Suprarenal vs. infrarenal fixation in EVAR-devices

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Cook Medical: Proctoring, Speaker’s fees, Grant support

Getinge: Educational grant support
1994-1995

- 23 patients
- 13 (56%) proximal stent graft migrations
Analytical Modeling and Numerical Simulation of Forces in an Endoluminal Graft

Kurt Liffman, PhD; Michael M.D. Lawrence-Brown, FRACS; James B. Semmens, PhD; Anh Bui, PhD; Murray Rudman, PhD; and David E. Hartley, FIR

Fluid mechanics analysis:
- Bifurcated graft
- 10N cyclical forces
- Acting to displace graft in caudal direction
The Impact of Stent Design on Proximal Stent-graft Fixation in the Abdominal Aorta: an Experimental Study

T. Resch*, M. Malina†, B. Lindblad‡, J. Malina‡, J. Brunkwall‡ and K. Ivancev§

- Force to dislodge stent graft 6X less than sutured anastomosis.
- Longer/stronger barbs better fixation than shorter/weaker
Suprarenal fixation: Reduced migration and increased proximal support?

- Cadaveric model
- Fixation hooks/barbs: Higher DF
- Suprarenal support: No added effect on DF
- Balloon dilatation: Higher DF

<table>
<thead>
<tr>
<th></th>
<th>1 (Proximal)</th>
<th>2 (Distal)</th>
</tr>
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<tbody>
<tr>
<td>Talent</td>
<td>16.18 ± 0.47</td>
<td>9.23 ± 1.25</td>
</tr>
<tr>
<td>Anaconda</td>
<td>36.16 ± 1.30</td>
<td>14.58 ± 0.68</td>
</tr>
<tr>
<td>Gore</td>
<td>22.58 ± 0.72</td>
<td>10.52 ± 0.40</td>
</tr>
<tr>
<td>AUI EndoFit</td>
<td>13.20 ± 0.75</td>
<td>8.83 ± 0.48</td>
</tr>
<tr>
<td>Zenith</td>
<td>39.30 ± 1.55</td>
<td>9.55 ± 1.52</td>
</tr>
<tr>
<td>Endurant</td>
<td>31.75 ± 2.27</td>
<td>9.65 ± 0.43</td>
</tr>
<tr>
<td>Endologix</td>
<td>14.80 ± 0.70</td>
<td>4.93 ± 0.50</td>
</tr>
</tbody>
</table>

Melas et al. EJVES 2010
Systematic review and meta-analysis of migration after endovascular abdominal aortic aneurysm repair

- Talent, Excluder, Aneurx, Zenith
- Factors associated with stent graft migration:
  - Aneurysm diameter
  - Neck length
Outcomes and Morphologic Changes After Endovascular Repair for Abdominal Aortic Aneurysms With a Severely Angulated Neck
– A Device-Specific Analysis –
Katsuyuki Hoshina, MD, PhD; Takafumi Akai, MD; Toshio Takayama, MD, PhD; Masaaki Kato, MD, PhD; Tatsu Nakazawa, MD, PhD; Hiroyuki Okamoto, MD, PhD; Kunihiro Shigematsu, MD, PhD; Tetsuro Miyata, MD, PhD

- Severe neck angulation (>60 degrees)
- 34 Excluder
- 12 Zenith
- Differences in straightening of neck
- No caudal migration in either group

Hoshina et al. Circ J 2013
Real-world Performance of the New C3 Gore Excluder Stent-Graft: 1-year Results from the European C3 Module of the Global Registry for Endovascular Aortic Treatment (GREAT)

- 400 patients
- Follow up 16 months
- No stent graft migration

Verhoeven et al. EJVES 2015
Stent struts across renal artery origin: Impact on kidney function?
Effect of suprarenal fixation on long term kidney function

- Bare struts over renal ostium
  - Effect on flow?
  - Embolisation? → infarct/loss of parenchyma?

- Multiple reasons for renal dysfunction:
  - Contrast induced nephropathy
  - Atherosclerotic disease
  - Contrast surveillance/re-intervention

- Studies heterogenous: Need uniform reporting of renal outcomes

- Different formulae for renal function: e.g. eGFR vs Creatinine
Follow up duration 72hours to 5 years

Endpoint: eGFR drop >20%

1 year: no difference SRF vs IRF

Not appropriate to look beyond 1 year with data

5 years (one study): SRF 17% vs 10% (p=0.03), OR 1.77 [CI 1.04-3.02]
Meta-analysis of Renal Function Following Infrarenal EVAR using Suprarenal or Infrarenal Fixation Devices

