

A Study of Cerebral Perfusion in Frontotemporal Dementia,
Alzheimer's Dementia, and Patients at Risk of Alzheimer's
Dementia using Dynamic Susceptibility Contrast MRI

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Abstract

Alzheimer's Dementia (AD) is the most common neurodegenerative disease and currently affects approximately 4.6 to 6 million people in the United States. One risk factor well known for causing AD is increasing age. The majority of those affected with AD are diagnosed at the age of 65 or older. It is projected that 10 million baby boomers will develop the disease in their lifetime. The role of imaging in the AD community has typically been to rule out other explanations of cognitive decline, but a newer method such as cerebral perfusion may be an important diagnostic tool for the future, but first it requires validation.

The application of Dynamic Susceptibility Contrast (DSC) perfusion with intravenous gadolinium contrast injection to investigate perfusion changes in AD has received only limited attention. The DSC technique has the ability to provide Cerebral Blood Flow (CBF), Cerebral Blood Volume (CBV), and Mean Transit Time (MTT) perfusion maps. Also, this technique can be performed rapidly and is less sensitive to normal age-dependent reductions in blood flow. Despite these advantages, conventional DSC-MRI with indicator-dilution modeling techniques has limited accuracy due to inadequate temporal resolution, partial volume artifacts, and non-linearity in MR signal as a function of contrast agent concentration. Recent approaches have made DSC-MRI more quantitative using estimates of blood volume in the steady-state (Newman 2006, Wu 2003). In this study I have compared cerebral perfusion imaging in Frontotemporal Dementia (FTD), Alzheimer's Dementia, and patients at risk for Alzheimer's Dementia using Dynamic Susceptibility Contrast Magnetic Resonance Imaging. Specifically I will

- 1) Determine regional patterns of CBF and CBV associated with specific brain areas of neurodegenerative disease among patients with FTD and AD.
- 2) Determine the effects of the apolipoprotein E ϵ 4, APOE4 allele, using MRI in healthy adults who are at risk for developing AD.
- 3) Compare two convolution

techniques: Fourier Transform and Singular Value Decomposition to calculate perfusion parameters in adults with the APOE4 genotype.