Introduction

Diffusion Tensor Imaging (DTI) is a Magnetic Resonance Imaging (MRI) methodology that by measuring the direction of movement of water molecules can determine the directionality and integrity of axonal tracts. The measure used in DTI is anisotropy. In low anisotropy the movement of water molecules is random, whereas in high anisotropy the water molecules are moving in the same direction. Healthy myelinated axon bundles in which all the axons are going in the same direction have high anisotropy values because the movement of the water cells is restricted by the axonal membrane and the myelin sheath. Bundles in which the fibers are crossing, are oriented in many different directions, or in which the myelin or axons are unhealthy slow low anisotropy values. This study investigates the changes in white matter anisotropy by Brodmann Area in patients with schizophrenia.

Subjects:

- 97 Adult Patients with Schizophrenia (71m, 26f, age mean=40.08, SD=15.28, range=18-79)
- 93 Normal Adults (58m, 35f, age mean = 35.77, SD = 18.12, range=18-82)

Imaging:

- 3 T Siemens Allegra MRI system
- Magnetization prepared rapid gradient echo (MP-RAGE) sequence; pixel size = .82 x .82 x .82 mm, field of view = 210 mm, repetition time = 2500 ms, echo time = 4.38, T1 = 1100 ms, flip angle = 8°.
- Diffusion tensor sequence; 28 3-mm-thick slices, 12 gradient directions

Analysis:

- Cortical edges, midlines and temporal stalk locations manually defined on MP-RAGE images
- MP-RAGE images thresholded to separate grey and white matter regions
- DTI images coregistered to MP-RAGE images
- Cortex segmented into Brodmann Areas by overlaying Perry Atlas in Axial sections and adjusting for the manually defined edges and points on the MP-RAGE
- Average Fractional Anisotropy (FA) values determined for white matter in each Brodmann Area in each hemisphere
- T-tests between groups for the FA value within the white matter of each Brodmann Area in each hemisphere

Methods

Coronal slices divided into Brodmann Regions

Results

Patients vs. Controls

Mean Anisotropy Difference

Right

Left

Anisotropy Difference t-test

Right

Left

Acute Patients vs. Chronic Patients

Mean Anisotropy Difference

Duration 3 years

Duration >3 years

Analysis of Covariance

Age as covariant
df=1,85 for all regions

Research Supported by the Conte Center MH66392-01