thinner cortices in primarily frontal and temporal regions ($p<0.001$). Compared to FTD, AD was associated with thinner cortices in parietal regions, precuneus and posterior cingulate ($p<0.01$). Compared to AD, FTD was associated with thinner cortices in orbitofrontal regions ($p<0.01$). In general, cortical thickness provided no significant advantage over the corresponding volumes in classifying AD from CN and FTD. However, cortical thickness of parietal and temporal lobes (area under the ROC curve (AUC): 0.70-0.95 95% confident interval) showed a trend ($p=0.06$) to better separate FTD from CN than the corresponding volume (AUC: 0.54-0.86). **Conclusions:** The characteristic patterns of cortical thinning in AD and FTD seen on MRI are consistent with pathological findings. Furthermore, cortical thinning may be a more prominent feature than volume loss for separating FTD from normal aging.

IC-P-027 THE EVIDENCE OF NEURAL NETWORK DISRUPTION IN MILD COGNITIVE IMPAIRMENT - MR DIFFUSION TENSOR IMAGING STUDY

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Background: Alzheimer's disease (DAT) has various processes like microvascular dysfunction, free radical toxicity, beta-amyloid deposits, and Wallerian degeneration, which can cause functionally relevant disturbances of cerebral neuronal networks. However, in mild cognitive impairment (MCI), the presence and extent of white matter alterations as a possible correlate of impaired memory function and as predictor of subsequent progression to DAT is not clarified yet. **Objectives:** We detected abnormal brain network in MCI using MR diffusion tensor imaging (DTI), which may be sensitive to the abnormality of white matter, to predict the conversion to DAT. **Methods:** 20 amnestic MCI patients, 20 DAT patients, and age-mached controls were studied with DTI. DTI contained fractional anisotorophy (FA) analysis and tractography for the corpus callosum, cingulum and fornix. FA analysis consists of region of interest (ROI) study and statistic parametric mapping (SPM) analysis. **Results:** In the tractography, the corpus callosum, cingulum and fornix fibers of respective DAT patients, were coarser than those of normal subjects. In the tractography of MCI patients, the fibers of corpus callosum and cingulum had no difference from those of normal, although the fibers of fornix around temporal lobes showed thin appearance. In the ROI study, the FAs in the corpus callosum (0.47) , cingulum (0.26) and fornix (0.51) of DAT were lower than those in normal subjects. In FA SPM mapping, MCI patients showed the decline area of FA in bilateral posterior white matter around fornix in comparison with normal subjects ($p<0.01$). **Conclusions:** These findings indicated bilateral posterior white matter in temporal lobes around the fornix, which have been the focus of neuronal connectivity in memory function, was the most vulnerable in MCI. DTI are sensitive enough to detect abnormal neural network in relation to higher brain dysfunction. The FA SPM analysis for MCI could be promising in early detection of neurodegenerative processes of DAT.

IC-P-028 EARLY DIAGNOSIS OF ALZHEIMER DISEASE BY DIFFUSION TENSOR IMAGING

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Background: Mild cognitive impairment (MCI) is a clinical diagnosis reserved for patients with cognitive deficits not severe enough to warrant a diagnosis of dementia but who have a higher risk of developing Alzheimer's disease (AD). However, the defining features that predict who will convert are still unclear. *Post-mortem* diagnosis of AD is based on the presence, density, and distribution of neurofibrillary tangles (NFT) and neuritic plaques. In the pre-clinical stages of AD, the cells of origin for the perforant pathway in the entorhinal cortex are the first ones to display NFT. Since NFT disrupt the axonal cytoskeletal system, it is expected that these lesions will affect the axons of the pathway. **Objective:** The objective of this study was to determine the integrity of the perforant pathway in MCI cases to detect early AD pathology. **Methods:** Nine AD patients, 9 MCI patients and 20 controls participated in this study. Diagnosis of AD followed criteria of the joint NINDS and the AD and Related Disorders Association. The diagnosis for MCI was modeled from the Memory Impairment Study. Scanning used a 3T GE scanner with the following sequences: T1-weighted (MP-RAGE), Diffusion Tensor (TurboProp) and Proton density. For DTI, we estimated Trace and fractional anisotropy (FA) maps. Its quantification was performed in the perforant and corticospinal pathways in both hemispheres. **Results:** Multivariate analysis of variance between the Alzheimer and control groups, showed a highly significant difference between the mean FA and trace values of the perforant pathway only (Table). Using discriminant analysis (FA), the membership of some MCI cases as assigned to the AD group. From the 9 MCI subjects, four (44%) were classified as AD and five as controls (table). **Conclusions:** This study provides the foundation for the *in vivo* assessment of the preclinical pathology of AD. The assessment of the perforant pathway is a novel approach to detect individuals vulnerable to AD before the clinical diagnosis is made. This prediction will be crucial when therapies become available that alter the pathologic process, since treatment can be given when cognitive impairment and brain pathology are not yet extensive.

