Long Stent Grafts for TEVAR have Bad Effects on the Heart and Tend to Migrate Proximally causing Type 1B Endoleaks: What are the Mechanisms?

FRANS MOLL et al.

“Aortic Compliance serves a crucial function to reduce impedance and workload of the Cardiac Ejection”

“Stiffening the Aorta after TEVAR results in elevated pulse-pressure, hypertension, reduced coronary perfusion, resulting in Heart Failure”

“Ascending Aortic rupture after Zone 2 TEVAR. Pulse-pressure 35% up, increased distensibility, increased strain in non-stented Aorta Segment”

Diederik van Bakel: Ascending Aortic rupture after zone 2 endovasc repairs: a multiparametric computational analysis.

“Distal transition zone of TEVAR still has a distensibility change during Cardiac Cycle up to 20% after implantation”

Dynamic cine-CT angiography for the evaluation of the Thoracic Aorta: insight in dynamic changes with implications for Thoracic Endograft treatment

Muhle BF, et al. EJVES 2006

• Interested in distal transition zone, because of physiological mismatch between native aorta and stent graft material
• Aim: Search literature for risk factors on type 1b endoleak after initially a successful TEVAR w minimum follow-up > 1 year

Results – Risk Factors

<table>
<thead>
<tr>
<th>Study</th>
<th>Aim</th>
<th>Study design</th>
<th>Risk factors related to type 1b endoleak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nakatamari H et al.</td>
<td>Impact of thoracic aortic morphology on development of endoleaks</td>
<td>Retrospective observational study</td>
<td>Large curvature index at the thoracoabdominal junction (related to endoleak type 1b)</td>
</tr>
<tr>
<td>Piffaretti G et al.</td>
<td>Identify the determinants of endoleaks</td>
<td>Retrospective observational study</td>
<td>Not specified between different types of endoleak: TAA diameter (p=0.033), SG characteristics, SG landing zone (p&lt;0.001)</td>
</tr>
</tbody>
</table>

Results - Treatment

• Treatment in most cases
• Early type 1b endoleak may resolve spontaneously

• 63 type 1b endoleak; 26 treatment reported
  – Secondary TEVAR: 21 (76.9%)
  – Embolization: 1 (3.8%)
  – Open repair: 0 (0%)
  – Death: 1 (3.8%)
  – No reintervention: 5 (19.2%)

1 Wain et al. JVS 1998; 27(1):69-80
• Nothing reported on prognosis

• 5 reported no reintervention
  – 3 (60%) resolved spontaneously
  – 2 (40%) refused reintervention

• Lack of data regarding type 1b endoleak
  – A heightened awareness and greater interest in treatment in the proximal transition zone to the stent graft
  – 1 study reports on relation tortuosity and type 1b endoleak
  – 2 other studies not included with same conclusions

• Flow studies show an explosion of energy at the end of the stent graft

• Only three spontaneous resolution

2 Karmonik et al.

• Limitations
  – No information on the IFU
  – No differentiating between old and new generation stent grafts
  – No information on distal sealing zone, oversizing, active fixation

• No firm conclusion can be made regarding
  – morbidity, mortality, risk factors and prognosis

• In need of better registration of type 1b endoleak
  – What is published is of low quality and short follow up

• Anatomical variables predicting type 1b endoleak should be examined and listed
  – Focus on distal transition zone from stent graft to native aorta
Conclusions

- Current stent-grafts do not reduce sufficiently impedance and workload of the Cardiac Ejection and may dislodge stent-graft at follow-up
- There is an urgent need to develop more compliant stent-grafts to provide more durable endovascular solutions to our patients