Respiratory-Induced Dynamics of the BeGraft Stent in FEVAR

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Christopher Cheng, PhD
Adjunct Professor of Vascular Surgery, Stanford University
Executive Vice President, Global Science & Technology
Disclosure

Speaker name: Christopher Cheng

I have the following potential conflicts of interest to report:

- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

☐ I do not have any potential conflict of interest
Increased adoption of fenestrated EVAR with a variety of bridging stent grafts

Mendes BC, Oderich GS (2017). Endovascular Aortic Repair, pp 360
Influence of bridging stents largely unknown

Diaphragmatic motion from breathing causes cyclic renovisceral vessel motion

Direct impact of fEVAR on branch vessel dynamics had not yet been studied

Prospective recruitment of 12 patients undergoing fEVAR of TAAAs (Oct2019-Feb2020)

Patients treated with 4-vessel Cook ZFEN endograft and Bentley BeGraft for bridging stents

Pre- and post-operative CTAs with inspiratory and expiratory breath-holds
Modeling & Data Analysis

Contour Segmentation

Centerline Extraction

Anatomic Quantification

- End-stent angle
- Vessel Curvature
- Branch angle
Branch Angle and End-Stent Angle

**Inspiration**

**Expiration**

**Respiratory Change**

**Branch Angle**

**End-Stent Angle**
Localized Max Vessel Curvature – Respiratory Change

![Image of localized max vessel curvature](image)

<table>
<thead>
<tr>
<th></th>
<th>Celiac</th>
<th>SMA</th>
<th>Renal</th>
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<tbody>
<tr>
<td>Pre-Op</td>
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<td>Post-Op</td>
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Delta Curvature (cm⁻¹)

- Celiac: NS
- SMA: 0.045
- Renal: NS
Discussion

• ZFEN-BeGraft fEVAR $\rightarrow$ $\sim 50\%$ reduction in respiratory-induced $\Delta$ branch angle

<table>
<thead>
<tr>
<th></th>
<th>fEVAR-induced $\Delta$ Branch Angle</th>
<th>Respiratory-induced $\Delta$ Branch Angle</th>
<th>Etiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZFEN-BeGraft</td>
<td>$\sim 10$ deg</td>
<td>$\sim 5$ deg</td>
<td>Thoracoabdominal</td>
</tr>
<tr>
<td>ZFEN-iCAST</td>
<td>$\sim 20$ deg</td>
<td>$\sim 1$ deg</td>
<td>Juxtarenal</td>
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<tr>
<td>iCAST/BeGraft</td>
<td>$\sim 2x$</td>
<td>$\sim 0.2x$</td>
<td></td>
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• ZFEN-BeGraft fEVAR $\rightarrow$ minimal fEVAR-induced end-stent angle change; SMA is exception, perhaps because least perpendicular
• ZFEN-BeGraft fEVAR $\rightarrow$ minimal respiratory-induced end-stent angle and curvature change; SMA is exception
• Conforms to native anatomy and respiratory-induced motion
• Findings may influence device selection and branch-specific stent design
Thank you!