MCI Subjects	FA Average Values	
	Predicted Group	**Probability**
1	Control	0.973
2	Control	0.657
3	Control	0.833
4	AD	0.592
5	Control	1
6	AD	0.917
7	Control	0.999
8	AD	0.757
9	AD	0.949

IC-P-029 QUALITY ASSURANCE IN A MULTI-CENTER PET IMAGING TRIAL

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Background: Inclusion of imaging studies in clinical trials poses added challenges. Uniform methods for identifying and tracking protocol deviations and adverse events are well established, but do not account for many logistical and technical problems that can affect image quality and trial success. These 'technical' deviations may not be apparent to study coordinators and often are identified only when images are processed. **Objectives:** To classify and evaluate the frequency and types of technical deviations in a multi-center imaging trial of patients with suspected frontotemporal dementia using positron emission tomography with 18F-fluorodeoxyglucose (FDG-PET). **Methods:** Nine academic centers with variable experience using FDG-PET in research and clinical care performed 55 scans and sent data to a centralized data coordinating center (DCC) for analysis. Scans were performed using standard techniques that did not involve head or body restraints. History of a behavior disturbance was not exclusionary; indeed it was common in these patients. We monitored the completion of studies, including timeliness of data transfer and processing. Images received at the DCC were evaluated against established quality standards. Deviations from expectations were classified into six categories and rated for severity based upon their effect on final image quality. **Results:** 52 of 55 images (96%) ultimately met full quality standards and all but one scan obtained early in the study were usable. There were 4 acquisition and 10 processing deviations and 1 HIPAA violation.

The most frequent technical deviation was a delay in transferring data to the DCC. There were no cases of poor image quality from subject movement. The number of technical deviations was variable from site to site and became less frequent as the trial progressed. The DCC identified one unexpected incidental image abnormality. **Conclusions:** Uniform and comprehensive technical standards should be established at the onset of imaging trials and assessed prospectively using explicit rules. Our procedures are effective and could be widely adopted. Timely quality assessment and working closely with sites can minimize problems caused by technical deviations. High quality FDG-PET studies can be achieved without restraints, even in demented patients with a history of behavior disturbance.

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IC-P-030 THE INFLUENCE OF AD FAMILY HISTORY AND APOE4 ON VULNERABLE BRAIN REGIONS IN COGNITIVELY NORMAL MIDDLE-AGED ADULTS

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Background: First-degree family history of sporadic Alzheimer Disease (AD) and the apolipoprotein E ε4 (APOE4) are risk factors for developing AD. Although the role of APOE4 in the pathogenesis has been well studied, family history remains a rarely studied and poorly understood risk factor. **Objective(s):** To determine the relative contribution of APOE4 and family history of AD on brain function. **Methods:** We examined 68 middle-aged participants with a parent diagnosed with AD (+FH) and 64 age-, gender- and education-matched controls without a first-degree family history of any dementia (-FH). All underwent cognitive testing, ApoE genotyping and performed two distinct functional MRI (fMRI) tasks. One of the tasks required discrimination of novel items from previously learned items and has previously been shown to activate the hippocampus in healthy adults. The second task was a self-referential decision making task and has previously been shown to activate the posterior cingulate in healthy adults. For each task, a 2 × 2 factorial ANOVA (presence/absence of parental family history and presence/absence of the APOE4) was used to detect group effects. **Results and Conclusions:** A greater response to novel items was detected in the mesial temporal lobe and fusiform gyrus bilaterally among persons without a first-degree family history of AD. In hippocampal areas, the -FH ε4 carriers exhibited the greatest signal change, and the +FH e4 carriers the least. For the self-referential task, there was a main effect of family history in the posterior cingulate, where a greater response was observed for persons without a family history of AD. There was no main effect of APOE in this young cohort. FH of AD was a strong predictor of the neural response on these tasks in regions known to be vulnerable to AD. Further, in appears that FH is modulating the effect of APOE in these middle-aged adults, suggesting that an as yet unspecified factor embodied in first-degree family history of AD is influencing the expression of APOE4 on brain function.

IC-P-031 BRAIN RESERVE CAPACITY IN FRONTOTEMPORAL DEMENTIA

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Background: The hypothesis of brain reserve capacity (BRC) was introduced almost 20 years ago to account for the repeated observation that brain damage and its clinical symptoms are not tightly linked. However, despite the assumable impact of BRC on the clinical manifestation of brain damage, research is still mainly focused on patients with Alzheimer disease. **Objective(s):** To provide initial evidence for BRC in frontotemporal dementia (FTD). **Methods:** 29 patients with FTD and 16 healthy age-matched controls underwent positron-emission-tomography imaging of the brain with ^{18}F-fluoro-2-deoxy-glucose. Scans were compared between patients and controls (two-sample t-tests) and a linear regression analysis with education as independent and regional cerebral glucose metabolism (rCGM) as dependent variable, adjusted for age, gender, and Mini-Mental State Examination, was conducted in SPM2. Compared to controls, patients with FTD showed a significantly reduced rCGM in extensive brain regions (bilateral frontal and temporal association cortex; $p < 0.05$, corrected for multiple comparisons, figure 1). The regression analysis revealed a significant negative influence of years of school education on rCGM in two extensive brain clusters (bilateral frontal association cortex; $p < 0.001$, uncorrected for multiple comparisons, figure 2), which was independent from demographical variables and cognitive performance level. There was a strong negative correlation of rCGM and education ($r = 0.45$, $p < 0.01$, figure 3). **Conclusions:** The relationship between brain pathology and clinical symptoms is modified by education in patients with FTD, which provides initial evidence for BRC in FTD.