

## **Early Effects of Prenatal Alcohol Exposure on Regional Brain Volumes - An Atlas-Based Fetal MRI Study**

### **PURPOSE**

Postnatal imaging studies have shown structural brain anomalies in patients suffering from Fetal Alcohol Spectrum Disorders, including enlarged and malformed hippocampi.<sup>1,2</sup> This atlasbased fetal MRI study aimed to identify early regional effects of prenatal alcohol exposure (PAE) on human fetal brain development.

### **METHODS AND MATERIALS**

This IRB approved prospective single-center study identified pregnant women referred for fetal MRI with variable amounts of alcohol intake during pregnancy using two standardized questionnaires (PRAMS and TACE).<sup>3,4</sup> Postprocessing was conducted generating superresolution imaging and semiautomated atlas-based segmentations. After visual inspection, assessment of data quality and manual correction, an atlas-based analysis of various fetal brain structures was performed. Linear models were applied with an additional factor to account for varying gestational ages and multiple comparisons were corrected using Benjamini-Yekutieli.<sup>5</sup>

### **RESULTS**

After excluding subjects with structural brain anomalies and/or poor superresolution image quality, a total of 27 patients with PAE and 36 controls (gestational age 20-37 weeks, mean 27.2 GW) were included and analyzed. In fetuses exposed to alcohol both hippocampi (left  $p = 0.035$ , right  $p = 0.024$ ) and the corpus callosum ( $p = 0.035$ ) showed significantly larger volumes (mean volumes  $\pm$  SD), whereas the periventricular/germinal zone ( $p = 0.003$ ) showed smaller volumes (mean volumes  $\pm$  SD) compared to controls.

### **CONCLUSIONS**

While it is well known that PAE may cause neurodevelopmental deficits, this study systematically documented selective effects on regional brain volumes at prenatal stages. Besides the reduction in size of the germinal matrix, an increased regional growth of the hippocampus and the corpus callosum was found.

### **CLINICAL RELEVANCE/APPLICATION:**

Prenatal imaging detection of germinal matrix, hippocampal and callosal abnormalities after embryonal/fetal alcohol exposure emphasizes the socioeconomic importance of prevention, detection and support of affected families.