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## **NIH study finds MRI more sensitive than CT in diagnosing most common form of acute stroke**

Results from the most comprehensive study to compare two imaging techniques for the emergency diagnosis of suspected acute stroke show that magnetic resonance imaging (MRI) can provide a more sensitive diagnosis than computed tomography (CT) for acute ischemic stroke. The difference between MRI and CT was attributable to MRI's superiority for detection of acute ischemic stroke—the most common form of stroke, caused by a blood clot. The study was conducted by physicians at the National Institute of Neurological Disorders and Stroke (NINDS), a part of the National Institutes of Health (NIH). Findings appear in the January 27, 2007 edition of *The Lancet*.

"These NIH research findings on acute stroke imaging are directly applicable to real-world clinical practice," said NIH Director Elias A. Zerhouni, M.D. "The patients involved in this study were the typical cross-section of suspected stroke patients that come into emergency rooms on a daily basis."

Furthermore, the study has good news for patients, according to Walter J. Koroshetz, M.D., NINDS Deputy Director. "This study shows that approximately 25 percent of stroke patients who come to the hospital within three hours of onset, the time frame for approved clot-busting therapy, have no detectable signs of damage. In other words, brain injury may be completely avoided in some stroke victims by quick re-opening of the blocked blood vessel," said Dr. Koroshetz.

The researchers conducted the study to determine whether MRI was superior to CT for emergency diagnosis of acute ischemic and hemorrhagic stroke (caused by bleeding into the brain). Standard CT uses X-rays which are passed through the body at different angles and processed by a computer as cross-sectional images, or slices of the internal structure of the body or organ. Standard MRI uses computer-generated radio waves and a powerful magnet to

produce detailed slices or three-dimensional images of body structures and nerves. A contrast dye may be used in both imaging techniques to enhance visibility of certain areas or tissues.

Study results show immediate non-contrast MRI is about five times more sensitive than and twice as accurate as immediate non-contrast CT for diagnosing ischemic stroke. Non-contrast CT and MRI were equally effective in the diagnosis of acute intracranial hemorrhage.

Non-contrast CT has been the standard in emergency stroke treatment, primarily to exclude hemorrhagic stroke, which cannot be treated with clot-busting therapies.

"Many patients who come to hospitals with a suspected stroke ultimately have a different diagnosis. Most possible stroke victims are first evaluated by non-specialists, who may be reluctant to treat a patient for stroke without greater confidence in the accuracy of the diagnosis. Our results show that MRI is twice as accurate in distinguishing stroke from non-stroke," said Steven Warach, M.D., Ph.D., director of the NINDS Stroke Diagnostics and Therapeutic Section and senior investigator of the study. "Based on these results, MRI should become the preferred imaging technique for diagnosing patients with acute stroke."

The study included 356 consecutive patients with suspected stroke arriving at the NIH Stroke Center at Suburban Hospital in Bethesda, MD, a primary stroke center that is designed to stabilize and treat acute stroke patients. Stroke specialists conducted emergency clinical assessments with all patients, including the NIH Stroke Scale which is used to measure stroke severity. MRI was done prior to CT in 304 patients. Scans were initiated within two hours of each other, with a median difference of 34 minutes. Patients were excluded from the analysis if either CT or MRI was not done. The images were sorted randomly and independently by two neuroradiologists and two stroke neurologists.

Results of the study show standard MRI is superior to standard CT in detecting acute stroke and particularly acute ischemic stroke. The four readers were unanimous in their agreement on the presence or absence of acute stroke in 80 percent of patients using MRI compared to 58 percent using non-contrast CT. No significant difference using the two technologies was seen in the diagnosis of acute intracranial hemorrhage, which is consistent with previous findings.

"Although MRI is remarkably accurate in detecting early stroke damage, it can't substitute for a doctor's clinical judgment in making a stroke diagnosis and deciding upon treatment," said Dr. Koroshetz. "Future studies are needed to determine whether advanced contrast enhanced CT techniques can afford the same level of clinical information more quickly and with less expense," he added.

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The National Institute of Neurological Disorders and Stroke is the nation's primary funder of research on the brain and nervous system. More information about stroke and other neurological disorders can be found on the NINDS web site, [www.ninds.nih.gov](http://www.ninds.nih.gov).

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