CT Versus MR for the Runoff

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Magnetic Resonance

Radio waves/magnetic fields
Arbitrary slice orientation
Easy to suppress bone/calcium
Contrast agents safer*
Anatomy + function

Computed Tomography

Ionizing radiation
Axial slice orientation only
Must segment out bone/calcium
Nephrotoxicity, allergic rxn
Anatomy only

*NSF!
Aortoiliac and Renal Arteries: Prospective Intraindividual Comparison of Contrast-enhanced Three-dimensional MR Angiography and Multi-Detector Row CT Angiography

Radiology 2003; 226:798–811
RESULTS: Sensitivity of MR angiography for detection of hemodynamically significant arterial stenosis was 92% for reader 1 and 93% for reader 2, and specificity was 100% and 99%, respectively. Sensitivity of CT angiography was 91% for reader 1 and 92% for reader 2, and specificity was 99% and 99%, respectively. Differences between the two modalities were not significant. Interobserver and intermodality agreement was excellent ($\kappa = 0.88–0.90$). The time for performance of 3D reconstruction and image analysis of CT data sets was significantly longer than that for MR data sets ($P < .001$). Patient acceptance was best for CT angiography ($P = .016$).
Aortoiliac and Renal Arteries: Prospective Intraindividual Comparison of Contrast-enhanced Three-dimensional MR Angiography and Multi–Detector Row CT Angiography

Radiology 2003; 226:798–811
Renal Artery Stenosis:
MRA may overestimate stenosis
CTA Better for Renal Stent Evaluation
Accuracy of Computed Tomographic Angiography and Magnetic Resonance Angiography for Diagnosing Renal Artery Stenosis

Ann Intern Med. 2004;141:674-682

COMMENTARY
In this study, the average pretest probability was 0.20 (pretest odds, 1:4). Given the negative likelihood ratio of 0.39 for CTA and 0.45 for MRA, the post-test odds would be about 1:10 after negative test results. Is that low enough to stop testing?
Fibromuscular Dysplasia of the Main Renal Arteries: Comparison of Contrast-enhanced MR Angiography with Digital Subtraction Angiography

Radiology: Volume 241: Number 3—December 2006 p922

<table>
<thead>
<tr>
<th>Parameter</th>
<th>FMD</th>
<th>Stenosis*</th>
<th>String of Pearls†</th>
<th>Aneurysm†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity (%)</td>
<td>97 (83, 100) [34/35]</td>
<td>68 (45, 85) [15/22]</td>
<td>95 (74, 100) [20/21]</td>
<td>100 (40, 100) [4/4]</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>93 (66, 100) [14/15]</td>
<td>94 (77, 99) [29/31]</td>
<td>93 (76, 99) [27/29]</td>
<td>93 (81, 98) [43/46]</td>
</tr>
<tr>
<td>κ Value‡</td>
<td>0.91</td>
<td>0.65</td>
<td>0.92</td>
<td>. . .</td>
</tr>
</tbody>
</table>

*retrospective study of 25 patients over 6 years, various MR scanners
Multidetector spiral CT renal angiography in the diagnosis of renal artery fibromuscular dysplasia

Eur J Radiol. 2007 Mar;61(3):520-7
21 patients with proven FMD,
Age range 24-85 years

CTA identified all 42 main renal arteries (100%) and all 10 accessory renal arteries (100%) visualized on CA. In the diagnosis of FMD, CTA detected all 40 (100%) lesions detected by CA.
Fibromuscular Dysplasia

MRA

CTA
## Peripheral MRA

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th># Patients</th>
<th>Technique</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owen (NEJM)</td>
<td>1992</td>
<td>23</td>
<td>2D TOF</td>
<td>superior to DSA</td>
<td></td>
</tr>
<tr>
<td>Baum (JAMA)</td>
<td>1995</td>
<td>155</td>
<td>2D TOF</td>
<td>82</td>
<td>84</td>
</tr>
<tr>
<td>Prince (Radiology)</td>
<td>1995</td>
<td>43</td>
<td>3D Gd</td>
<td>94</td>
<td>98</td>
</tr>
<tr>
<td>Snidow (Radiology)</td>
<td>1996</td>
<td>32</td>
<td>3D Gd</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td>Hany (Radiology)</td>
<td>1997</td>
<td>39</td>
<td>3D Gd</td>
<td>93-96</td>
<td>96-100</td>
</tr>
<tr>
<td>Ho (Radiology)</td>
<td>1998</td>
<td>28</td>
<td>Bolus chase</td>
<td>93</td>
<td>98</td>
</tr>
<tr>
<td>Meaney (Radiology)</td>
<td>1998</td>
<td>20</td>
<td>Bolus Chase</td>
<td>81-89</td>
<td>91-95</td>
</tr>
<tr>
<td>Yamashita (JMRI)</td>
<td>1998</td>
<td>20</td>
<td>3D Gd</td>
<td>96</td>
<td>83</td>
</tr>
<tr>
<td>Lee (Radiology)</td>
<td>1998</td>
<td>23</td>
<td>2D Gd</td>
<td>94</td>
<td>91</td>
</tr>
<tr>
<td>Winchester (JMRI)</td>
<td>1998</td>
<td>22</td>
<td>2D Gd</td>
<td>90</td>
<td>98</td>
</tr>
<tr>
<td>Link (Radiology)</td>
<td>1999</td>
<td>67</td>
<td>3D Gd</td>
<td>100</td>
<td>83</td>
</tr>
</tbody>
</table>

(post stent)
CTA:

- Pulmonary Embolism
- Aorta, proximal peripheral artery disease (e.g. claudication)
- Subtle abnormalities (e.g. renal FMD)
- Suboptimal MR capability
- Note… Pacemakers, stents ok
  - But… requires iodinated contrast medium; must consider renal function; radiation exposure in younger patients

Recommendations

MRA:

- Distal disease (e.g. limb-threatening ischemia), but good for proximal disease as well
- RAS except (maybe) for suspected FMD
- Time-resolved imaging, function
- Note… Gadolinium chelates generally safe in patients with abnormal renal function or diabetes, but now have to worry about NSF!
- No pacemakers; stents give artifacts
Peripheral CTA: Faster, Easier Set-up Than MRA
TABLE 6: Interobserver Agreement of MDCT Angiography in Segments With and Without Vessel Wall Calcifications

<table>
<thead>
<tr>
<th>Anatomic Location</th>
<th>Interobserver Agreement on Segments Without Vessel Wall Calcifications</th>
<th>Interobserver Agreement on Segments With Vessel Calcifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Segments</td>
<td>$\kappa_w$ (95% CI)</td>
</tr>
<tr>
<td>Aortoiliac arteries</td>
<td>124</td>
<td>0.94 (0.90–0.98)</td>
</tr>
<tr>
<td>Femoropopliteal arteries</td>
<td>549</td>
<td>0.91 (0.88–0.95)</td>
</tr>
<tr>
<td>Crural arteries</td>
<td>841</td>
<td>0.84 (0.81–0.88)</td>
</tr>
</tbody>
</table>

Note—$\kappa_w =$ weighted kappa, CI = confidence interval.
Interobserver Agreement for the Interpretation of Contrast-Enhanced 3D MR Angiography and MDCT Angiography in Peripheral Arterial Disease

AJR 2005; 185:1261–1267
CTA Excellent for Evaluation of Stent Grafts