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NEWS

RSNA Press Release

Radiologists Identify Early Brain Marker of Alzheimer's Disease

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At A Glance

- fMRI identifies abnormalities in the brain associated with early Alzheimer's disease.
- Early diagnosis of Alzheimer's disease is critical to determine the proper therapy course.
- More than five million Americans currently have Alzheimer's disease.

OAK BROOK, Ill. — Researchers using functional magnetic resonance imaging (fMRI) have found a new marker which may aid in early diagnosis of Alzheimer's disease, according to a study published in the October issue of *Radiology*.

"The findings of this study implicate a potential functional, rather than structural, brain marker—separate from atrophy—that may help enhance diagnosis and treatment monitoring of Alzheimer's patients," said the study's lead author, Jeffrey R. Petrella, M.D., associate professor of radiology at Duke University Medical Center in Durham, N.C.

Alzheimer's disease is a progressive brain disorder characterized by memory loss, confusion, personality or behavioral changes and other symptoms. According to the Alzheimer's Association, more than five million Americans currently have Alzheimer's disease.

While there is still no cure for the disorder, early diagnosis is crucial so that the patient receives proper treatment.

"As new therapies for Alzheimer's disease enter the pipeline over the next five years, early diagnosis will become critical for patient selection," Dr. Petrella said. "fMRI may play a key role in early diagnosis, when combined with clinical, genetic and other imaging markers."

Among the earliest known changes to the brain in Alzheimer's disease are episodic memory deficits and structural changes in the medial temporal lobe (MTL). For the study, Dr. Petrella and colleagues set out to identify brain regions in which changes in activation took place during a memory task and to correlate these changes with the degree of memory impairment present in patients with Alzheimer's disease or mild cognitive impairment.

The researchers studied 13 patients with mild Alzheimer's disease, 34 patients with mild cognitive impairment and 28 healthy controls. The study group contained 37 men and 38 women with a mean age of 72.9 years. After completing standard neuropsychological

testing, the study participants were monitored with fMRI while performing a face-name associative memory task.

While some areas of the brain activate, or turn on their activity, when a person tries to remember something, other areas deactivate, or suppress their activity. Results from this study showed that along the spectrum from healthy people at low risk, to people with mild memory problems, to patients with Alzheimer's disease, there was increasingly impaired activation in the MTL, an area of the brain associated with episodic memory that normally turns on during a memory task. More surprising, however, was increasingly impaired deactivation in the posteromedial cortices (PMC), an area recently implicated with personal memory that normally suppresses its activity during a memory task. The magnitude of deactivation in the PMC was closely related to the level of memory impairment in the patients and significantly correlated with their neuropsychological testing scores.

While previous studies have suggested that MTL activation may be a possible marker of Alzheimer's, based on the findings, Dr. Petrella and colleagues concluded that, compared to activation in the MTL, deactivation in the PMC may represent a more sensitive marker of early Alzheimer's disease.

"In other words, the brain not only loses its ability to turn on in certain regions, but also loses its ability to turn off in other regions, and the latter may be a more sensitive marker. These findings give us insight into how the brain's memory networks break down, remodel and finally fail as memory impairment ensues," Dr. Petrella said.

The researchers hope that fMRI will eventually help to identify patients at risk for developing Alzheimer's disease.

The next step is to conduct a large, multicenter study to see if fMRI can be combined with other imaging and genetic tests to scan for future disease," said study co-author P. Murali Doraiswamy, M.D., chief of the Division of Biological Psychiatry and Alzheimer's clinical trial expert at Duke. "Much like a negative colonoscopy gives you reassurance, a normal fMRI may, in the future, also offer predictive value."

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"Cortical Deactivation in Mild Cognitive Impairment." Collaborating with Drs. Petrella and Doraiswamy on this paper were Lihong Wang, M.D., Ph.D., Sriyesh Krishnan, M.D., Melissa J. Slavin, Ph.D., Steven E. Prince, B.S., and Thanh-Thu T. Tran, B.S.