Alcoholism: Clinical & Experimental Research 2006;30(6):229A.

ASSOCIATIONS BETWEEN BRAIN STRUCTURE, CHEMISTRY, AND FUNCTION AS ASSESSED BY MRI, MRS, fMRI, AND NEUROPSYCHOLOGICAL TESTING AMONG CHILDREN WITH FETAL ALCOHOL SPECTRUM DISORDERS (FASD).

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MRI, MR spectroscopy (MRS), functional MRI (fMRI), and a comprehensive neuropsychological and structured psychiatric assessment were administered to 4 groups of children (n ≈ 20/group) age 8-15 years. The groups included: 1) FAS/Partial FAS; 2) Static Encephalopathy/Alcohol Exposed (no FAS facial phenotype); 3) Neurobehavioral Disorder/Alcohol Exposed (no FAS facial phenotype); 4) typically-developing controls. The 3 FASD groups were diagnosed using the 2004 FASD 4-Digit Diagnostic Code at the University of Washington FAS DPN Clinic. RESULTS: Significant neuropsychological contrasts were identified between all 4 groups. Among children with prenatal alcohol exposure and cognitive/behavioral dysfunction, those with the FAS facial phenotype (group 1) were significantly more impaired than those without the FAS facial phenotype (group 2). Volumes for total brain, frontal lobe, hippocampus, caudate, and putamen were computed as well as midsagittal measures of the corpus callosum and cerebellar vermis. Children with prenatal alcohol exposure had significant reductions in several brain regions. Those with FAS had the greatest reductions. Choline levels, as detected by MRS, were significantly different between the control and alcohol-exposed groups, with the greatest contrasts observed among those with FAS. Significant correlations were observed between neurostructural, neurochemical, and neuropsychological alterations with compelling correlates to the literature on ethanol-induced damage of the developing forebrain, cholinergic innervation of the cerebral cortex and hippocampus, and functional consequences. CONCLUSION: Alterations in neurochemistry, neurostructure, and/or neurometabolism serve as compelling evidence of brain damage. MRI, MRS, and fMRI are sensitive, non-invasive tools for detecting this damage and may play an important role in the neurostructural/neurological component of the FASD diagnostic evaluation, when clinical norms are established. Identification of neurochemical, neurostructural, and neuropsychological correlations could help elucidate the etiology of FASD cognitive/behavioral impairments and facilitate more effective intervention.