The evolution of the aortic neck after EVAR

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Proximal Necks

Straight  Tapered  Reversed tapered  Angulated*  Bulge  Short*

[Images of different types of necks]
Background

A continuous aortic enlargement at the level of infrarenal aortic neck has been reported after endovascular repair (EVAR)

Background

The amount of proximal device oversizing with self-expanding stent grafts (SESG) influences neck progression

Background

When aortic neck dilatation occurs, it is related to adverse mid-term outcomes

Aortic neck dilatation with balloon expandable stent graft

Background

EndoAnchors Mimic Open Surgically Sutured Anastomosis

BUILDING ON HISTORY

1902
1st Vascular Anastomosis by Alexis Carrel

1951
1st Open AAA Repair by Charles Dubost

1991
1st Endovascular AAA Repair by Juan Parodi

2005
1st Endovascular Anastomosis via EndoAnchoring in EVAR by David Deaton and Takao Ohki
TAILORED SEAL AND FIXATION OF ENDOANCHORS

Create the stability of a surgical anastomosis in EVAR and TEVAR

Surgical Anastomosis

EndoAnchoring

Displacement force in Newtons

Melas et al. JVS 2012;55(6):1726-33

Case images from John Aruny MD, Bart Edward Muhs, MD, PhD.
Do EndoAnchors have value in preventing proximal neck complications in patients with challenging neck anatomy?
The EVAR Durability Question and a Potential Solution

Baseline anatomy in propensity-matched cohorts

<table>
<thead>
<tr>
<th>Anatomic Measures for Propensity Matching</th>
<th>Controls N = 103</th>
<th>EndoAnchors N = 103</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max AAA Diameter</td>
<td>56 ± 13 mm</td>
<td>56 ± 10 mm</td>
<td>.674</td>
</tr>
<tr>
<td>Suprarenal Diameter</td>
<td>27 ± 4 mm</td>
<td>27 ± 3 mm</td>
<td>.999</td>
</tr>
<tr>
<td>Diameter at Lowest Renal</td>
<td>25 ± 4 mm</td>
<td>26 ± 4 mm</td>
<td>.458</td>
</tr>
<tr>
<td>Proximal Neck Length</td>
<td>23 ± 14 mm</td>
<td>20 ± 13 mm</td>
<td>.093</td>
</tr>
<tr>
<td>Suprarenal Angulation</td>
<td>16 ± 11°</td>
<td>17 ± 13°</td>
<td>.664</td>
</tr>
<tr>
<td>Infrarenal Angulation</td>
<td>37 ± 16°</td>
<td>37 ± 18°</td>
<td>.885</td>
</tr>
<tr>
<td>Neck Thrombus</td>
<td>23± 54°</td>
<td>38 ± 71°</td>
<td>.107</td>
</tr>
<tr>
<td>Neck Calcium</td>
<td>20± 29°</td>
<td>19 ± 30°</td>
<td>.845</td>
</tr>
<tr>
<td>Necks &lt;10mm Length</td>
<td>18.4%</td>
<td>26.5%</td>
<td>.097</td>
</tr>
</tbody>
</table>
The EVAR Durability Question and a Potential Solution

composite endpoint of proximal neck failure

Mean follow-up only 6 months (range 1-12 months)

No statistical tests performed, pending longer term data in the ANCHOR test group

Initial observations:
- While the numbers are small, there are trends toward reduction in Proximal Neck Failure in EndoAnchor group
- Definitive results forthcoming, with full 12-month data for both groups
The Ovation stent graft (TriVascular, Santa Rosa – CA)

- New concept of sealing by non-expansive circumferential apposition of polymer-filled ring to the aortic wall
Trivascular Ovation Italian Registry (TOIS)

METHODS

- Retrospective, multicenter registry (Nov 2014)
- 13 Italian Centers of Vascular Surgery
- Only patients who had undergone implantation of a Trivascular Ovation at least 24 months previously (before Nov 2012)
- CT scans available at a minimum 2-year follow-up were collected and sent for blind reading to a centralized core laboratory.
Trivascular Ovation Italian Registry (TOIS)

Central database for the core lab review of morphological changes

- OsiriX MD (v.6.5.1 64-bit)

- 1 VS as single observer
  (intra-observer agreement 0.91)

- All vessel measurements after center line lumen (CLL) reconstructions
  (manual segmentation)
Proximal aortic neck segmentation

- Zone A (fixation area)
- Zone B (infrarenal aorta)
- Zone C (sealing zone)
Trivascular Ovation Italian Registry (TOIS)

RESULTS

161 patients
mean age 74 ± 5
92% male

Median 32 months (range 24-50)

CT @ ≥ 24 moths ➔ 89 pts
FOLLOW-UP

- 17 pts died (no AAA-related death)
- 15 pts lost at follow-up
Trivascular Ovation Italian Registry (TOIS)

C  Freedom from type 1 endoleak

Percent survival

Survival  Number of events  Number at risk  Standard Error
1y         98.6%           3             141         0.006
2y         98%             0             129         0.009
3y         98%             0             50          0.011
4y         98%             0             3            0.011

Months
Reinterventions (total n=8)
- 3 type IA endoleak
  - 1 aortic cuff,
  - 1 balloon-expandable stent
  - 1 coil and glue embolization
- 4 iliac limb occlusion
  - 1 bypass,
  - 3 surgical thrombectomy
- 1 type II endoleak
  - coil embolization
Morphological changes @ 2 years
Core lab ➔ 89 CT scans

Zone A

Patency of visceral arteries in Zone A was 100%
Morphological changes

Zone A at 2 years

The mean change was 0.18 ± 0.22 mm (SE 0.02)
Morphological changes

Zone B\_deployment

The mean stent-graft landing distance to the lowest renal artery was $3.13 \pm 4.25$ mm (SE 0.45)

* Type I endoleak in less precise stent graft deployment
Morphological changes

Zone B & C

- No Neck enlargement (≥2mm)
- No Stent graft migration (≥3mm)
Zone B

The mean change was -0.32±0.87 mm (SE 0.09)
Morphological changes

Zone C

The mean change in diameters
-0.06 ± 0.97 mm (SE 0.1)
Correlation Zone B vs Zone A

Spearman correlation test (Zone B vs Zona A)

Correlation coefficient 0.000
P=1.0
Correlation Zone B vs Zone C

Spearman correlation test (Zone B vs Zone C)

Correlation coefficient 0.183
P = .05
Morphological changes_Summary

Neck evolution

- Zone A  +0.18 ± 0.22 mm
- Zone B  -0.32±0.87 mm
- Zone C  -0.06 ± 0.97 mm

No correlation
Correlation
Neck evolution

Zone B - 0.32±0.87 mm

- nitinol stent touches the aortic wall but no self expanding force is applied

- graft material is slightly free to move independently of the stent and may conform to the aortic wall ("mainsail effect"), preserving blood stream between the fabric and the wall.

zone B is protected from arterial pressure
- No aortic neck dilatation occurred in patients treated with TriVascular Ovation stent graft at CT scan after a minimum 24-month follow-up.

- This may suggest that aortic neck evolution is not associated to EVAR at mid-term follow-up when an endograft with no chronic outward radial force is implanted.
Considerations 2

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- This may suggest that aortic neck evolution is not associated to EVAR at mid-term follow-up when an endograft with no chronic outward radial force is implanted.

Even in very short neck <7mm
Conclusions

• Proximal aortic neck complications represent a critical issue after EVAR
• New technologies seems to provide better results
• Follow up is mandatory after EVAR
Thank you

Piazza del Campo, Siena – Italy
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