Dynamic imaging of the ascending aorta: what are the implications for endograft treatment

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The arch and ascending aorta

Arch, ascending and TAVI

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39 patients
Type I endoleak: 6 (15%)
Distal migration: 1 (3%)
Re-intervention: 10 (26%)
Aortic motion

MOTION QUANTIFICATION

Cyclic three-dimensional wall motion of the human ascending and abdominal aorta characterized by time-resolved three-dimensional ultrasound speckle tracking

4D MRI - Aortic displacement – cardiac motion

4D MRI - Aortic displacement – respiratory motion
Comparison

<table>
<thead>
<tr>
<th>Cardiac</th>
<th>Respiratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascending aorta motion [mm]</td>
<td>![Graph]</td>
</tr>
<tr>
<td>Arch motion [mm]</td>
<td>![Graph]</td>
</tr>
<tr>
<td>Descending aorta motion [mm]</td>
<td>![Graph]</td>
</tr>
</tbody>
</table>

P = 0.002
Mann Whitney

P = 0.0001
Mann Whitney

P = 0.31
Mann Whitney

EFFECT OF ENDOVASCULAR REPAIR

Changes in Geometry and Cardiac Deformation of the Thoracic Aorta after Thoracic Endovascular Aortic Repair

<table>
<thead>
<tr>
<th>Time</th>
<th>Ascending aorta (right coronary to left coronary artery)</th>
<th>Arch (descending aorta to common iliac arteries)</th>
<th>Descending aorta (iliac artery to renal arteries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-TAVR</td>
<td>Ascending aorta maximum change [%]</td>
<td>11 ± 4.6</td>
<td>31 ± 6.6</td>
</tr>
<tr>
<td>Mean curvature [%]</td>
<td>0.05 ± 0.04</td>
<td>0.03 ± 0.02</td>
<td>0.02 ± 0.01</td>
</tr>
<tr>
<td>Peak curvature [%]</td>
<td>0.06 ± 0.04</td>
<td>0.05 ± 0.04</td>
<td>0.06 ± 0.04</td>
</tr>
<tr>
<td>Post-TAVR</td>
<td>Ascending aorta maximum change [%]</td>
<td>2.7 ± 11.0</td>
<td>-0.4 ± 0.5</td>
</tr>
<tr>
<td>Mean curvature [%]</td>
<td>0.05 ± 0.04</td>
<td>0.03 ± 0.02</td>
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EFFECT ON THE HEART
Cardiac effect of endovascular repair

Positive correlation between PWV and LV mass

Exercise tolerance

Conclusion

- Biomechanics of the ascending aorta are complex and different to the arch, thoracic and abdominal aorta
- Effect of endovascular repair on the other aortic segments and the heart