Neuropsychology Abstracts

Title: INCREASED CORTICAL COMPLEXITY IN CORTICALLY-THIN REGIONS: AN AMRI STUDY IN SPINA BIFIDA

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Background: Spina bifida myelomeningocele is a congenital disorder characterized by abnormal neurodevelopment of the brain and spinal cord. In addition to significant hydrocephalus, children with SBM often demonstrate structural abnormalities in periventricular regions such as the midbrain, cerebellum, and corpus callosum. Furthermore, relative to age-matched controls, neocortical regions are reorganized in SB as demonstrated by regionally-specific patterns of reduced gray matter volume, reduced surface area, and increased cortical thickness in the frontal lobe. The present study was undertaken to investigate if patterns of cortical complexity, as quantified by a three-dimensional local gyrification index (LGI), differed in SB relative to typically-developing age-matched controls.

Method: All MRIs were performed on a Philips 3T scanner. A three-dimensional T1-weighted sequence (SPGR) was performed in the coronal plane to obtain whole-brain coverage. All T1-weighted images were reviewed for image quality prior to performing morphometric analyses. Using freesurfer v 4.0.5 software (www.surfer.nmr.mgh.harvard.edu) on a 64-bit Linux computer, the fully-automated image processing stream was completed on each scan. Subsequently, Freesurfer's fully-automated 3D LGI analysis was completed on each scan. For group comparisons (SB v Ctrls), freesurfer's QDEC utility was utilized to correct for multiple comparisons of vertex-wise analyses of LGI as well as covariates including age and gender.

Results: Both qualitative and quantitative aspects of LGI values were remarkably different in SB relative to Ctrls. In SB, increased LGI values localized to the anterior cingulate and posterior portion of the sylvian fissure. Furthermore, increased LGI values in SB were specifically observed in regions with reduced cortical thickness (e.g. regions of cortical thinning). In Ctrls, increased LGI values primarily localized to the anterior portion of the sylvian fissure.

Conclusion: Cortical complexity in the SB brain is markedly increased in areas of cortical thinning. Follow-up analyses are currently underway to investigate whether regionally-specific increased cortical complexity mediates compensatory function in behaviorally-relevant cognitive domains.