

Review: Gadolinium-enhanced magnetic resonance angiography is highly sensitive and specific for peripheral arterial disease

Visser K, Hunink MG. Peripheral arterial disease: gadolinium-enhanced MR angiography versus color-guided duplex US—a meta-analysis. *Radiology*. 2000 Jul;216:67-77.

QUESTION

How does gadolinium-enhanced magnetic resonance (MR) angiography compare with color-guided duplex ultrasonography (DUS) and conventional angiography in the workup for patients with peripheral arterial disease?

DATA SOURCES

Studies were identified by searching MEDLINE (1984 to November 1998), scanning the bibliographies of relevant studies, and contacting experts in the field.

STUDY SELECTION

Studies were selected if gadolinium-enhanced MR angiography or color-guided DUS was done for the evaluation of arterial stenoses and occlusions in the workup for peripheral arterial disease of the lower extremities and if conventional angiography was used as the diagnostic standard. Absolute numbers for data analyses also had to be available.

DATA EXTRACTION

Data were extracted on study location, MR parameter, imaging protocol, gadolinium dose, DUS criteria, scanner used, patient characteristics, and outcome measures.

MAIN RESULTS

9 articles on MR angiography and 18 on DUS met the selection criteria. Using a random-effects model, pooled sensitivity for MR angiography was higher than that for DUS (Table). Pooled specificities were similar (Table). Summary receiver operating characteristic analysis showed better discriminatory power for MR angiography than for DUS. The regression coefficient for MR angiography compared with DUS was 1.73 (CI 0.44 to 3.02) with adjustment for covariates in a random-effects model.

CONCLUSIONS

Using conventional angiography as the diagnostic standard, gadolinium-enhanced

magnetic resonance angiography is highly sensitive and specific for the diagnosis of peripheral vascular disease. It has slightly better discriminatory power than does color-guided duplex ultrasonography for the localization of lesions of peripheral vascular disease.

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Operating characteristics of gadolinium-enhanced magnetic resonance (MR) angiography and color-guided duplex ultrasonography (DUS) using conventional angiography as the diagnostic standard in the workup for peripheral arterial disease*

Tests	Weighted sensitivity (95% CI)	Weighted specificity (CI)	+LR	-LR
MR angiography	98% (96 to 99)	96% (94 to 98)	26	0.03
DUS	88% (84 to 91)	95% (93 to 96)	17	0.13

*LRs defined in Glossary and calculated from data in article.

COMMENTARY

Peripheral arterial disease is a highly prevalent manifestation of atherosclerosis. The disease is initially asymptomatic, but with progression, patients experience claudication or chronic ischemia. The diagnosis of peripheral arterial disease is important to establish in the primary care setting because these patients have a marked increased risk for cardiovascular ischemic events (1). Diagnosis and risk stratification of peripheral arterial disease can be done by measurement of the ankle-brachial blood pressure index, with a ratio ≤ 0.90 indicating the presence of disease. Lower ratios are associated with higher mortality risks. Blood pressure measurements in the limb can also localize the occlusive lesions.

Most patients with peripheral arterial disease can be managed medically, but those considered for revascularization require angiographic location of the arterial lesions. The review by Visser and Hunink addresses the sensitivity and specificity of noninvasive techniques in patients who are being considered for angioplasty or surgery. The meta-analysis of the literature used appropriate techniques to obtain results that indicate that MR angiography has better diagnostic performance than does DUS and that MR angiography is a highly sensitive and specific method when conventional angiography is used as the diagnostic standard.

One of the primary limitations of DUS is that it is technician dependent, and therefore the results of the study by Visser and Hunink may not be generalizable to all vascular laboratories, particularly those that have not been certified. In contrast, MR angiography is less operator dependent but more expensive, particularly with gadolinium imaging. Furthermore, patients having angioplasty still require conventional angiography before the angioplasty procedure. For these reasons, neither of the noninvasive techniques will replace angiography in the near future, except in some centers where MR angiography alone may be adequate to plan a bypass operation. Patients who are at high risk for the use of contrast or patients with difficult-to-visualize distal vessels should also be considered for MR imaging, with DUS as an acceptable alternative when done in accredited laboratories.

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Reference

1. Criqui MH, Langer RD, Fronek A, et al. Mortality over a period of 10 years in patients with peripheral arterial disease. *N Engl J Med*. 1992;326:381-6.