Experience from the PERICLES registry with the use of chimney grafts in the treatment of type I endoleaks after previous EVAR shows reproducible results

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**EVAR > EL-IA**

3,5 - 15,5%

*Millen, JVS, 2015  
Tadros, JVS, 2014*

**Time:** early or late EL-I?

**Cause:** migration or neck degeneration?

**Case:** emergent, urgent or elective?
EL-IA > treatments option

**ENDO**

- ✓ Ballooning
- ✓ Palmaz Stent
- ✓ Cuff
- ✓ Embolization
- ✓ Endoanchor
- ✓ FEVAR

**OPEN**

- ✓ Banding
- ✓ EG eplant + BP

✓ CHIMNEY GRAFTS
## EL-IA & Ch-EVAR > Literature Data

<table>
<thead>
<tr>
<th>Description</th>
<th>30D-M</th>
<th>EL-IA</th>
<th>Stent Patency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of parallel grafts to save failed prior endovascular aortic aneurysm repair and type 1a endoleaks</td>
<td>5.5%</td>
<td>11.1%</td>
<td>96.7%</td>
</tr>
<tr>
<td>2015, JVS, Donas Muenster &gt; 18 cases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 12-Year Experience With Chimney and Periscope Grafts for Treatment of Type 1 Endoleaks</td>
<td>4%</td>
<td>12.5%</td>
<td>94%</td>
</tr>
<tr>
<td>2015, JEVT, Montelione Zurich &gt; 24 cases</td>
<td></td>
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</tr>
</tbody>
</table>

Only 2 single center registries
United States: 119 patients
Europe: 398 patients

898 chimney grafts placed
692 RA, 156 MSA, 50 CT

49.2% balloon-expandable covered stents
39.6% self-expanding covered stents
11.2% balloon-expandable bare-metal stents

No sponsorship from industry

Mean follow-up: 17.1 months
Primary patency: 94%
Secondary patency: 95.3%
Overall survival: 79%

517 Ch-EVAR/ 898 CGs
(13 centers)

39 Ch-EVAR/ 70 CGs
For Type IA endoleak
(7 centers,
31 from Rome, Munster, Zurich)
PERICLES and EL-IA > 39 CASES (70 CHIMPS) in 7 international centers

Demographics

<table>
<thead>
<tr>
<th>Demographic</th>
<th>n – (%) or mean +/- SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>76.2 ± 7.6</td>
</tr>
<tr>
<td>Male</td>
<td>25 – 83.2%</td>
</tr>
<tr>
<td>ASA III</td>
<td>20 – 51.3%</td>
</tr>
<tr>
<td>ASA IV</td>
<td>19 – 48.7%</td>
</tr>
</tbody>
</table>

Cause for EL-IA

- Neck degeneration (sev angulation) | 18 – 46.2%
- Migration                          | 21 – 53.8%

Indication

- Symptomatic                        | 9 – 23%
- Time to previous EVAR (yrs)       | 7 ± 1.3

AAA anatomical features

- Juxtarenal AAA                     | 32 – 82.1%
- Suprarenal AAA                     | 5 – 12.8%
- Type IV TAAA                        | 2 – 5.2%

<table>
<thead>
<tr>
<th>AAA Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrarenal neck diameter (mm)</td>
<td>27.0 ± 5.2</td>
</tr>
<tr>
<td>Infrarenal neck length (mm)</td>
<td>3.9 ± 4.0</td>
</tr>
<tr>
<td>AAA diameter (mm)</td>
<td>71.5 ± 29.0</td>
</tr>
</tbody>
</table>

Operative variables

<table>
<thead>
<tr>
<th>Endograft</th>
<th>n – (%) or mean +/- SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medtronic Endurant</td>
<td>20 – 51.3%</td>
</tr>
<tr>
<td>Other devices</td>
<td>19 – 48.7%</td>
</tr>
<tr>
<td>Cook Zenith</td>
<td>7 – 18.0%</td>
</tr>
<tr>
<td>Gore C-TAG</td>
<td>4 – 10.3%</td>
</tr>
<tr>
<td>Gore Excluder</td>
<td>3 – 7.7%</td>
</tr>
<tr>
<td>Jotec E-Vita Abdominal</td>
<td>≈50% ENDURANT Cuff</td>
</tr>
<tr>
<td>Other</td>
<td>≈50% BECS/SECS</td>
</tr>
<tr>
<td></td>
<td>≈50% 1 Chimney</td>
</tr>
</tbody>
</table>

Chimney per patient

<table>
<thead>
<tr>
<th>Chimney Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single chimney</td>
<td>18 – 46.1%</td>
</tr>
<tr>
<td>Multiple chimneys</td>
<td>21 – 53.9%</td>
</tr>
<tr>
<td>2 chimneys</td>
<td>14 – 35.9%</td>
</tr>
<tr>
<td>3 chimneys</td>
<td>4 – 10.3%</td>
</tr>
<tr>
<td>4 chimneys</td>
<td>3 – 7.7%</td>
</tr>
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</table>
## Outcomes

<table>
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<tr>
<th>Follow-up (months)</th>
<th>n – (%) or mean (SD, range)</th>
<th>p</th>
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<tr>
<td>Time to last CTA/MRA</td>
<td>21.9 – (0.23 – 72.3)</td>
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### Anatomy

- **New neck length**: 20.4 ± 4.2 mm
- **Post-op max AAA Ø decrease**: 1.6 mm, p = 0.486

### Mortality (n=3)

<p>| | |</p>
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<th></th>
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<tr>
<td>30-day</td>
<td>1 – 2.6%</td>
</tr>
<tr>
<td>Overall</td>
<td>3 – 7.7%</td>
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### Any complication (n=8)

- **Persistent type I endoleak**: 3 – 7.7%
- **Treated late type I endoleak**: 1 – 2.6%
- **Chimney occlusion**: 4 – 5.7%

### Late type I endoleak (n=3)

- **Other devices (n=19)**: 2 – 10.5%, p = 0.605*
- **Endurant (n=20)**: 1 – 5.0%

### Treated late type I endoleak (n=1)

- **Other devices (n=19)**: 0 – 0.0%, p = 1.000*
- **Endurant (n=20)**: 1 – 5.0%

* Fisher’s exact test.

