Techniques to achieve seal in short neck aneurysms

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Disclosures Dr. Kasprzak (grants, speaker fee, development,
Cook, Gore, Vascutek, Bard, Medtronic, Maquet, UCB, Bentley
Short and hostile infrarenal neck.
I don´t see any problem...
Definition of short neck
<15mm or <10mm?

the long axis of the aneurysm sac, (3) short neck: neck length ≤15 mm, (4) significant

J ENDOVASC THER 2009;16:137–146

mm between 2 axial CT cuts. Patients were categorized into 3 groups according to the infrarenal neck length: >15 mm (group A, n=2822), between 11 and 15 mm (group B, n=485), and ≤10 mm (group C, n=192).

J Endovasc Ther 2006;13:640–648

aneurysm repair [EVAR] of abdominal aortic aneurysms (AAAs) with short, straight proximal aortic necks(<1.5 cm).


Definitions and end points. Patients were categorized as having favorable neck anatomy (FNA) or HNA. HNA was defined as having one or more of six neck features: neck length of <10 mm, angle of >60°, a diam-

(J Vasc Surg 2011;54:13-21.)

Definitions of hostile neck anatomy were established as
(1) short neck—a distance of less than or equal to 10 mm

Influence of Infrarenal Neck Length on Outcome of Endovascular Abdominal Aortic Aneurysm Repair

Purpose: To evaluate the influence of the infrarenal neck length on clinical outcome after endovascular abdominal aortic aneurysm repair (EVAR).

3499 Pts EUROSTAR Register
3 Groups: > 15 mm (A), 11-15 mm (B), und < 10 mm (C)

Results: 30-d Mortality ↑
in Pts with neck <15mm vs Pts with neck >15 mm

Proximal Endoleak 2x higher
if neck 11 - 15 mm vs neck >15 mm

Conclusion: Our study indicates that endovascular treatment of abdominal aortic aneurysms with infrarenal neck length <15 mm is associated with significantly increased risk of short- and midterm proximal endoleaks after EVAR. The greater risk of proximal endoleaks should be weighed against the risks of alternative treatment modalities.
Hostile neck

Short neck
Angulation
Taper
Calcification
Thrombus
> Diameter

A: suprarenal angulation $\leq 60^\circ$
B: proximal neck length $\geq 15$ mm
C: proximal neck diameter 18-28 mm (19-26 mm)*
C-C': diameter increase $\leq 10%$
(no conical shape)
D: distal fixation length $\geq 10$ mm
E: distal fixation diameter 7.5-20 mm (8-18.5 mm)*

*Thrombosis of calcification $\leq 25\%$ of circumference
Meta-Analysis of 7 major studies in EVAR by Antoniou et al\(^1\) compared outcomes in hostile vs. friendly neck anatomies (total patients N = 1559)

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Size</th>
<th>Endografs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torsello et al, 2011</td>
<td>177</td>
<td>Endurant</td>
</tr>
<tr>
<td>AbuRahma et al, 2010</td>
<td>238</td>
<td>AneuRx, Excluder, Zenith, Talent</td>
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<tr>
<td>Hoshina et al, 2010</td>
<td>129</td>
<td>Excluder, Zenith</td>
</tr>
<tr>
<td>Abbruzzese et al, 2008</td>
<td>565</td>
<td>AneuRx, Excluder, Zenith</td>
</tr>
<tr>
<td>Choke et al, 2006</td>
<td>147</td>
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<tr>
<td>Fulton et al, 2006</td>
<td>84</td>
<td>AneuRx</td>
</tr>
<tr>
<td>Fairman et al, 2004</td>
<td>219</td>
<td>Talent</td>
</tr>
</tbody>
</table>

- **Type I endoleaks 4.5x more likely at 1-year after endograft implantation in hostile proximal aortic neck anatomy (P = .010)**

- **Aneurysm-related mortality risk 9x greater in hostile neck anatomy (P= .013)**

Hostile Neck

Different Options

- try EVAR
- which Stent Prosthesis?
  (new Concepts Ovation, Nellix)
- Adjunct Methods
  (Endoanchors)

