GEOMETRICAL DETERMINANTS OF TARGET VESSEL INSTABILITY IN FEVAR

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Disclosure

Speaker name: MICHELE PIAZZA

I have the following potential conflicts of interest to report:

- Consulting agreements

Cook*
Medtronic*
Gore W.L. & Associates*
Terumo Aortic*
Artivion*

*all consulting fees paid to the Dept. of Cardiac Thoracic Vascular Sciences, University of Padua.

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The major factor affecting the mid-term outcomes of FEVAR is represented by branches complications, as related endoleak or occlusion.

Main aspect to be considered for TV STABILITY:

- Aortic anatomy
- Target vessel anatomy
- Type of main endograft and bridging stent
AORTIC ANATOMY

From the Society for Vascular Surgery

Effect of aortic angulation on the outcomes of fenestrated-branched endovascular aortic repair

Francesco Squizzato, MD, Gustavo S. Oderich, MD, Parvathi Balachandran, MS, Emanuel R. Tenorio, PhD, Bernardo C. Mendes, MD, and Randall R. De Martino, MD, MS, Rochester, Minn

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TARGET VESSEL ANATOMY

Renal Artery Orientation Influences the Renal Outcome in Endovascular Thoraco-abdominal Aortic Aneurysm Repair

Enrico Galitto, Gianluca Faggioli, Rodolfo Pini, Chiara Mascili, Stefano Ancetti, Mohammad Abualhin, Andrea Stella, Mauro Gaggiulo

Vascular Surgery, Department of Experimental, Diagnostic and Speciality Medicine, University of Bologna, Policlinico Sant’Orsola-Malpighi, Bologna, Italy

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FEVAR

• TV instability is primarily driven by endoleaks because of possible inadequate connection between the BS and the main body

• The post-implantation geometric conformation may play an important role in the target vessels-related outcomes of FEVAR.
Single-center retrospective study (2014-2021)
132 target vessels
Post-implantation geometrical analysis on the first post-operative CTA
POST-IMPLANTATION GEOMETRICAL ANALYSIS

BRIDGING STENT LENGTH

- SL: Sealing Length
- BL: Bridging Length
- PL: Protrusion Length

FLARE RATIO

- $L_1$
- $L_2$

MISALIGNMENT

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OVERALL FREEDOM FROM TV INSTABILITY

90.5% freedom from EL: 94%
primary patency: 98%

Number at risk
- 173
- 130
- 102
- 81
- 66
- 54
- 50
- 44

Time (months)
0 6 12 18 24 30 36 42

Percentage
0.00 0.25 0.50 0.75 1.00

Number at risk
- 173
- 130
- 102
- 81
- 66
- 54
- 50
- 44

Time (months)
0 6 12 18 24 30 36 42

Percentage
0% 25% 50% 75% 100%
## RESULTS
### GEOMETRICAL ANALYSIS

<table>
<thead>
<tr>
<th></th>
<th>All stent types</th>
<th>New generation (VBX)</th>
<th>Other ST*</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridging stent nominal diameter</td>
<td>7.4±1.1</td>
<td>7.4±1.1</td>
<td>7.4±1.1</td>
<td>.75</td>
</tr>
<tr>
<td>Post-Flare max diameter, mm</td>
<td>8.4±1.6</td>
<td>8.7±1.9</td>
<td>8.1±1.4</td>
<td>.02</td>
</tr>
<tr>
<td>Bridging stent min diameter, mm</td>
<td>6.1±1.1</td>
<td>6.1±1.1</td>
<td>6.1±1.2</td>
<td>.97</td>
</tr>
<tr>
<td>Flare ratio</td>
<td>1.13±0.26</td>
<td>1.27±0.27</td>
<td>1.19±0.23</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Stent length, mm</td>
<td>32.5±6.6</td>
<td>32.8±4.9</td>
<td>32.1±8.1</td>
<td>.52</td>
</tr>
<tr>
<td>Protrusion length, mm</td>
<td>6.4±2.1</td>
<td>6.9±2.2</td>
<td>5.7±1.9</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Bridging length, mm</td>
<td>0.9±2.1</td>
<td>0.6±1.7</td>
<td>1.1±2.4</td>
<td>.20</td>
</tr>
<tr>
<td>Sealing length, mm</td>
<td>21.7±5.9</td>
<td>21.7±4.5</td>
<td>21.7±7.0</td>
<td>.98</td>
</tr>
</tbody>
</table>

* Stainless Steel

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THE BRIDGING LENGTH IMPACT ON STABILITY

<table>
<thead>
<tr>
<th>Bridging Length (mm)</th>
<th>Target Vessel Instability</th>
</tr>
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<table>
<thead>
<tr>
<th>Bridging Length (mm)</th>
<th>Hazard Ratio</th>
<th>95% CI</th>
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<tbody>
<tr>
<td>0</td>
<td>1</td>
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<td>1</td>
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<td>9</td>
<td>10</td>
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<table>
<thead>
<tr>
<th>Bl&lt;5mm</th>
<th>Bl≥5mm</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>9±13</td>
<td>21±12</td>
<td>.01</td>
</tr>
<tr>
<td>0.7±1.1</td>
<td>0.7±1.3</td>
<td>.96</td>
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INSTABILITY RELATED TO MISALIGNMENT

Horizontal Misalignment

Vertical Misalignment

22% cases >15°

100% cases <5 mm
DETERMINANTS OF INSTABILITY RELATED TO HORIZONTAL MISALIGNMENT >15°

Anatomical factors

Iliac tortuosity

Pararenal aortic angle

Bridging length

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RESULTS

EFFECT ON BRANCH STABILITY RELATED TO ALIGNMENT CHANGES OVER TIME

Median=30 months

<table>
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<tr>
<th>Misalignment increase during follow-up</th>
<th>Univariate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OR (95%CI)</strong></td>
<td><strong>P</strong></td>
</tr>
<tr>
<td>Baseline horizontal misalignment, °</td>
<td>1.04 (1.01-1.08)</td>
</tr>
<tr>
<td>Pararenal aortic angle</td>
<td>1.03 (1.00-1.07)</td>
</tr>
<tr>
<td>Bridging distance ≥5mm</td>
<td>2.00 (1.02-11.29)</td>
</tr>
<tr>
<td>Any kind of endoleak</td>
<td>5.85 (1.2-29.1)</td>
</tr>
</tbody>
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HOW TO IMPROVE OUR PRACTICE

• PLANNING
HOW TO IMPROVE OUR PRACTICE

• PROCEDURE ➔ Reduce the risk of twisting during endograft advancement
  • Introducer sheath
  • Femoral-brachial through and through
  • Low-profile device
Other possible influencing factors:
Mid and long term effect of dinamic movements between the main body and the BS
CONCLUSIONS

• TV instability in FEVAR is primarily related to a bridging length > 5 mm that may cause leak related to horizontal misalignment.

• This geometrical pattern, together with iliac tortuosity and pararenal aortic angulation are predictors of endoleak.

• In the near future, the role of continuous pulsatile aortic movement will need to be evaluated for their role in long term TV stability.
THANKS FOR YOUR ATTENTION

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