Perspectives of Magnetic Resonance Imaging (MRI) for aortic aneurysms and dissections

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No disclosures
Agenda:

✓ Current role of MRI in aortic disease

✓ Examples of applications

✓ Possibilities & perspective
Current role of MRI in aortic disease:

- …mainly in CT:
  - Fast
  - Few contraindications

Eligible for intensive care patients

- Requires only little cooperation from patient.
What is the current role of MRI in aortic disease now?

- ...mainly in CT:
  - Fast
  - Few contraindications
  - Available
  - Established
  - Technically easy
  - Requires only little cooperation from patient.

MRA
What is the current role of MRI in aortic disease now?

Main arguments for MRI:

- More young patients with more follow up-exams.
- Native examinations in MR allow for vascular imaging.
  - First evaluation of diameters of the aorta.
  - Follow up-exams.
- More information
  - Function (flow measurement)
  - Function (wall movement)
  - Perfusion imaging

Evaluation of prognosis
Application: Rule out Endoleak - Angiography and perfusion

MRA | CTA with Gd | MRA | Perfusion

Additional information

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Application: Rule out Endoleak - data overview

Table 4. Magnetic Resonance Imaging vs Computed Tomography Angiography for Additional Detection of Endoleaks.

<table>
<thead>
<tr>
<th>First Author (Year)</th>
<th>MRI+ CTA−</th>
<th>MRI− CTA+</th>
<th>MRI+ CTA−</th>
<th>MRI− CTA+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cantisani (2011)</td>
<td>3</td>
<td>0</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td>Cejna (2002)</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Haulon (2001)</td>
<td>12</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ichihashi (2013)</td>
<td>3</td>
<td>1</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td>van der Laan (2006)</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wieners (2009)</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

Abbreviations: CTA, computed tomography; MRI, magnetic resonance imaging; NI, not included.

Magnetic Resonance Imaging vs Computed Tomography Angiography for the Detection of Aortic Aneurysm Repair

A Systematic Review of Ultrasound or Magnetic Resonance Imaging Compared With Computed Tomography for Endoleak Detection and Aneurysm Diameter Measurement After Endovascular Aneurysm Repair
Application: Morphologic imaging without use of contrast agent

SSFP-Sequences
Application: Morphologic imaging without use of contrast agent

SSFP-Sequences

SSFP-Sequences (Trufi 3D)
Application: Magnetic Resonance Angiography
Table 2. Reported Sensitivity and Specificity of Diagnostic Tools for Acute Aortic Syndrome

<table>
<thead>
<tr>
<th>Diagnostic Tool</th>
<th>Studies, No.</th>
<th>Patients, No.</th>
<th>Threshold</th>
<th>All AAS(^a,,,b)</th>
<th>Acute Aortic Dissection(^a,,,b)</th>
<th>Intramural Hematoma(^a,,,b)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sensitivity</td>
<td>Specificity</td>
<td>Specificity</td>
</tr>
<tr>
<td>CT27</td>
<td>1</td>
<td>49</td>
<td></td>
<td>100 (86.3-100)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>MRI(^{29-31})</td>
<td>3</td>
<td>116</td>
<td></td>
<td>95.0-100</td>
<td>94.0-98.0</td>
<td>95.0-100</td>
</tr>
<tr>
<td>TEE(^{17,27,29,30,32,33})</td>
<td>6</td>
<td>520</td>
<td></td>
<td>86.0-100</td>
<td>90.0-100</td>
<td>86.0-100</td>
</tr>
<tr>
<td>TTE(^{34,35})</td>
<td>2</td>
<td>228</td>
<td></td>
<td>73.7-100</td>
<td>71.2-91.0</td>
<td>73.7-100</td>
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<tr>
<td>Intravascular ultrasound(^{36})</td>
<td>1</td>
<td>28</td>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>D-dimer(^{37-42})</td>
<td>6</td>
<td>876</td>
<td>&gt;0.5-0.7 (\mu)g/mL</td>
<td>51.7-100</td>
<td>32.8-89.2</td>
<td>51.7-100</td>
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<tr>
<td>Elastin degradation products(^{43})</td>
<td>1</td>
<td>609</td>
<td>&gt;3 SD above mean of healthy patients</td>
<td>99.8 (99.1-100)</td>
<td>99.8 (99.1-100)</td>
<td></td>
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<tr>
<td>MMP 8/9(^{44})</td>
<td>1</td>
<td>126</td>
<td>&gt;3.6 ng/mL</td>
<td>100 (93.2-100)</td>
<td>9.5 (3.9-18.5)</td>
<td></td>
</tr>
<tr>
<td>Smooth muscle myosin heavy chain(^{45})</td>
<td>1</td>
<td>27</td>
<td>&gt;10 ng/mL</td>
<td>90.0 (78.7-100)</td>
<td>97.0</td>
<td>90.0 (78.7-100)</td>
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<tr>
<td>Soluble lectin-like oxidized LDLR 1(^{46})</td>
<td>1</td>
<td>19</td>
<td>&gt;150 pg/mL</td>
<td>89.5</td>
<td>94.3</td>
<td></td>
</tr>
</tbody>
</table>
Perspective: New prognostic parameter

FlowDisplacement = \frac{\text{Systolic Flow Displacement}}{\text{AoDiameter}}

Systolic Flow Displacement Correlates With Future Ascending Aortic Growth in Patients With Bicuspid Aortic Valves Undergoing Magnetic Resonance Surveillance

Nicholas S. Burris, MD,*, Monica Sigovan, PhD,‡ Heather A. Knauer, MSPH,‡ Elaine E. Tseng, MD,§ David Saloner, PhD,*, and Michael D. Hope, MD*
Perspective: New prognostic parameter
Perspective: New prognostic parameter

Valve-Related Hemodynamics Mediate Human Bicuspid Aortopathy
Journal of the American College of Cardiology Aug 2015, 66 (8) 892-900; DOI: 10.1016/j.jacc.2015.06.1310
Summary:

➢ Diagnostic potential of MR exhibits that of the CT in many vascular applications

➢ Many opportunities: E.g. prognostic data or diagnostic

➢ Eligible for frequent follow-up examinations; in some cases without contrast agent

➢ Complicated and time consuming examination
Thank you very much for your attention!