The corpus callosum (CC) is the largest white matter (WM) fiber bundle in the brain, consisting of approximately 200 million commissural axons. The CC primarily provides information as to the integrity and microstructure of WM fiber bundles.

**RESULTS**

- There were significant differences between the 6 CC segments in terms of FA and Mode (Fig.4) in general. FA and Mode were observed to increase from the genu to the splenium. The highest FA and most cylindrical Mode was observed in CC5 (Visual segment) and CC6 (Temporal segment).

- **Between-group differences (Figs. 4, 5 and 6)**
  - SZ patients showed significantly reduced FA in CC1 (Frontal segment; t = -2.1, p = 0.046). Supplementary analyses revealed abnormally increased Radial Diffusivity (ΔRD; t = 2.1, p = 0.036) and Axial Diffusivity (ΔAD; t = 2.1, p = 0.036) in the SZ patients in CC5.
  - Correlation analysis revealed significant positive correlations b/w CC1 FA and patients’ PANSS-Delusions (r=0.56, p=0.015) and Hallucinations (r=0.53, p=0.026) scores. Conversely, there were significant negative correlations b/w CC1 Radial Diffusivity and PANSS-Delusions (r=0.56, p=0.016).
  - SZ patients showed significantly increased Mode (i.e. more cylindrical ellipsoids) in CC4 (Parietal fibers; t = 2.3, p=0.025).

**DISCUSSION**

- The SZ patients showed FA reductions in the frontal (CC1) fibers. Post-hoc analyses revealed these fibers to be abnormally increased in terms of their Radial Diffusivity (a putative measure of myelination) but unchanged in terms of their Axial Diffusivity (a putative measure of axon damage). Given the known role of myelin in the conduction velocity of action potentials, such a increase in Radial Diffusivity would be expected to result in delayed inter-hemispheric transmission. This was noted to be especially true for the most severely affected SZ patients, who showed abnormally increased Mode (i.e., more cylindrical ellipsoids) in the parietal CC segments.

- It has been suggested that fiber bundles consisting of lightly-myelinated, thin-fibers (e.g., fronto-motor – Fig.8), because of the associated increase in diffusivity in these fibers, will show higher FA than heavily-myelinated, thick-fibers (e.g., sensorimotor – Fig.8), because of the associated increase in axon density. While CC2 (Premotor) and CC3 (Sensorimotor) did show the lowest FA values, the thin-fibers of CC1 (Frontal) showed substantially lower FA than did the thick-fibers of CC5 (Visual).

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**REFERENCES**

- **BACKGROUND**
  - FB: The white matter (WM) generally, and the corpus callosum specifically, have been implicated as abnormal in schizophrenia (SZ).
  - There is evidence for WM abnormalities generally, and CC abnormalities specifically.
  - Diffusion Tensor Imaging (DTI) enables the testing these models in vivo, as it provides information as to the integrity and microstructure of WM fiber bundles.

- **METHODS**
  - **19 SZ patients (mean age = 44 yrs) and 19 healthy controls (mean age = 40 years) participated in the study. Patients' symptoms were assessed using the Positive and Negative Syndrome Scale (PANSS).**
  - Participants all underwent a Diffusion-Weighted MR scan on a 3T GE system (EPI sequence, b=700, 51 independent directions, 8 baseline images, 1.7mm isotropic voxels).
  - These scans were converted into Diffusion-Tensor Images (DTIs).
  - Whole-Brain Fiber Tractography (Fig.1) was performed on each DTI. The resultant tract graphs were segmented into 400 clusters, based on a parvise similarity function that takes into account tract shapes and spatial locations.
  - Clusters consisting the CCs were manually identified on a single participant (Fig.2), and automatically extracted for all other participants.
  - The CC clusters were subdivided into 6 segments on the basis of their cortical projections (Fig.3). The 6 CC segments were: Frontal (red), Premotor (blue), Sensorimotor (green), Parietal (pink), Visual (orange) and Temporal (yellow) fibers. For each participant, these 6 CC segments were transformed into binary images and used to mask their DTI.
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  - **Mean Fractional Anisotropy (FA), Trace and Mode (Fig.5) were calculated for each CC segment in which between-group differences in FA were observed.**

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