Redo treatment and open conversion after TEVAR

Roberto Chiesa

Vascular Surgery, “Vita-Salute” University Scientific Institute San Raffaele – Milan, Italy
“Off-Label” indications for TEVAR

Russell et al. J Interven Cardiol 2006
The “domino” effect

Experience with endovascular devices has evolved

Application expanded to more complicated cases

Reports of complication has increased

Increased secondary endo procedure and open conversion
## TEVAR: Long-term results

### “Real world” results

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>N° TEVAR</th>
<th>Open Conversions</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geisbüsch P.</td>
<td>2011</td>
<td>264</td>
<td>11</td>
<td>4.1%</td>
</tr>
<tr>
<td>Dumfarth J.</td>
<td>2011</td>
<td>421</td>
<td>21</td>
<td>5.0%</td>
</tr>
<tr>
<td>Miyahara S.</td>
<td>2013</td>
<td>147</td>
<td>16</td>
<td>10.8%</td>
</tr>
<tr>
<td>Canaud L.</td>
<td>2013</td>
<td>236</td>
<td>14</td>
<td>5.9%</td>
</tr>
<tr>
<td>Scali S.T.</td>
<td>2014</td>
<td>585</td>
<td>46</td>
<td>7.9%</td>
</tr>
<tr>
<td>Roselli E.</td>
<td>2014</td>
<td>_</td>
<td>50</td>
<td>_</td>
</tr>
<tr>
<td>Nozdrzykowski M.</td>
<td>2015</td>
<td>371</td>
<td>25</td>
<td>6.7%</td>
</tr>
</tbody>
</table>
## Thoracic aortic experience 1993-2015

<table>
<thead>
<tr>
<th></th>
<th>Arch</th>
<th>DTA</th>
<th>TAAA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPEN</strong> (1993 – 2015)</td>
<td>75</td>
<td>381</td>
<td>771</td>
</tr>
<tr>
<td>1227 pts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TEVAR</strong> (1999 – 2015)</td>
<td>208</td>
<td>304</td>
<td>55</td>
</tr>
<tr>
<td>567 pts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total:</strong> 1794</td>
<td>283</td>
<td>685</td>
<td>826</td>
</tr>
</tbody>
</table>
Thoracic reinterventions

156

Our series = 76 (49%)
Other Institutions = 80 (51%)
## Indications to reintervention

<table>
<thead>
<tr>
<th>Condition</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoleak</td>
<td>86</td>
</tr>
<tr>
<td>Stent-graft migration</td>
<td>35</td>
</tr>
<tr>
<td>Stent-graft failure</td>
<td>17</td>
</tr>
<tr>
<td>Infection / fistulization</td>
<td>12</td>
</tr>
<tr>
<td>Retrograde dissection</td>
<td>6</td>
</tr>
</tbody>
</table>
**“Redo” treatment strategies**

<table>
<thead>
<tr>
<th>Procedure Type</th>
<th>Number (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endo-Procedures</td>
<td>N = 85 (54%)</td>
</tr>
<tr>
<td>Open conversion</td>
<td>N = 59 (38%)</td>
</tr>
<tr>
<td>Hybrid approach</td>
<td>N = 12 (8%)</td>
</tr>
</tbody>
</table>

---

San Raffaele Scientific Institute - Vascular Surgery - “Vita-Salute” University
Case #1  Endoleak

- ♂, 68 years
- 1998: AAA open repair
- 2009: TEVAR for DTA (Medtronic Talent)
- 2011: Sudden back pain
  
  CT: endoleak, sac growth
Case #1  
Open conversion

Thoracoabdominal aorta exposure
Case #1  Visceral perfusion

Previous AAA graft  Previous DTA stent-graft
Case #1  Visceral perfusion

6-cm long  
(no anatomic feasibility for branched-EVAR)
Case #1  Reconstruction
Case #2  TEVAR failure

- ♂, 65 years
- **Multiple** aortic interventions (other Institutions)
  - AAA open repair
  - Zone 0 arch debranch. + TEVAR
  - Re-TEVAR for endoleak
  - 3 multi-layer stents in DTA
  - Re-TEVAR for endoleak
  - Distal platinum bare-stent
Case #2 Complete aneurysm perfusion

Type III endoleak (from Cardiatis ML stents)

95 mm
Case #2  Open conversion

Arch aneurysm

TAAA
Case #2 Hypothermic CC arrest
Case #2 Stent-grafts explantation

Mural thrombosis of ML stents only in overlapping regions

Reperfusion branch
Case #2  Reconstruction

Visceral perfusion

Distal anastomosis
Case #3 Fenestrated-EVAR failure

- ♂, 70 years
- Previous F-EVAR for type IV TAAA
- Progressive sac enlargement

Cook fenestrated graft

67 mm
Case #3  F-EVAR failure

Endoleak (Type III)  SMA stent fracture
Case #3  Open conversion
Case #3 Removal of fenestrated-SG

SMA stent (left in situ)
Case #3  Final reconstruction

Gore Hybrid (LRA)
Case #4  Stent-graft infection / AEF

- ♂, 67 years
- TEVAR for saccular TAA
- 14 months later: hematemesis

Close contact with the esophagus

Tracer captation at PET/CT
Case #4  Open conversion

Left thoracotomy - Intercostal muscle flap preparation
Case #4  Open conversion

Endograft removal
Case #4  Reconstruction

Evidence of AEF

“\textit{In situ}” repair with silver-coated graft
Case #4  Reconstruction

Esophageal repair

Intercostal muscle interposition
## Results

<table>
<thead>
<tr>
<th>Open conversion</th>
<th>N pts (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>59</td>
</tr>
<tr>
<td><strong>Mortality (30-days)</strong></td>
<td><strong>10 (17%)</strong></td>
</tr>
<tr>
<td><strong>Major morbidity</strong></td>
<td></td>
</tr>
<tr>
<td>Respiratory failure</td>
<td><strong>15 (25%)</strong></td>
</tr>
<tr>
<td>Renal failure</td>
<td><strong>8 (14%)</strong></td>
</tr>
<tr>
<td>Paraplegia</td>
<td><strong>2 (3%)</strong></td>
</tr>
</tbody>
</table>
Mortality x Etiology

59 open conversions

<table>
<thead>
<tr>
<th>Indication to conversion</th>
<th>30-days Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoleak (25)</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Endograft migration + failure (16)</td>
<td>2 (12%)</td>
</tr>
<tr>
<td>Retrograde dissection (6)</td>
<td>2 (33%)</td>
</tr>
<tr>
<td>Infection/fistulization (12)</td>
<td>5 (42%)</td>
</tr>
</tbody>
</table>
Who performs open conversions?

US Medicare database
(763 hospitals, 3554 open repairs and 3517 TEVARs)

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals performing TEVAR</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>Hospitals performing OPEN repair</td>
<td>95%</td>
<td>57%</td>
</tr>
</tbody>
</table>

Patel et al, J Vasc Surg 2013
Who performs open conversions?

Mortality of OPEN repair depends from the hospital volume / experience

Patel et al, J Vasc Surg 2013
Importance of teaching open surgery...

1958: OR during a De Bakey’s operation
...to avoid this scenario in the future!

I’m the only who performs OPEN surgery

Surgeo-matic V2.5
Conclusions

- Close follow-up after TEVAR
- Open conversion
  - Technical challenge
  - Acceptable results in High Volume Centers
- Increased mortality in case of retrograde dissection and infection
Redo treatment and open conversion after TEVAR

Roberto Chiesa

Vascular Surgery, “Vita-Salute” University
Scientific Institute San Raffaele – Milan, Italy