Alzheimer's Disease and Diabetes: Diffusion Tensor Imaging as a Probable Diagnostic Measure

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Abstract

The main neuropathological features of Alzheimer's disease, a chronic neurodegenerative condition, are amyloid plaques (extracellular lesions) and neurofibrillary tangles (intercellular lesions) agglomeration in brain tissue. Some studies illustrate that Diabetes Mellitus type II might facilitate accumulation of amyloid-beta in brain tissue; can dispose patients to Alzheimer's disease. In brain, water molecules mainly diffuse in the same directions as the neural pathways; amyloid-beta depositions as obstacles alter the normal directions of water motion in brain tissue ergo presenting as abnormalities in images taken by Diffusion Tensor Imaging that can be utilized for early diagnosis of Alzheimer's disease.

Keywords: Alzheimer's disease; Diabetes; Probable diagnostic measure

Introduction

Alzheimer's disease, a chronic neurodegenerative condition, impairs cognitive functions specifically memory which deteriorates with its progression. The main neuropathological features of this disease are amyloid plaques and neurofibrillary tangles agglomeration in brain tissue. Some studies have demonstrated that Diabetes Mellitus type II, a metabolic disorder characterized by hyperglycemia in the context of insulin resistance, might facilitate accumulation of amyloid-beta in brain tissue; can dispose patients to Alzheimer's disease. Because of changes in life style and eating habits, risk factors of diabetes mellitus like obesity are more common which can increase the prevalence of this condition in population. Due to improvements in medicine, nowadays, diabetic patients receive better medical care and therefore their lifetime is longer than it used to be in the past. As a result of these changes patients with diabetes are approximately 100% more at risk for developing dementia and its most common type, Alzheimer's disease [1-3].

Early diagnosis of Alzheimer's disease can abate the vast amount of money spent on it each year. Diffusion Tensor Imaging is a MRI imaging method that produces images based on directions of molecular diffusion in tissues. In brain, water molecules mainly diffuse in the same directions as the neural pathways; amyloid-beta depositions as obstacles alter the normal directions of water motion in brain tissue ergo presenting as abnormalities in images taken by this technique that can be utilized for early diagnosis of Alzheimer's disease [4,5].

As demonstrated above the amyloid-beta accumulation is the similar pathologic finding in the patients with Diabetes Mellitus type II and Alzheimer's disease. We hypothesize that using DTI can lead us to an early diagnosis of Alzheimer's disease at preclinical stages (before evident cognitive function impairments) in Diabetes Mellitus type II patients non-invasively and accurately; therefore early medical interventions can take place which may improve prognosis and impact the development of Alzheimer's disease.

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