## MID-TERM RESULTS (FU ≈ 2 YRS)

- **The new sealing zone increased to 20.4 ± 4.2 mm**
- **Post-op max AAA diameter decreased of 1.6 mm (p = 0.486)**
- **30-d mortality: 2.6%**
**Outcomes**  

<table>
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<th>Follow-up (months)</th>
<th>n (%) or mean (SD, range)</th>
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**Anatomy**

| | n=3 |
| New neck length | 20.4 ± 4.2 |
| Post-op max AAA Ø decrease | 1.6 | 0.486 |

**Mortality (n=3)**

| | |
| 30-day | 1 – 2.6% |
| Overall | 3 – 7.7% |

**Any complication (n=8)**

| | |
| Persistent type I endoleak | 3 – 7.7% |
| Treated type I endoleak | 1 – 2.6% |
| Chimney occlusion | 4 – 5.7% |

**Late type I endoleak (n=3)**

| | 0.605* |
| Other devices (n=19) | 2 – 10.5% |
| Endurant (n=20) | 1 – 5.0% |

**Treated late type I endoleak (n=1)**

| | 1.000* |
| Other devices (n=19) | 0 – 0.0% |
| Endurant (n=20) | 1 – 5.0% |

* Fisher's exact test.

**MID-TERM RESULTS**

(FU ≈ 2 YRS)

**TECHNICAL SUCCESS 89.7%**

3 Persistent EL-I + 1 Chimney Occlusion

**Primary patency**

94.3% at 3 yrs
PERICLES and EL-IA > 39 CASES (70 CHIMPS) in 7 international centers

4 cases of Chimney occlusion: 5.7% (4/70)

CHIMNEY OCCLUSION 4.5%
Usai, JEVT, 2015 (REVIEW)
PERICLES and EL-IA > 39 CASES (70 CHIMPS) in 7 international centers

...all in BECS cases

...3/4 in Endurant cases
Previous Main Graft: TALENT
Cause: Migration

Ch-EVAR:
Tube Graft: ENDURANT
Covered Stent: Viabahn
Reinforcing BMS: Protege’
Previous Main Graft: ENDURANT
Cause: Neck Evolution (Symptomatic pt)
Previous Main Graft: ENDURANT
Cause: Neck Evolution
Ch-EVAR:
Tube Graft: CTAG
Covered Stent: Advanta (MSA), Viabahn (LRA)
Reinforcing BMS: Protege’
Previous Main Graft: OVATION
Cause: Neck Evolution

Ch-EVAR:
Tube Graft: ENDURANT
Covered Stent: Viabahn
Reinforcing BMS: Protege’
Ch-EVAR:
Tube Graft: ENDURANT
Covered Stent: Viabahn
Reinforcing BMS: Protege’
CASES # 4 (SANDWICH)

Previous Main Graft: EXCLUDER

Ch-EVAR:
Tube Graft: Excluder Cuff
Covered Stent: Viabahn
Reinforcing BMS: Protege’
Previous Main Graft: ENDURANT
Cause: Neck Evolution

3 yrs: 72 mm
CASES # 5 (+ ONIX + COILS)

Ch-EVAR:
Tube Graft: COOK LP Cuff
Covered Stent: Viabahn
Reinforcing BMS: Protege’
Previous Main Graft: ENDURANT
Cause: Neck Evolution
CASES # 6 (+ PROXIMAL CGs EXT)
Accurate planning

Previous EVAR EG (Main Body length, lower RA > flow divider)

Neck length > CGs single or multiple (+/- coils)

Access > CGs: brachial or femoral (sandwich periscope)

Materials > Infrarenal Cuff or thoracic EG

CGs combination > Endurant + Advanta (IFU), Gore + Viabahn, EG + BeGraft

Main Graft OVERSIZING > Pers exp, Formulas, IFU or CUSTOM PLANNING...
OVER-SIRIX

*Over-SIRIX*: A New Method for Sizing Aortic Endografts in Combination with the Chimney Grafts: Early Experience with Aortic Arch Disease.
Fazzini S, Ronchey S, Orrico M, Martinelli C, Alberti V, Praquin B, Mangiardi N.
PMID: 28739452
Similar articles
OVER-SIRIX

MSA: Stent 8 mm

LRA: Stent 6 mm

Ideal Main Graft Diameter:

\[ D = \frac{C}{3.14} \]

Ex: \( \frac{118}{3.14} = 37.5 \text{ mm} \)
EL-IA & Ch-EVAR: take home message

1. Ch-EVAR is a **safe and viable option** to treat EL-I

2. Results are **independent of the used EG or CGs combinations**

3. The comparison with FEVAR globally shows **similar results**

4. Ch-evar is the best choice for **urgent** and/or **emergent** cases