

Decrease of White Matter Integrity in Obese Adolescents: Study of Diffusion Tensor Imaging (DTI)

Sunday 11:15-11:25 AM | VSPD11-03 | Room: E451B

PURPOSE

The aim of this study is to investigate the influence of childhood obesity on changes in brain connectivity, comparing to lean adolescents, using DTI by Magnetic Resonance (MRI).

METHOD AND MATERIALS

The images were obtained on 3T MRI scanner. The sample consisted of 120 subjects: 59 obese adolescents and 61 healthy adolescents, aged 12 years to 16 years, and matched regarding gender, age, sexual development and schooling. The images were processed with the FSL-Tbss (Tract Based Spatial Statistics) program and analyzed statistically by the program MATLAB-SPM8 (Statistical Parametric Mapping) with T-test (obese group versus control group). The DTI-measure used was the Fractal Anisotropy (FA). In this study, the significant statistical level considered was 95% or $p < 0.05$. Blood tests were done to evaluate inflammatory markers ratios in order to elucidate the systemic inflammation associated with the obesity. Then, correlation maps with inflammatory markers (TNF- α , TNF- β , IL1- α , IL1- β , IL6). was performed to evaluate the influence of inflammation on cerebral changes.

RESULTS

The statistical and exploratory analysis of 339350 voxels showed a reduction of the FA values in obese patients when compared to the control group in regions located in the body of the corpus callosum (pfwe < 0.001), splenius of the corpus callosum (pfwe < 0.017) and medium orbital gyrus (pfwe < 0.044). There was no region with increased FA in obese patients. Correlation maps revealed a negative association with TNF- β and FA values in splenius of Corpus Callosum (pfwe = 0.028; $z = 3.66$; cluster = 10 voxels). IL6 also presents negative correlation with FA values in medial orbital gyrus (pfwe = 0.028; $z = 3.58$; cluster = 10 voxels) and body of Corpus Callosum (pfwe = 0.05; $z = 3.29$; cluster = 5 voxels). There were no positive correlation results with inflammatory markers and FA values.

CONCLUSION

The data reveal a pattern of damage in important regions responsible for control of appetite, emotions and cognitive functions in obese adolescents, and correlation with some inflammatory markers. Further studies need to be performed to elucidate whether, in fact, obesity inflammation is a consequence of structural changes in the brain.

CLINICAL RELEVANCE/APPLICATION

Childhood obesity is a subject of high clinical importance, and presents data of ascent from 10 to 40% of the last 10 years in most countries.