

Systematic Review Snapshot

TAKE-HOME MESSAGE

MRI has superior sensitivity for detection of acute ischemic stroke in comparison to CT; however, its ability to detect acute hemorrhagic stroke remains unclear.

METHODS

DATA SOURCES

The authors searched MEDLINE, EMBASE, CENTRAL, MEDION, and the Cochrane Stroke Group Trials Register (to March 2009). In addition, stroke conference proceedings and the Web sites of various relevant organizations were reviewed.

STUDY SELECTION

Diagnostic studies directly comparing computed tomography (CT) to magnetic resonance imaging (MRI) for the diagnosis of ischemic or hemorrhagic stroke within 12 hours of symptom onset compared with a final diagnosis assigned on the basis of clinical assessment and imaging findings.

DATA EXTRACTION AND SYNTHESIS

Three authors independently reviewed and abstracted data from included trials. A combination of random- and fixed-effects models was used to analyze the 7 trials on ischemic stroke. As a result of heterogeneity, there was no pooled analysis of the 2 trials that examined hemorrhagic stroke.

Is MRI More Accurate Than CT in Patients With Suspected Acute Stroke?

EBEM Commentators

Christopher Hall, MD, FRCPC

Eddy Lang, MD, FRCPC

Alberta Health Services (Hall, Lang), and University of Calgary (Lang), Calgary, Alberta, Canada

Results

Ischemic stroke.

Imaging Modality	Sensitivity (95% CI)	Specificity (95% CI)
MRI	0.99 (0.23–1.00)	0.92 (0.83–0.97)
CT	0.39 (0.16–0.69)	1.00 (0.94–1.00)

CI, Confidence interval.

Six of the included studies examined the diagnosis of ischemic stroke, 1 examined hemorrhagic stroke, and 1 addressed both. Study design, patient characteristics, and study quality varied widely across included trials. Assessment of study quality with the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool for diagnostic studies revealed that only 1 study sampled a representative population, and none of the studies reported using a blinded reference standard.

For hemorrhagic strokes, the 2 included trials reported sensitivities ranging from 0.83 to 1.00 and specificities from 0.98 to 1.00 for MRI.

Incorporation bias may have led to inflated estimates of specificity for MRI because the results of this test were included as part of the reference standard. The exclusion of pa-

tients with nonstroke diagnoses reduced the generalizability of these results to the typical emergency department (ED) population. None of the included trials addressed the practicality or the cost-effectiveness of using MRI in the setting of acute stroke.

Commentary

When attempting to identify patients who may be candidates for thrombolytic therapy in the setting of suspected acute stroke, emergency physicians must reliably and rapidly exclude those with hemorrhagic infarcts, ischemic infarcts with hemorrhagic transformation, and other conditions known to mimic ischemic stroke. Although MRI is widely considered to be more sensitive than CT in the diagnosis of ischemic stroke when diffusion-weighted imaging techniques are used,¹⁻³ its accuracy and efficacy in diagnosing hemorrhagic stroke are not as well established.

The results of this systematic review suggest MRI is more sensitive for detecting ischemic stroke compared with CT, though not to a statistically significant degree. An important caveat to this result is that most of the included studies used MRI as a com-

ponent of the reference standard, thus contributing to overestimates of sensitivity and specificity through incorporation bias.

With respect to hemorrhagic stroke, the authors conclude that the literature provides insufficient information on which to base a firm conclusion about the accuracy of MRI. They were able to retrieve only 2 studies that attempted to answer this question, and both had weaknesses related to incorporation and spectrum biases.

According to the results of this review, MRI cannot be recommended as the first-line imaging modality of choice in ED patients with suspected acute stroke. It may, how-

ever, have a role in establishing the presence of ischemic injury in patients with atypical or minor stroke symptoms.

1. Latchaw RE, Alberts MJ, Lev MH, et al. Recommendations for imaging of acute ischemic stroke: a scientific statement from the American Heart Association. *Stroke*. 2009;40:3646-3678.
2. Schellinger PD, Bryan RN, Caplan LR, et al. Evidence-based guideline: the role of diffusion and perfusion MRI for the diagnosis of acute ischemic stroke: report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. *Neurology*. 2010;75:177-185.
3. European Stroke Organisation (ESO) Executive Committee; ESO Writing Committee. Guidelines for management of ischaemic stroke and transient ischaemic attack 2008. *Cerebrovasc Dis*. 2008;25:457-507.

This is a clinical synopsis, a regular feature of the *Annals'* Systematic Review Snapshot (SRS) series. The source for this systematic review snapshot is: Brazzelli M, Sandercock PAG, Chappell FM, et al. Magnetic resonance imaging versus computed tomography for detection of acute vascular lesions in patients presenting with stroke symptoms. *Cochrane Database Syst Rev*. 2009;(4):CD007424. DOI: 10.1002/14651858.CD007424.pub2. The *Annals'* EBEM editors assisted in the preparation of the abstract of this Cochrane systematic review.

Systematic Review Author Contact

Miriam Brazzelli, BSc, PhD
Division of Clinical Neurosciences
University of Edinburgh
Edinburgh, UK
E-mail: m.brazzellied.ac.uk