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Preclinical diagnosis of Alzheimer's disease

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The pathology of Alzheimer's disease (AD) occurs as a sequence of events that start years or decades before clinical dementia appears. A prolonged phase of preclinical AD has been described in numerous studies. Identification of individuals in the preclinical phase of AD would provide a critical window of opportunity for therapeutic intervention to slow the progression of the disease. Therapeutic interventions are currently focused on the later stages of AD (mild cognitive impairment [MCI] or AD dementia) and most clinical trials of these therapies have failed. Detection of various biomarkers hold enormous promise for identifying individuals with preclinical AD and predicting the development of AD dementia. In addition to AD biomarkers in cerebrospinal fluid (CSF) (Abeta42, tau and phosphor-tau), non-invasive neuroimaging can detect brain atrophy in the medial temporal area (measured by magnetic resonance imaging, MRI) and amyloid plaques (measured by positron emission tomography, PET). These biomarkers are now being used to support the preclinical AD diagnosis in the clinical research setting. Other neuroimaging studies have examined region-specific cerebral blood flow and microstructural changes as biomarkers of preclinical AD. Functional MRI (fMRI), diffusion tensor imaging (DTI) MRI, atrial spin labeling (ASL) MRI and advanced PET imaging have potential applications in preclinical AD diagnosis. In this presentation, we critically evaluate the utility of neuroimaging AD biomarkers in the diagnosis of preclinical AD and propose a comprehensive preclinical AD diagnostic algorithm based on neuroimaging and CSF biomarkers, as well as genetic markers of AD (Figure). Although commonly viewed as an abnormality of the brain, AD is a systemic disease with associated dysfunction in metabolic, oxidative, inflammatory and biochemical pathways in peripheral tissues, such as the skin and blood cells. This has led researchers to investigate and develop assays of peripheral AD biomarkers that require minimally invasive skin or blood samples.

Speaker Biography

Tapan K Khan has expertise in Alzheimer's disease biomarker. He has published numerous research articles in the field of Alzheimer's disease. He was an Associate Professor at the Blanchette Rockefeller Neurosciences Institute (BRNI). Currently, he is a Lead Research Scientist at the BRNI, West Virginia University. He is the Lead Investigator for the development of noninvasive diagnostics for Alzheimer's disease in his Institute. He has published a book, title: *"Biomarkers in Alzheimer's disease"* recently (Academic press). He is also an Associate Editor of the *Journal of Alzheimer's disease.*

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