• Ch-EVAR
• F-EVAR

• Open Operation
Different Concepts
Different Concepts

An EVAR revolution may have truly arrived

30th October 2013  301

- Iliac and femoral artery access that allows for atraumatic device introduction
- Aortic proximal neck diameter range of 18 to 32 mm
- Minimum aortic proximal neck length \( \geq 10 \text{ mm} \)
- Infrarenal aortic neck angulation of \( \leq 60^\circ \)
- Aortic aneurysm with a blood lumen diameter \( \leq 70 \text{ mm} \)
- Iliac arteries luminal diameter range of 9 to 35 mm
Different Concepts

Endologix’ Nellix receives CE mark with refined Instructions for Use

22nd September 2017

Endologix’ Nellix
## Different Concepts

<table>
<thead>
<tr>
<th>Indications for Use</th>
<th>Next Generation Nellix</th>
<th>Nellix 3SQ+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current (Next Generation Nellix &amp; Nellix 3SQ+)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iliac and femoral artery access that allows for atraumatic device introduction</td>
<td>No Change</td>
<td></td>
</tr>
<tr>
<td>Aortic proximal neck diameter range of 18 to 32mm</td>
<td>Aortic proximal neck diameter range of 18 to 28mm</td>
<td></td>
</tr>
<tr>
<td>Minimum aortic proximal neck length of ≥ 10mm</td>
<td>Criteria remains the same; however, the definition of aortic proximal neck length is updated to diameter change of 10% vs. previous 20%</td>
<td></td>
</tr>
<tr>
<td>Proximal aortic neck angulation of ≤60°</td>
<td>No Change</td>
<td></td>
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<tr>
<td>Aortic aneurysm with a blood lumen diameter of ≤70mm (60mm for Nellix 3SQ+)</td>
<td>No Change</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>Ratio of maximum aortic aneurysm diameter to maximum aortic blood lumen diameter &lt;1.4</td>
<td></td>
</tr>
<tr>
<td>Iliac arteries luminal diameter range of 9 to 35mm</td>
<td>• iliac artery blood lumen diameter range of 9 to 35mm outside the distal seal zone</td>
<td>• iliac artery inner wall diameter range of 9 to 20 mm outside the distal seal zone</td>
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ein aneurysmafreier, proximaler Aortenhals
- mit einer Länge von mindestens 7 mm proximal zum Aneurysma,
- mit einem Innenwanddurchmesser von mindestens 16 mm und maximal 30 mm
  und
- mit einer Aortenabweichung von $\leq 60$ Grad, falls der proximale Hals $\geq 10$ mm ist,
  und $\leq 45$ Grad, falls der proximale Hals $< 10$ mm ist,
Adjuncts
EndoAnchors – De Novo Indication vs. Revision

Regensburg 2011 – 2015

88 Patients

Age 69 (±10) 42-87

Primary 80,3%
Revision 19,7%
EndoAnchors in Regensburg

Proximal neck with Thrombus or Kinking $> 45^\circ$ or tapered

$> 15 \text{ mm (IFU 10mm)}$ \hspace{1cm} $10 - < 15 \text{ mm}$ \hspace{1cm} $0 - < 10 \text{ mm}$

EVAR \hspace{1cm} EVAR + EndoAnchors \hspace{1cm} FEVAR/BEVAR
Summary

- Proximal Neck >15mm → st. EVAR
- Proximal Neck 10-15 mm or 15mm mit Angulation, Thrombus, Bell-Shape, Taper → st. EVAR + Endoanchors
- Proximal neck <10mm
Alternatives

F-EVAR

Ch-EVAR
CHIMneyPeriscopeSandwich (CHIMPS)

Parallel Grafts

- Chimney
  - snorkel
- Periscope

Courtesy M. Lachat
Gutter sealing (embolization)

Up to 10%
Ch-EVAR

Primarily as Bail-out for overstented renal arteries
Ch-EVAR advantages  F-EVAR

• Less complex
• ↓ Costs
• Off-the-shelf
Ch-EVAR

but...
Ch-EVAR

but...

