ABSTRACT

Background: The corpus callosum is a major pathway connecting the two hemispheres and has an important role in relaying sensory, cognitive, and motor information throughout the brain. While MRI studies have shown mixed results, Diffusion Tensor Imaging (DTI) has proven to be a much more sensitive test for examining integrity of white matter fiber bundles. Although seven DTI studies have shown corpus callosum abnormalities, none have examined separately anatomical subdivisions of the corpus using high-resolution 3T images combined with an automatic clustering method.

Methods: 12 chronic schizophrenic men, mean age 42.9, and 12 normal controls, mean age 40.2, were scanned on a 3T magnet using a high resolution DTI protocol. DT fiber tractography was performed on the whole brain for each subject, and then using an automatic procedure, the tracts were grouped into clusters according to their shapes and their spatial locations. Five fiber clusters were defined for the corpus callosum and fractional anisotropy, a measure of the tract integrity, was computed.

Results: Reduced FA in schizoprenia as compared to normal controls in the second cluster (p = 0.051). Reduced volume in schizophrenics’ third cluster (p = 0.031).

Conclusions: Our findings suggest possible abnormalities in interhemispheric connectivity between posterior parts of the frontal lobes in chronic schizophrenia. Further studies are needed to investigate the clinical role of these abnormalities.

BACKGROUND

• The Corpus Callosum is a thick band of white matter fibers connecting cortical areas of both hemispheres. Lent (1993).

• Abnormalities in the Corpus Callosum can lead to disordered transfer between the two hemispheres (O’Shea, 2003) and may explain some symptoms and abnormalities found in schizophrenia (Crow, 1998).

• Animal studies provide evidence of five anatomical subdivisions of the Corpus Callosum. (Figure 1)

• MRI studies have found a reduction in area of the Corpus Callosum (Woodruff, 1995). Traditionally, Corpus Callosum has been subdivided using geometric rules (Vilis, 1998).

• Diffusion Tensor Imaging (DTI), see Figure 2 and Figure 3, has proven to be a much more sensitive tool for examining integrity of White matter Fiber Bundles and for examining the possible functional significance of the structural abnormalities (Ferring, 2002).

• Although seven DTI studies have shown Corpus Callosum abnormalities, none have examined separately anatomical subdivisions of the corpus using high-resolution 3T images combined with an automatic clustering method.

MATERIALS AND METHODS

SUBJECTS:
12 Schizophrenic Patients (mean age = 44.25) and 12 Normal Controls (mean age = 40.33) Table 1

RESULTS

• Autocorrelation of orthonormal eigenvectors: 0.005

• Fiber clustering using a Gaussian mixture model: 0.007

• Fiber clustering using a Gaussian mixture model: 0.008

• Fiber clustering using a Gaussian mixture model: 0.009

• Fiber clustering using a Gaussian mixture model: 0.010

• Fiber clustering using a Gaussian mixture model: 0.011

• Fiber clustering using a Gaussian mixture model: 0.012

• Fiber clustering using a Gaussian mixture model: 0.013

• Fiber clustering using a Gaussian mixture model: 0.014

• Fiber clustering using a Gaussian mixture model: 0.015

REFERENCES


This software is designed for the detection of abnormalities in the white matter of the brain. Neuroimage 1:305-17.


