treatment of juxtarenal, suprarenal, and thoracoabdominal aneurysms at a single institution


- Reinterventions for endoleak in FEVAR group: 0%
- Reinterventions for endoleak in P/S group: 13.1%

Type 4 TAAA
No long term follow up
Chimney/Periscope/Sandwich in TAAA

- 201 pt
- 343 TV
- 46.8% juxtarenal / 33.3% pararenal
- 5% TAAA type 4
- 15.1% prox. failures of prior repair
- 23.3% mortality after 14.7 ± 18m FU
- 11.9% 1a EL

*Post-operative Type 1a Endoleak.* The univariable analysis revealed two variables associated with proximal Type I EL on the first post-operative imaging: number of CG ≥ 2 (OR 3.4, 95% CI 1.3—8.9) as predictive factor and JRA repair (OR 0.14, 95% CI 0.04—0.5) as preventive factor. The preventive role of JRA was confirmed in multivariable analysis (OR 0.17, 95% CI 0.05—0.58).
Where do we have long-term follow-up?

**Juxtarenal AAA**
- 517 patients with mean FU 28.2m
- 244 patients with FU > 30m (47%)
- mean FU 46.6 m
Where do we have long-term follow-up?

- CG Patency at 5y: 90.5%
- EL1a: 5.9%
- Mortality 25.5%
- Mean sac regression: 7.8 ± 11.4mm (P < .0001)
- Sac growth: 5.2%
Where do we have long-term follow-up?

**Long-term chimney/snorkel endovascular aortic aneurysm repair experience for complex abdominal aortic pathologies within the PERICLES registry**

(J. Vasc Surg 2020;33(9):289)

Cargana T., Tateya, MD; T., Jason T., Lee, MD; Tran, MD; D., Ronald Dalman; D., Giovanni Torsello; D., Stefano Fazzini; D., Frank J., Veith; D. and Konstantinos P.; Donas, MD.

Langen and Münster, Germany; Madrid, Spain; Stanford, Calif; New York, NY; and Cleveland, Ohio

- CG Patency at 5y: 90.5%
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- Mean sac regression: 7.8 ± 11.4mm (P < .0001)
- Sac growth: 5.2%

**Table V. Anatomic and device predictive factors for late type 1a endoleak**

<table>
<thead>
<tr>
<th>Factor</th>
<th>OR</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximal AAA diameter per 10 mm</td>
<td>1.23</td>
<td>0.75-2.03</td>
<td>416</td>
</tr>
<tr>
<td>Sealing zone diameter &gt;50 mm</td>
<td>4.86</td>
<td>1.62-16.5</td>
<td>012</td>
</tr>
<tr>
<td>Absence of infrarenal neck</td>
<td>2.61</td>
<td>0.86-8.89</td>
<td>126</td>
</tr>
<tr>
<td>Snorkel length</td>
<td>0.99</td>
<td>0.89-1.09</td>
<td>864</td>
</tr>
<tr>
<td>Suprarenal fixation</td>
<td>1.07</td>
<td>0.22-5.17</td>
<td>929</td>
</tr>
<tr>
<td>Balloon-expandable CGs</td>
<td>2.63</td>
<td>0.36-12.2</td>
<td>217</td>
</tr>
<tr>
<td>Total CGs</td>
<td>0.50</td>
<td>0.16-1.59</td>
<td>244</td>
</tr>
<tr>
<td>Lining BMS</td>
<td>0.52</td>
<td>0.09-2.76</td>
<td>445</td>
</tr>
</tbody>
</table>

AAA: Abdominal aortic aneurysm; BMS: bare metal stent; CI: confidence interval; CGs: chimney grafts; OR: odds ratio.
Lessons learned

• Sufficient proximal sealing zone $\geq 20\%$

• Oversizing aortic graft: 30%

• Aortic neck $< 29\text{mm}$ ($28\text{mm} + 30\% = 36\text{mm}$)
Conclusion

• No long-term data available for chimney/periscope in TAAA

• **New:** long-term data for CHEVAR in juxtarenal AAA

• Long-term CG patency 90.5% at 5y

• Endoleak 1a remains Achilles’ Heel: rate early 1a EL > late 1a EL (ruptured AAA?)

• STOP using CHEVAR in ≥30mm necks or in absence of infrarenal neck
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