.... and supraaortic access for one/multiple sheaths
Comparison of Outcomes with Open, Fenestrated and Chimney Graft Repair of Juxtarenal Aneurysms

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<td>0.1</td>
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<td>9.8</td>
<td>3.7</td>
<td>0.3</td>
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<tr>
<td>Ch-EVAR</td>
<td>5.3</td>
<td>12</td>
<td>7.4</td>
<td>3.2</td>
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Katsagyris et al., J Endovasc Ther 2013;20:159-169
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Katsagyris et al., J Endovasc Ther 2013;20:159-169
Longer proximal seal in parallel aortic segment
Open (group A) vs stEVAR (group B) vs fEVAR (group C)  FU 19,5 mth´s

- ↑ Aneurysm diameter in stEVAR vs fEVAR  (12.2% vs 1.9%, p=0.036)

**Conclusion:** The results of EVAR and OR were similar for AAAs with a challenging proximal neck. Endovascular reinterventions were more frequent after EVAR, particularly in patients with an angulated or short neck. Open reinterventions were more common after OR. More patients and long-term data are needed to confirm these findings.
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- ↑ Aneurysm diameter in stEVAR vs fEVAR  (12.2% vs 1.9%, p=0.036)
- ↑ Reinterventions for stEVAR in short neck  (p=0.024)
- ↓ Reinterventions and Type I Endoleaks in fEVAR

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Chimney versus fenestrated endovascular aortic repair for juxta-renal aneurysms.

Caradu C¹, Berard X, Sassoust G, Midy D, Ducasse E.

RESULTS: Fifteen studies on F-EVAR, 8 on CG-EVAR and 5 on both techniques were included; 1748 F-EVAR patients (3993 target vessels) vs 757 (1158 target vessels, 13% symptomatic and 7% ruptured). F-EVAR patients suffered from significantly less comorbidities, technical success was lower (94% vs 99%; p < 0.0001) but with more reconstructed vessels/patient (2.2±0.4 vs 1.5±0.3; p < 0.0001) and 30-day mortality was lower (2% vs 4%; p = 0.02). There were more reinterventions after F-EVAR (20% vs 8%; p < 0.0001); mainly EL (44% vs 25%) and target vessels related (36% vs 32%); less type I ELs (1% vs 6%; p = 0.002) but more type III (2% vs 0%; p < 0.0001). The rates of chronic kidney disease (9% vs 15%; p = 0.0002) and dialysis (1% vs 3%; p = 0.007) were lower after F-EVAR, with less target vessel's occlusions (3% vs 6%; p < 0.0001). The meta-analysis on 5 comparative studies supported F-EVAR in terms of 30-day mortality (OR 0.94 [0.25, 3.55]), target vessel's occlusions (OR 2.40 [0.95, 6.06]) and type I EL (OR 0.62 [0.10, 3.93]); and CG-EVAR in terms of technical success (OR 3.28 [0.67, 15.93], type II (OR 1.25 [0.48, 3.28]) and III ELs (OR 1.62 [0.29, 8.94]) and reintervention (OR 1.77 [0.89, 3.52]) without a significant difference.

CONCLUSION: Current evidence does not support CG-EVAR's widespread use in all elective patients but CG-EVAR seems justified in symptomatic patients, as bailout, or in elective patients who are poor candidates for open repair and F-EVAR.
CONCLUSIONS: FEVAR as a first line strategy was associated with high technical success and a low operative mortality rate. Efficacy and durability in the mid-term appear very good, with significant regression of aneurysm sac diameter, high target vessel patency, and acceptable rate of re-intervention.

CONCLUSION: The use of FEVAR for juxtarenal and suprarenal aneurysms is associated with low 30-day mortality/morbidity and high midterm efficacy. So far, perioperative and midterm results are not affected by the use of more complex fenestrated designs.
Summary

- Proximal neck >15mm → st. EVAR
- Proximal neck 10-15 mm
  Angulation, Thrombus, Bell-shape → st. EVAR + Endoanchors
- Proximal neck <10mm → F-EVAR
  Ch-EVAR in emergency
Fit the anatomy to the solution...?

...or the solution to the anatomy?