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NEWS

RSNA Press Release

Brain Imaging May Predict Alzheimer Disease

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OAK BROOK, Ill. - A new, noninvasive brain imaging technique can detect unbalanced brain activity, a potential sign of the early development of Alzheimer Disease (AD), according to a study appearing in the October issue of the journal *Radiology*.

Advancements in AD therapeutics and interventions have underscored the need for identification of people at risk for developing the disease. Unfortunately, there are no recognized biological markers for AD.

"The value of our research findings is that we can now predict Alzheimer's before symptoms appear," says lead author Shi-Jiang Li, Ph.D., from the Medical College of Wisconsin in Milwaukee. "Through functional magnetic resonance imaging (fMRI), we can predict which patients with mild cognitive impairment (MCI) are likely to develop AD and which are aging normally." MCI is a risk factor for developing AD dementia.

The study included 24 men and women with a mean age range of 69 to 73. The patients-nine cognitively normal control subjects, 10 with probable AD and five with MCI-underwent resting-state fMRI to measure functional synchrony (orderly neural activity) in the hippocampus.

The hippocampus, located in the temporal lobe of the inner brain, is the brain's center for short-term memory and learning. The neuritic plaques and neurofibrillary tangles characteristic of AD are first deposited in the hippocampal formation without causing clinical symptoms. As AD progresses, it affects other parts of the brain, causing the onset of AD symptoms.

Dr. Li and colleagues developed the COSLOF (cross-correlation coefficients of spontaneous low frequency) index to describe the level of normal, well-orchestrated neural activity within the hippocampus. Developing AD plaques and tangles disrupt the synchronized flow of neural activity. As a result, the researchers found much lower COSLOF index values in the AD patients than in the control subjects. Normal patients registered at approximately 0.3 on the COSLOF index, while patients with AD registered about 0.1. The MCI subjects registered at approximately 0.2, between the AD subjects and the controls.

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Early treatment can delay onset of AD and reduce the brain degeneration rate. "Before this study, we knew we had effective Alzheimer's interventions, but we did not know who the recipients should be. Obviously, we could not treat everyone 65 years of age or older," says Dr. Li. "Now, fMRI measurement of the COSLOF index can select candidates for early Alzheimer's treatment before they develop AD."

While the findings appear promising, Dr. Li emphasizes caution, stating, "This is a preliminary study using a newly developed fMRI method to produce an index as a marker for possible development of AD. It will take two years to perfect the technology and another five years to thoroughly prove the COSLOF index."

As advances continue to be made, Dr. Li envisions fMRI assuming a broader role in the fight against AD. "Eventually," concludes Dr. Li, "functional magnetic resonance imaging may also provide an objective method of evaluating treatment efficacy."

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Radiology is a monthly scientific journal devoted to clinical radiology and allied sciences. The journal is edited by Anthony V. Proto, M.D., School of Medicine, Virginia Commonwealth University, Richmond, Virginia. *Radiology* is owned and published by the Radiological Society of North America, Inc. (http://radiology.rsna.org)

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"Alzheimer Disease: Functional MR Imaging Index as a Marker." Collaborating with Dr. Li on this study were Zhu Li, M.D., Gaohong Wu, Ph.D., Mei-Jie Zhang, Ph.D., Malgorzata Franczak, M.D., and Piero G. Antuono, M.D.

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