Aberrant Structural Brain Connectivity in Adolescents with Attentional Problems Who Were Born Prematurely

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Abstract

BACKGROUND AND PURPOSE:
Differences in structural brain connectivity that underlie inattention have been previously investigated in adolescents with attention deficit/hyperactivity disorder, but not in the context of premature birth, which is often associated with attentional problems. The purpose of this study was to identify the neural correlates of attentional problems in adolescents born prematurely and determine neonatal predictors of those neural correlates and attention problems.

MATERIALS AND METHODS:
The study included 24 adolescents (12.5 ± 1.8 years of age; 12 girls, 12 boys) who were born prematurely and underwent MR imaging of the brain and cognitive assessment, both shortly after birth and as adolescents. Structural connectivity was assessed at adolescence using diffusion tensor imaging and tractography.

RESULTS:
Of the 24 subjects, 12 had attention deficits. A set of axonal pathways connecting the frontal, parietal, temporal, and occipital lobes had significantly lower fractional anisotropy in subjects with attentional problems. The temporoparietal connection between the left precuneus and left middle temporal gyrus was the most significantly underconnected interlobar axonal pathway. Low birth weight and ventriculomegaly, but not white matter injury or intraventricular hemorrhage on neonatal MR imaging, predicted temporoparietal hypoconnectivity in adolescence. However, neither birth weight nor other neonatal characteristics were associated with attention deficits directly.

CONCLUSIONS:
We identified an aberrant structural brain connectivity pattern, involving temporoparietal hypoconnectivity, in prematurely born adolescents with attentional problems. We also identified birth weight as a potential neonatal predictor of the temporoparietal hypoconnectivity. These findings add to our understanding of the neural basis and etiology of inattention in adolescents after premature birth.