DTI abnormalities in pediatric obsessive compulsive disorder

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Introduction

Obsessive-compulsive disorder (OCD) is a disorder of the brain and behavior that is characterized by recurrent worries and repetitive behaviors. Pediatric OCD is similar to OCD in adults. However the content of obsessions and compulsions can be influenced by developmental factors such as age, gender, genetics [1,2]. Neuro-imaging studies have contributed to our understanding of the neurobiological basis of pediatric OCD [3]. The purpose of this study was to use diffusion tensor image (DTI) derived metrics to explore disease affected circuits in pediatric OCD patients compared to healthy volunteers.

Subjects and Methods

We studied 23 pediatric OCD patients (14.3± 2.1 yo) and 23 age-matched controls (14.2± 2.2 yo) using a 3T clinical scanner. The DTI protocol included 31 directions with b-value of 1000 s/mm^2 and 5 b=0 images, 51 slices of 2.5 mm thickness, FOV 240 mm, image matrix of 128x128 zero filled to 256x256 and 14 sec TR. After data acquisition, fractional anisotropy (FA) maps were reconstructed from DTI images and registered to a standard MNI template using FSL software [4]. The significant group differences were determined voxel-wise over the entire brain volume using SPM software [5]. Group differences were considered significant at a voxel-level threshold of $p<0.005$ with cluster extent correction at $p<0.05$ and a cluster cutoff of 250 voxels. FA values for each significant cluster were compared across groups using Student's *t*-tests. We also performed group tractography [6] using these FA difference regions as seed volumes and counted numbers of fiber tracts going through these seeds for each group.

Results

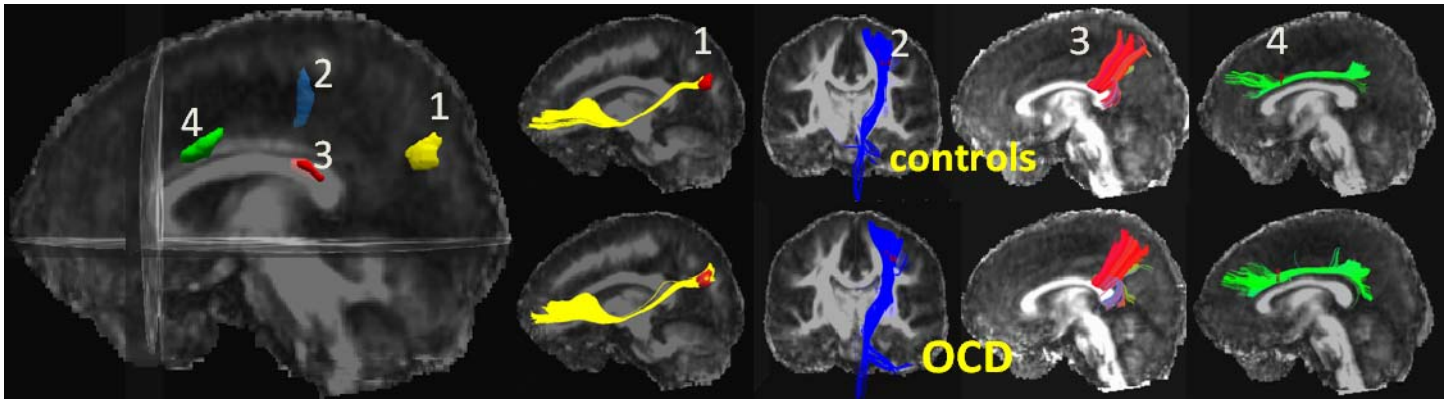

Figure 1: Significant clusters showing FA increases in pediatric OCD compared to controls. The tracts passing through each cluster are shown.

When compared to healthy volunteers, pediatric OCD patients showed FA increases in the left occipital lobe, right S1/M1, splenium of corpus callosum and left cingulum (Fig. 1, left). Fiber tracts passing through clusters in control and pediatric OCD groups are also presented (Fig. 1, right). The coordinates, cluster size, FA value and post-hoc *p*-value of each significant cluster and number of tracts are provided in the table below.

	Region	MNI coordinates			Cluster size	FA			Group tracts	
		x	y	z	(voxels)	Control	OCD	p <	Control	OCD
1	Left occipital lobe	-32	-70	24	286	0.268 ± 0.106	0.403 ± 0.086	0.0001	664	1114
2	Right S1/M1	22	-32	50	552	0.340 ± 0.087	0.457 ± 0.054	0.0001	4004	8253
3	Splenium of corpus callosum	4	-29	22	567	0.496 ± 0.138	0.638 ± 0.108	0.0005	5557	6993
4	Left cingulum	-14	9	30	638	0.292 ± 0.090	0.391 ± 0.103	0.001	2671	4036

Discussion/Conclusions

Our results show significant FA increases in the left occipital lobe, right S1/M1, splenium corpus callosum and left cingulum of pediatric OCD subjects compared to healthy volunteers. We also found increased tract counts in these four regions in pediatric OCD patients compared to healthy volunteers. Increased focal FA values and corresponding increases in the tract counts may relate to the pathology of the circuits in this disorder. The increase in FA may be due to change of maturation rate of the white matter bundles in OCD group when compared to controls. The particular changes in cingulum bundle support anterior cingulate dysfunction [7].

Acknowledgments

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References

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