Is EVAS going to change the practice with short necks and chimneys?

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Disclosure

Speaker name: MMPJ Reijnen

I have the following potential conflicts of interest to report:

- [X] Consulting
- [ ] Employment in industry
- [ ] Stockholder of a healthcare company
- [ ] Owner of a healthcare company
- [ ] Other(s)

- [ ] I do not have any potential conflict of interest
EVAR outside IFU

- Proximal neck major limitation of EVAR
- EVAR devices have been used outside IFU, but at higher complication rate
- Custom-made FEVAR not always available and relatively high turn-down rate
- Issues with off the shelf FEVAR devices
- Chimney-EVAR used as alternative

<table>
<thead>
<tr>
<th>Neck Length</th>
<th>N</th>
<th>Early Type I Leak</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;15mm</td>
<td>195</td>
<td>12%</td>
</tr>
<tr>
<td>10-15mm</td>
<td>24</td>
<td>42%</td>
</tr>
<tr>
<td>&lt;10mm</td>
<td>17</td>
<td>53%</td>
</tr>
</tbody>
</table>

Juxtarenal aneurysms

- Chimneys were mostly used in aneurysms unsuitable for FEVAR
- 30-day mortality
  - FEVAR 2.4%
  - Ch-EVAR 5.3% (p=ns)
- Ischemic stroke
  - FEVAR 0.3%
  - Ch-EVAR 3.2% (p=0.01)
- Immediate type-1a endoleak
  - FEVAR 4.3%
  - Ch-EVAR 10% (p=0.002)
Gutters and compression

<table>
<thead>
<tr>
<th>Device</th>
<th>Type</th>
<th>Gutter mm²</th>
<th>P</th>
<th>%</th>
<th>Stent compression</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endograft</td>
<td>Excluder</td>
<td>6.1 (4.5–12.5)</td>
<td>0.448</td>
<td>15% (0–23)</td>
<td>0.181</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Endurant</td>
<td>5.7 (3.9–10.9)</td>
<td>0.475</td>
<td>20% (9–35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parallel stent</td>
<td>Viabahn</td>
<td>4.7 (3.6–10.3)</td>
<td>0.129</td>
<td>23% (16–35)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V12</td>
<td>8.9 (4.5–11.7)</td>
<td>0.129</td>
<td>9% (0–15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combinations</td>
<td>Viabahn – Excluder</td>
<td>4.8 (4.4–13.0)</td>
<td>0.270</td>
<td>17% (13–25)</td>
<td>0.047</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Viabahn – Endurant</td>
<td>3.9 (2.7–8.1)</td>
<td>0.270</td>
<td>35% (21–38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>V12 – Excluder</td>
<td>6.7 (4.5–14.8)</td>
<td>0.847</td>
<td>0% (0–16)</td>
<td>0.470</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V12 – Endurant</td>
<td>9.7 (4.7–11.6)</td>
<td>0.847</td>
<td>11% (3–14)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Why chimneys in combination with Nellix?

1. The polymer-filled endobags are likely to reduce or prevent gutter formation
2. The cured polymer will no longer exert external pressure on the chimney grafts, which may reduce stent compression
Case example

- 85-year old male patient
- Medical history:
  - myocardial infarction
  - CABG
- 60 cm juxtarenal aneurysm
- Unsuitable for custom-made FEVAR
- Open surgery refused due to the age and general condition

Chimney EVAS with single Advanta V12™ chimney in LRA
Case example

2x N10-160 Nellix
63 mL Polymer
Fill pressure 200 mmHg
6x38mm Advanta V12™
Case example
Arnhem experience

- 7 male patients
- Age 77 (71-84) years
- 5 juxtarenal and 2 pararenal aneurysms
- Aneurysm diameter 62 (58-69) mm
- Neck diameter 28 (25-31) mm
- Operation time 159 (114-182) min
- 4 single and 3 double chimneys
- Advanta V12 BE stents in all cases
  - 8x 6mm
  - 2x 7mm
Arnhem experience

- Complications:
  - Renal bleeding
  - Delirium
  - Respiratory insufficiency
  - Pneumonia
  - Duodenal bleeding
- Hospital admission 4.5 days (range 3-9 days)
- Median Follow-up 6 months (range 2-12 months)
  - No endoleak
  - All chimney grafts patent
  - No re-interventions
  - Stable renal function
    - Pre-operative 72 (62-85) mL/min
    - Post-operative 75 (63-90) mL/min
Chimney graft geometry

- 1 stent with kinking
- Mean stent compression $12.9 \pm 4.7\%$
- Maximum stent compression $23.7 \pm 10.9\%$
Chimney-EVAS

- No differences in gutter formation between BE and SE stents
- Balloon dilation of chimney grafts during entire period of polymerization reduces stent compression
Ruptured aneurysms

EVAR in the acute setting:
• Limited to anatomical criteria
• Endoleak -> persistent bleeding

Potential advantages of EVAS:
• Implantation is fast and easy
• No cannulation of a contralateral limb
• Pre-fill-> fast control of bleeding
• Ability to treat a range of anatomies
• No persistent bleeding from endoleak

Juxtarenal rAAA:
• Off-the-shelf FEVAR not available
• Chimney EVAR -> gutters -> endoleak

Treatment protocols for rAAA with Nellix are still in development
71-year old male patient

**Medical history:**
- Tube graft for rAAA with suprarenal clamping 2008
- COPD
- Rheumatoid arthritis

62 cm ruptured pararenal aneurysm

**Chimney-EVAS with two Advanta V12™ chimneys in the renal arteries**
Chimney- EVAS in rAAA

Prefill with saline solution
Pressure 180 mm Hg
Chimney- EVAS in rAAA

2x N10-170 Nellix
70 mL Polymer
Fill pressure 190 mmHg
1 x 6x38 mm Advanta V12™
1 x 6x58 mm Advanta V12™
Chimney- EVAS in rAAA
Conclusions

• Chimney-EVAS is feasible and safe
• The endobags are likely to avoid gutter formation
• BE covered stents perform well as the chimney graft, but SE covered stents may do as well
• The technique can be applied in both elective and acute cases
• Treatment protocols for rAAA need further development in clinical trials
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