White matter changes in obsessive-compulsive disorder revealed by diffusion tensor imaging

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Objectives:

Specific cortico-subcortical circuits have been implicated in obsessive-compulsive disorder (OCD). However, previous studies addressing the involvement of the white matter (WM) in OCD have shown contradictory findings[1,2]. Diffusion tensor imaging (DTI) quantifies water diffusivity *in vivo,* providing information on microstructural tissue integrity[3]. The aim of this study was to investigate WM abnormalities in OCD using two approaches: (i) whole brain, tract-based spatial statistic (TBSS) and (ii) selected regions of interest (ROIs) analyses.

Methods:

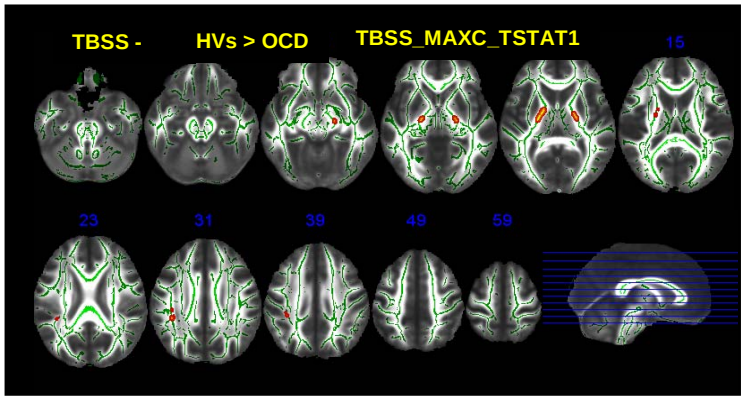
Conventional and DTI images were acquired in nine patients with the diagnosis of OCD according to DSM-IV criteria and nine gender- and age-matched healthy volunteers (HVs). After inspection and correction for movement and Eddy current artifacts, the diffusion tensor was calculated and the fractional anisotropy (FA) and mean diffusivity (MD) maps were created (BET and DTIFit, part of FSL 4.0 FMRIB software). Whole brain voxel-wise statistical analysis of FA and MD maps were performed using TBSS (FSL, cluster significance threshold of $p \leq 0.05$, corrected for multiple comparisons)[4]. A priori ROIs were placed onto the FA and MD maps in selected regions: corpus calosum (CC), internal capsule (IC), longitudinal superior fascicule (LSF) and cingulate bundle (CB). Differences in the ROI mean values between patients and HVs were examined using an ANOVA to measure the group (patients, control) significance of repeated ROI and hemispheric lateralization (right, left) effects ($p \leq 0.05$, corrected for multiple comparisons). Post-hoc independent t tests examined for group differences in the individual ROIs.

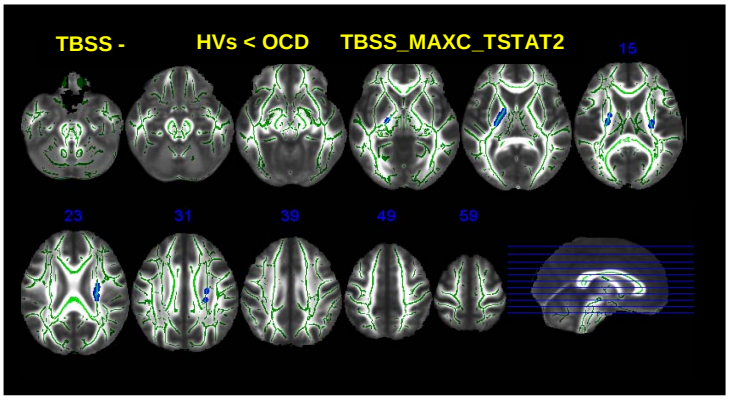
Results:

TBSS analyses showed reduced FA and increased MD in regions of the IC (genu and posterior limb) and LSF in OCD patients compared to HVs (Figure). A priori ROIs analyses confirmed the changes observed with the voxel-wise method and, in addition, showed increased MD in the left CB ($p = 0.002$) and splenium of CC ($p < 0.05$) in ODC patients.

Conclusion:

Our findings, though preliminary, support the hypothesis of WM involvement in OCD, especially of the CB, in accordance to previous reports. In addition, these results provide new evidence for a possible role of additional WM tracts in this neuropsychiatric condition. The observed increased MD and decreased FA in these WM tracts are compatible with either reduced fiber density or myelination of these tracts. Future studies using larger samples should address parametric relationships between WM changes and OCD severity.





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