What’s the best test for renal artery stenosis in patients with refractory hypertension?

Evidence-based answer
Magnetic resonance angiography (MRA) and computed tomography angiography (CTA) are the most consistently accurate, noninvasive screening methods. MRA is likely the preferred option because of its lack of radiation and reduced risk of contrast media (strength of recommendation [SOR]: A, large meta-analyses).

Evidence summary
Significant renal artery stenosis (RAS) is defined anatomically as >50% stenosis of the lumen by renal angiography; stenosis is considered hemodynamically significant (potentially causing renovascular hypertension) if it exceeds 75%. The prevalence of renovascular hypertension among the general hypertensive population varies from 1% to 5%. The prevalence increases to 20% to 40% in the presence of certain clinical criteria:
- hypertension in patients <30 years
- worsening or sudden onset of hypertension in patients >50 years
- hypertension refractory to multiple medications
- malignant hypertension
- worsening renal function after starting an angiotensin-converting enzyme inhibitor (ACE-I). (Worsening renal function is defined as >30% decline in estimated glomerular filtration rate or >30% increase in serum creatinine during the first 2 months of ACE-I therapy.)

Refractory hypertension associated with generalized atherosclerosis is the most predictive risk factor for RAS.

MRA is usually best, but don’t overlook ultrasound
Among the primary diagnostic tests for RAS (see TABLE W1 on page 216a), MRA is the most consistently accurate and least operator dependent—which makes it the best choice in most situations. One rare but serious concern with MRA is that contrast agents may cause nephrogenic systemic fibrosis (NSF), a debilitating and sometimes fatal diffuse disease affecting the skin, muscle, and internal organs. In 2006, 25 cases of NSF after exposure to gadolinium-based contrast agents were reported, prompting an FDA warning.

Kidney duplex Doppler ultrasound can rival MRA and CTA in accuracy, but is highly operator dependent. If access to highly skilled, experienced technicians is available, this safe and less expensive option can be considered, especially for patients with chronic kidney disease.

Recommendations
The American College of Radiology recommends stratifying patients into 3 groups:
- high index of suspicion with nor-
• Abnormal renal function
• High index of suspicion with diminished renal function
• Low index of suspicion.

Recommendations include:
• MRA or CTA for high suspicion with normal renal function
• MRA or ultrasonography for high suspicion with impaired renal function
• All methods equally inappropriate if suspicion is low.

Cost-effectiveness was not evaluated in the meta-analysis used to derive the guidelines.

The National Kidney Foundation recommends MRA and CTA as accurate, noninvasive, and consistent means of diagnosing RAS. The foundation also recommends duplex ultrasonography as a less invasive and less expensive alternative when local expertise is available. The guidelines include a moderately predictive rule for identifying patients who should be screened for renovascular hypertension—that is, patients with intermediate or high pretest probability (www.kidney.org/professionals/kdoqi/guidelines_bp/guide_4.htm).

The American College of Cardiology and the American Heart Association list advantages and disadvantages of each diagnostic method and recommend choosing the one that is best suited to the patient.

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References
### Diagnostic tests for renovascular hypertension

<table>
<thead>
<tr>
<th>TEST</th>
<th>COMPOSITE RATING</th>
<th>SENSITIVITY</th>
<th>SPECIFICITY</th>
<th>SPECIAL CONSIDERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRA</td>
<td>1</td>
<td>94%-97%&lt;sup&gt;4&lt;/sup&gt;</td>
<td>85%-93%&lt;sup&gt;4&lt;/sup&gt;</td>
<td>No radiation; expensive; small risk of nephrogenic systemic fibrosis from gadolinium contrast agents</td>
</tr>
<tr>
<td>CTA</td>
<td>2</td>
<td>88%-96%&lt;sup&gt;3&lt;/sup&gt;</td>
<td>77%-98%&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Similar accuracy to MRA; moderate radiation exposure; requires iodinated contrast media</td>
</tr>
<tr>
<td>US duplex Doppler</td>
<td>3</td>
<td>0%-90%&lt;sup&gt;3&lt;/sup&gt;</td>
<td>95%&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Noninvasive; highly operator dependent</td>
</tr>
<tr>
<td>ACE-I renography/scintography</td>
<td>4</td>
<td>58%-95%&lt;sup&gt;2&lt;/sup&gt;</td>
<td>17%-100%&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Noninvasive; can be used in renal insufficiency; high radiation exposure; literature is not uniform regarding techniques and interpretation criteria</td>
</tr>
<tr>
<td>Invasive arteriography</td>
<td>5</td>
<td>—</td>
<td>—</td>
<td>Gold standard; invasive; better used as confirmation than screening</td>
</tr>
<tr>
<td>Invasive renal vein renin assays</td>
<td>6</td>
<td>65%-74%&lt;sup&gt;3&lt;/sup&gt;</td>
<td>100%&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Good confirmatory test; invasive; possibility of sampling error</td>
</tr>
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ACE-I, angiotensin-converting enzyme inhibitor; CTA, computed tomography angiography; MRA, magnetic resonance angiography; US, ultrasound.