Scientists reveal early diagnostic clues for AD using advanced brain imaging technology

Alzheimer's disease (AD) is a major neurodegenerative disorder that affects millions of people worldwide. New and accurate techniques for early diagnosis are critical. Pravat K. Mandal, PhD, and his colleagues have developed a completely non-invasive brain imaging technique to measure specific brain chemical changes. This provides a signature of the early stages of AD from the hippocampal region of the brain. Their work is reported in the Journal of Alzheimer's Disease.
"Alzheimer's disease has become a silent tsunami in the aging population," says Dr. Mandal, who is associated with the National Brain Research Center, Gurgaon, India, and Johns Hopkins University School of Medicine. "This discovery of a diagnostic technique that requires no blood work or radiation, and that can be conducted in less than fifteen minutes, may offer hope to Alzheimer's disease patients and their families."

Dr. Mandal and his co-investigators studied the brains of normal controls, AD patients, and patients with mild cognitive impairment (MCI) using multi-voxel 31P magnetic resonance spectroscopy (MRS) imaging, along with an advanced analytical tool, to assess brain chemistry in the hippocampal regions. They observed during the course of their study that the left hippocampus becomes alkaline in AD patients, which is in contrast to the normal aging process in which the brain tends to be more acidic.

Dr. Mandal and his colleagues also identified four brain chemicals that change significantly in pre-Alzheimer and Alzheimer disease patients compared to normal subjects. They are phosphomonoester (PME), the building block of neuronal membrane; phosphodiester (PDE), the membrane degradation product; phosphocreatine (PCr), stored energy for -ATP), the source ofgbrain functioning; and adenosine triphosphate (brain energy. The level of PME is significantly decreased in the left hippocampal areas of these patients, and the levels of PDE, PCr, and -ATP are increased.g

"In the left hippocampus the increase in pH to the alkaline range, -ATPgalong with statistically significant increases in PDE, PCr, and and decreases in PDE, serve as a promising new biomarker for AD," notes Dr. Mandal. He and his colleagues plan to conduct longitudinal studies with Alzheimer and Parkinson patients with larger sample sizes to investigate specificity of their test. "It is our hope that such clinical research, using state-of-the-art technology, may give new hope to cognitively impaired patients for an earlier and more predictable AD diagnosis."

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