CME CREDIT

Screening for renal artery stenosis: Which patients? Which test?

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ABSTRACT

If a patient has clinical clues suggestive of renovascular hypertension such as persistently high blood pressure despite a multiple-drug regimen, it may be reasonable to screen him or her using captopril renography, duplex ultrasonography, or magnetic resonance angiography.

Screening is reasonable in patients with clinical clues suggesting renal artery stenosis

IF A PATIENT has persistently high blood pressure despite multiple medications, the problem may be renovascular hypertension: high blood pressure induced by a critical decrease in perfusion to one or both kidneys, usually due to renal artery stenosis, and associated with activation of the renin-angiotensin-aldosterone system.

Renovascular hypertension probably accounts for only about 1% of cases of high blood pressure, but it accounts for as many as 30% of patients seen in hypertension referral centers because of refractory hypertension.[1]

Atherosclerosis accounts for approximately 70% of cases of renal artery stenosis, and is especially common in older patients.[2] In this age group, extensive atherosclerosis of the abdominal aorta and proximal renal arteries often leads to ischemic nephropathy. On the other hand, fibromuscular dysplasia accounts for more cases in younger patients.

WHO SHOULD BE SCREENED?

In view of the low prevalence of renovascular hypertension, it is not cost-effective to screen all new hypertensive patients for renal artery stenosis. Screening is more cost-effective and should have a greater predictive value in patients with one or more clues suggestive of renal artery stenosis.

The clinical evaluation should therefore begin with a careful medical history and thorough physical examination that can uncover important clinical clues suggesting renovascular hypertension, such as:

- Abrupt onset of hypertension before age 30 or after age 55
- Accelerated or malignant hypertension (with grade 3 or 4 retinopathy)
- Hypertension refractory to an appropriate triple-drug regimen
- Moderate hypertension in a patient with diffuse atherosclerosis (eg, in the carotid, coronary, and peripheral arteries)
- A continuous systolic-diastolic epigastric bruit
- Moderate hypertension and unexplained azotemia
- Azotemia induced by an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker
- A unilateral small kidney by any prior investigational procedure
- Undiagnosed renal insufficiency, with or without hypertension (particularly with normal urine sediment)
- "Flash pulmonary edema" (ie, of sudden onset) in the presence of hypertension and diffuse atherosclerotic vascular disease.

WHAT IS THE FIRST, BEST TEST TO USE?

If a patient has normal renal function and clinical clues suggestive of renal artery stenosis, I would recommend any of three screening tests:

- Captopril renography,
- Duplex ultrasonography, or
- Magnetic resonance angiography.

In older patients or those with impaired renal function, I prefer duplex ultrasonography because it provides some anatomic imaging of the renal artery, retains its sensitivity despite impaired renal function, and in most institutions is a bit more cost-effective than magnetic resonance angiography. If this test is not available, however, magnetic resonance angiography with gadolinium is also useful for screening for renal artery stenosis.

For the occasional patient in whom these noninvasive screening tests are nondiagnostic and the suspicion for renal artery stenosis remains high, intra-arterial digital subtraction angiography may be considered. This procedure provides images of comparable quality to those of standard arteriography and uses less contrast medium, entailing a lower risk of contrast nephrotoxicity in patients with renal insufficiency. On the other hand, it is invasive (entailing aortic catheterization) and carries risks similar to those observed with standard arteriography.

ADVANTAGES AND DISADVANTAGES OF THE DIFFERENT TESTS

Intravenous pyelography and renography using iodine-131 orthoiodohippurate are no longer used because of poor sensitivity and specificity. Intravenous pyelography may also carry an increased risk of contrast-induced nephrotoxicity in older patients with suspected ischemic nephropathy. Measurement of plasma renin activity also has poor sensitivity and specificity and is highly subject to the influence of other drugs that may induce spurious values. These older screening tests have also failed to accurately predict the blood pressure response to revascularization.

The captopril plasma renin test (measurement of plasma renin activity after a single dose of captopril) is relatively inexpensive and can be performed on an outpatient basis. Its major limitation is that it does not provide any information about the anatomy of the renal arteries or kidney involvement or function. In addition, its sensitivity and specificity vary from center to center and are reduced in patients with impaired renal function. Ideally other antihypertensive agents should be discontinued several days before testing.

Recent advances in treatment have stimulated interest in developing improved noninvasive screening tests for renovascular hypertension.[3,4]

Captopril renography

Captopril renography consists of renal scintigraphy using any one of several appropriate isotopes, performed at baseline and again 30 to 60 minutes after ingestion of 25 or 50 mg of captopril. A reduced uptake of the radionuclide and prolonged time to maximal activity after captopril administration indicate delayed excretion and possibly renal artery stenosis.

Advantages. Captopril renography can identify critical renal artery stenosis with a sensitivity and specificity exceeding 90%.[3]

Disadvantages. Captopril renography does not provide information about renal artery anatomy. In addition, its sensitivity and specificity may be reduced in patients with renal insufficiency. This limitation can pose a problem in older patients being screened for possible ischemic nephropathy.

Duplex ultrasonography

Duplex ultrasonography combines direct (B-mode) imaging with Doppler measurement of the velocity of blood flow. Results are usually given as one of three degrees of stenosis: 60% or less, 60% to 99%, or total occlusion.

Advantages. Duplex ultrasonography provides both an anatomic and functional assessment of the degree of stenosis and a measurement of the kidneys' size. Sensitivities exceeding 90% and specificities approaching 100% are reported.[5] The results correlate well with those of renal angiography. Duplex scanning is noninvasive, requires no contrast material, and is therefore safe in patients with impaired renal function. It has also proved useful for serial follow-up after intervention. Continuing technologic developments will facilitate determinations of flow velocities and pressure gradients across stenoses.

Disadvantages. The technique is operator-dependent and is less reliable in obese subjects.

Duplex ultrasound may be best in older patients and those with renal failure

Magnetic resonance angiography

Magnetic resonance angiography is based on the physical differences between moving and stationary protons.

Advantages. Magnetic resonance angiography is entirely noninvasive and uses no radiation.[6] Several studies found it to have a sensitivity and specificity of 90% to 95% in identifying renal artery stenosis greater than 50%, and it has improved even more with the development of special contrast solutions such as gadolinium.

Disadvantages. Respiratory artifact, peristalsis, tortuous vessels, and turbulent flow can limit the clarity of the images. In addition, up to 10% of patients may not tolerate the confinement of the machine due to anxiety.

STENOSIS DOES NOT EQUAL HYPERTENSION

A caveat: Stenosis does not equal hypertension. Even in a patient with high blood pressure, the presence of renal artery stenosis does not necessarily prove the patient has renovascular hypertension, as stenosis may or may not cause significant hypertension. In general, stenosis is not hemodynamically significant unless it occludes the artery by at least 70%. The true test for renovascular hypertension however is whether the blood pressure returns to normal levels after the stenosis is corrected.

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