Cortical growth patterns in relation to autism spectrum disorder in ages 1-2 years

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Background and Hypothesis: Autism Spectrum Disorder (ASD) is a common neurodevelopmental disorder with a prevalence of 2.76% among children ages 3-17 in the United States[1]. Some studies have linked total brain volume overgrowth or gyrification changes to ASD[2,3,4]. However, few have attempted to relate specific growth patterns to ASD. We hypothesize that regional differences in brain growth in subjects aged 12-24 months will correlate with diagnoses from the Autism Diagnostic Observation Schedule (ADOS).

Project Methods: The subjects for this study came from the Infant Brain Imaging Study (IBIS)[5]. The CIVET pipeline was used to segment T1-weighted magnetic resonance images (MRIs) into surfaces using a non-linear classification method[5,6,7]. CIVET quality control outputs were used for validation and to select parameters for the tasks along with previous recommendations[5,8]. Analysis of Functional NeuroImages (AFNI) was used to convert the CIVET output format, and Connectome Workbench was used to calculate surface curvature. Using cortical reconstructions and surface curvatures from 12- and 24-month brains, anatomically-constrained Multimodal Surface Matching (aMSM) was applied to achieve point correspondence and generate individual cortical growth maps[9,10].

Results: Within the IBIS database, we found 38 individuals with ASD and 121 controls with T1-weighted scans at both 12 and 24-month time points. Once individual growth maps have been generated for all subjects, Permutation Analysis of Linear Models (PALM)[11] will be used to determine statistically significant differences in the cortical growth patterns of ASD versus control groups.

Conclusion and Potential Impact: Research on autism may benefit from longitudinal studies of growth, as opposed to analysis of structural differences at later ages[4]. We concentrate on cortical growth before 24 months, which may serve as an earlier marker of ASD, when abnormal brain growth can be seen yet social deficits are not fully established[5].

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