Philip W. Stather*, James Ferguson, Ayoola Awopetu, Jonathan R. Boyle
Department of Vascular Surgery, Cambridge University Hospital, Hills Road, Cambridge, UK

- Equivalent renal function at 12 months
- Renal impairment higher with SRF: 5.98% vs. 4.83% OR 1.29 [CI 1.18-1.4]
- Number needed to harm = 200
- Renal infarcts, stenosis and occlusion higher with SRF but effect size small
- No difference in rate of dialysis
- Heterogenous methodology: Any definition of renal decline allowed

Stather et al. EJVES 2018
Case matched eGFR after 5 years

- Supra-renal fixation
- Infrarenal fixation
- Open aneurysm repair
- Carotid endarterectomy
- 5 year eGFR worse in suprarenal group
- No patient progressed to dialysis

Computational Fluid Dynamics: 2mm thick fixation reduces flow by 30%
Suprarenal fixation: Impact on re-interventions
# Fenestrated cuffs: St Thomas’ Experience

<table>
<thead>
<tr>
<th>Target Vessel</th>
<th>Fenestration</th>
<th>Scallop</th>
<th>Success</th>
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<tbody>
<tr>
<td>Left Renal</td>
<td>29</td>
<td>0</td>
<td>29 (100%)</td>
</tr>
<tr>
<td>Right Renal</td>
<td>29</td>
<td>0</td>
<td>29 (100%)</td>
</tr>
<tr>
<td>SMA</td>
<td>29</td>
<td>0</td>
<td>29 (100%)</td>
</tr>
<tr>
<td>Coeliac</td>
<td>26</td>
<td>3</td>
<td>22 (84.6%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>113</strong></td>
<td><strong>3</strong></td>
<td><strong>109 (96.2%)</strong></td>
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Late open conversion and explantation of abdominal aortic stent grafts

Clayton J. Brinster, MD, Ronald M. Fairman, MD, Edward Y. Woo, MD, Grace J. Wang, MD, Jeffrey P. Carpenter, MD, and Benjamin M. Jackson, MD, Philadelphia, Pa

- AneuRx (6)
- Zenith (6)
- Talent (3)
- Excluder (2)
- Anaconda (1)
- Ancure (1)
- Quantum LP (1)
- Powerlink (1)

Majority of cases need supracoeliac or suprarenal cross clamping

Brinster et al. JVS 2011
Strategies and outcomes for aortic endograft explantation

Dean J. Arnaoutakis, MD, MBA, Gaurav Sharma, MD, Stuart Blackwood, MD, Samir K. Shah, MD, Matthew Menard, MD, C. Keith Ozaki, MD, and Michael Belkin, MD, Gainesville, Fla; and Boston, Mass

- Clamp position:
  - Supracoeliac (31%)
  - Suprarenal in 31%
  - Infrarenal (38%)

- Suprarenal fixation: More likely to have the upper main body left in situ (67% vs 17%; P=0.029)

<table>
<thead>
<tr>
<th>Type (N = 32), No. (%)</th>
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<tbody>
<tr>
<td>AneuRx&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Excluder&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Zenith&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Talent&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Powerlink&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
<td>Endurant&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>Aorfix&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>AFX&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
</tbody>
</table>
Technique for safe removal of an aortic endograft with suprarenal fixation

Olivier H. J. Koning, MD, Jan-Willem Hinnen, MD, and Jary M. van Baalen, MD, PhD,
Leiden, The Netherlands
Fixation reduces migration

Case selection is key regardless of supra/infra renal fixation

Suprarenal fixation: Possible effect on long term renal function

Effect on renal function clinically relevant?

Suprarenal fixation does not preclude vessel cannulation
Editor’s Choice — Late Open Surgical Conversion after Endovascular Abdominal Aortic Aneurysm Repair

Vinay Kansal a, Sudhir Nagpal b,c, Prasad Jetty b,c,*

a University of Ottawa, Faculty of Medicine, Ottawa, Ontario, Canada
b University of Ottawa, Division of Vascular Surgery, Ottawa, Ontario, Canada
c Ottawa Hospital Research Institute, Ottawa, Ontario, Canada

<table>
<thead>
<tr>
<th>Device</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medtronic Talent</td>
<td>8</td>
<td>50.0%</td>
</tr>
<tr>
<td>Medtronic Endurant</td>
<td>3</td>
<td>18.8%</td>
</tr>
<tr>
<td>Cook Zenith</td>
<td>4</td>
<td>25.0%</td>
</tr>
<tr>
<td>Terumo Anaconda</td>
<td>1</td>
<td>6.2%</td>
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1060 consecutive Infrarenal stent grafts
3 (Talent) explanted for migration