

Magnetic resonance angiography had high specificity but moderate sensitivity for detecting pulmonary emboli

Oudkerk M, van Beek EJ, Wielopolski P, et al. Comparison of contrast-enhanced magnetic resonance angiography and conventional pulmonary angiography for the diagnosis of pulmonary embolism: a prospective study. *Lancet*. 2002 May 11;359:1643-7.

QUESTION

In unselected patients with clinically suspected pulmonary embolism, is magnetic resonance angiography (MRA) an accurate diagnostic test?

DESIGN

Blinded comparison of MRA with conventional pulmonary angiography (CPA) as the diagnostic standard.

SETTING

The Netherlands.

PATIENTS

118 patients with clinically suspected pulmonary embolism and abnormal findings on the perfusion lung scintigram.

DESCRIPTION OF TEST AND DIAGNOSTIC STANDARD

High-resolution, 3-dimensional, gadolinium-enhanced MRA with a 512 matrix was done in patients after deep inspiration during 2 separate breath-holds (1 for each lung) on a 1.5T MR Vision (Siemens Medical Systems,

Erlangen, Germany). 2 independent radiologists who were blinded to the results of CPA interpreted MRA images for presence or absence of pulmonary embolism. CPA consisted of selective catheterization of the left and right main pulmonary artery after a trial injection into the main pulmonary trunk of low osmolar contrast (0.3 gI/mL [Ultravist, Schering, Berlin, Germany]). Images were obtained at 6 frames per second on a Siemens Multistar System (Siemens Medical Systems, Erlangen, Germany). Pulmonary emboli were shown by a filling defect or a persistent cut-off of a large artery despite highly selective injection.

MAIN OUTCOME MEASURES

Sensitivity, specificity, and positive and negative likelihood ratios.

MAIN RESULTS

30% of patients had pulmonary embolism. Sensitivity, specificity, and positive and negative likelihood ratios are shown in the Table. Agreement between the 2 independent radiologists for MRA results was high ($\kappa = 0.75$).

CONCLUSION

Magnetic resonance angiography had high specificity but moderate sensitivity for detecting pulmonary emboli in unselected patients.

Source of funding: Not stated.

For correspondence: Professor M. Oudkerk, Academic Hospital Groningen, Groningen, The Netherlands. E-mail m.oudkerk@rad.azg.nl. ■

Diagnostic characteristics of magnetic resonance angiography in suspected pulmonary embolism*

Disease	Sensitivity (95% CI)	Specificity (CI)	+LR	-LR
Pulmonary embolism	77% (61 to 90)	98% (92 to 100)	38.50	0.23

*Diagnostic terms defined in Glossary; CI and LRs calculated from data in article.

COMMENTARY

Diagnosing pulmonary embolism remains troublesome. A normal result on the perfusion lung scan allows anticoagulants to be withheld safely; however, abnormal results on the perfusion and ventilation lung scans that do not show a high probability pattern for acute pulmonary embolism ("nondiagnostic scans") require additional testing (1). Similarly, more testing is necessary when a normal result is obtained on the computed tomography pulmonary angiogram but pulmonary embolism is suspected.

Pulmonary angiography is the definitive test for confirming or excluding pulmonary embolism. However, clinicians prefer not to use this test unless necessary because of the cost and potential for complications. MRA may reduce costs and complications, and a preliminary study suggested that this technique had a high sensitivity and specificity for acute pulmonary embolism (2).

Oudkerk and colleagues provide a well-designed, larger study of unselected patients to assess the accuracy of MRA for the diagnosis of pulmonary embolism. The investigators report a high sensitivity for central and lobar pulmonary emboli and diminishing sensitivities for segmental, subsegmental, and isolated subsegmental pulmonary emboli. Overall, the sensitivity was moderate, making this test unsafe for

excluding a diagnosis of pulmonary embolism. The specificity was high, allowing confirmation of a strong clinical suspicion of pulmonary embolism.

How should MRA fit into the diagnostic strategy for pulmonary embolism? MRA cannot replace conventional pulmonary angiography. The authors suggest incorporating MRA with D-dimer and perfusion lung scans. This strategy, as well as others that use MRA, requires additional study, including well-designed outcome studies, before they are adopted. For now, MRA for diagnosis of pulmonary embolism is probably best reserved for selected patients for whom the risks of pulmonary angiography are high.

Greg Elliott, MD
LDS Hospital
Salt Lake City, Utah, USA

References

1. Tapson VF, Carroll BA, Davidson BL, et al. The diagnostic approach to acute venous thromboembolism. Clinical Practice Guideline. *Am J Respir Crit Care Med*. 1999;160:1043-66.
2. Tapson VF. Pulmonary embolism—new diagnostic approaches. *N Engl J Med*. 1997;336:1422-7.