White Matter Abnormalities in Whole Brain and its Regional Specificity in Chronic Schizophrenia: A Diffusion Tensor Imaging Study

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Abstract
Using Diffusion tensor imaging (DTI), we previously reported abnormalities in multiple fiber bundles in schizophrenia. Nonetheless, alterations in whole brain white matter (WM) in schizophrenia have thus far been inconclusive. DTI, however, allows for a more thorough analysis of WM alteration in schizophrenia despite the absence of WM volumetric differences reported using more conventional MR measures.
We found reduced FA and increased Trace in whole brain WM of schizophrenic subjects, as well as in cerebral Trace, and subcortical WM. Within cerebral WM, prefrontal WM showed reduced FA and increased Tr bilaterally, while the fronto-parietal WM did not. Temporal WM showed increased Trace bilaterally, and occipital WM showed reduced FA and increased Trace bilaterally.

Methods
Subjects
Sample 1
30 male chronic schizophrenics were age matched to 30 male normal controls were matched for age
Sample 2
8 male first episode schizophrenics, 12 male schizoaffective, and 8 male normal controls were matched for age and socioeconomic status
Image Acquisition and Processing
Images were acquired on a 1.5 T GE longbore magnet. Structural Images: Coronally acquired 128 slice spgr (1mmx1mmx1.5mm) series were coregistered to axially acquired (1mmx1mmx3mm) An automated, intensity based segmentation was applied to coregistered structural images to acquire grey and white matter labelmaps
DTI baseline images (1mmx1mmx5mm) and tensors were analysed with Slicer 2.6. Diffusion weighted tensors were converted to 3 corresponding scalars

Results
•We observed differences in the whole brain white matter fractional anisotropy and trace between chronic schizophrenics and normal controls, F(1,58)=5.770, p<0.02
•This observation was supported by differences in mode and trace in whole brain grey matter F(1,58)=15.690, p=0.000
•Both Normal controls and first episode schizophrenia patients demonstrated differences in cortical and subcortical white matter trace measures when compared to schizoaffective patients F(2,31)=4.234, p=0.022; F(2,31)=3.466, p<0.044, respectively

Whole Brain White Matter Abnormalities

ROI Analysis

Discussion
These findings suggest that whole brain WM abnormalities are present in schizophrenia and related disorders. Furthermore, cerebral WM abnormalities were observed more robustly in prefrontal, temporal and occipital lobar regions.