Article: EPA-0625
Topic: FC10 - Free Communications Session 10: Neuroimaging

WHITE MATTER DIFFUSION TENSOR IMAGING MICROSTRUCTURE CORRELATES OF ADOLESCENT DEPRESSION: STRUCTURAL EVIDENCE FOR FRONTOLIMBIC DISCONNECTIVITY

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Background: Despite the significant prevalence of adolescent depression, little is known about the neuroanatomical basis of this disorder. Functional dysregulation in frontolimbic circuitry has been suggested as a key neural correlate of adult and adolescent depression impeding emotional regulation. However, less is known about whether this dysregulation is overlaid on impaired white matter microstructure. Guided by neuroimaging findings, we test the a priori hypotheses that adolescent depression is associated with alterations in white matter microstructure in the 1) uncinate fasciculus (UF) 2) cingulum bundles, and 3) fibers linking subgenual anterior cingulate cortex (sgACC) and amygdala.

Methods: Diffusion tensor magnetic resonance imaging (DTI) data were obtained on 52 un-medicated adolescents with major depressive disorder and 42 matched controls. We calculated fractional anisotropy (FA), radial diffusivity (RD), and axial diffusivity (AD) for bilateral UF, cingulum, and sgACC-amygdala fibers using probabilistic tractography. We also completed a voxelwise comparison of depressed and control participants using tract-based spatial statistics (TBSS).

Results: Depressed adolescents had significantly lower FA and higher RD in bilateral UF and right sgACC-amygdala tracts. TBSS results additionally revealed lower FA values in the white matter associated with the limbic-cortical-striatal-thalamic circuit, corpus callosum, and anterior and superior corona radiata.

Conclusions: Adolescent depression is associated with reduced white matter integrity in emotion regulatory networks, which may underlie the functional differences in frontolimbic circuitry often observed in adolescent depression. We offer evidence that poor myelination of the white matter tracts supporting emotion regulation may contribute to the etiology of early-onset depression.

https://doi.org/10.1016/S0924-9338(14)78003-4 Published online by Cambridge University Press