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Foetal Alcohol Exposure Affects Brain Structure in Children

Children exposed to alcohol during foetal development exhibit changes in brain structure and metabolism that are visible using various imaging techniques, according to a new study presented at the annual meeting of the Radiological Society of North America (RSNA) in Chicago, U.S.

Alcohol use by pregnant women can lead to problems with the mental and physical development of their children, a condition known as foetal alcohol syndrome (FAS). Research suggests an incidence in the U.S. of 0.2 to 1.5 per 1,000 live births, according to the Centers for Disease Control and Prevention. Costs for care of individuals affected by foetal alcohol syndrome (FAS) in the U.S. have been estimated at $4 billion annually.

Advances in magnetic resonance imaging (MRI) are giving unprecedented insights into the effects of alcohol on the central nervous systems of children whose mothers drank alcohol during their pregnancy. Recently, researchers in Poland used three different MRI techniques to better define these effects.

The study group included 200 children who were exposed to alcohol during their fetal stage and 30 children whose mothers did not drink while pregnant or during lactation. Researchers used MRI to evaluate the size and shape of the corpus callosum, the bundle of nerve fibres that forms the major communication link between the right and left halves of the brain, in the two groups. Prenatal alcohol exposure is the major cause of impaired development or complete absence of the corpus callosum.

The MRI results showed statistically significant thinning of the corpus callosum in the children exposed to alcohol compared with the other group.

"These changes are strongly associated with psychological problems in children," said Andrzej Urbanik, M.D., chair of the Department of Radiology at Jagiellonian University in Krakow, Poland.

Dr. Urbanik and colleagues also used diffusion weighted imaging (DWI) to study six areas of the central nervous system in the children. DWI maps the diffusion process of water and can be a more sensitive means than traditional MRI for detecting tissue abnormalities.

Children in the alcohol group exhibited statistically significant increases in diffusion on DWI compared with the other children.

"The increase of diffusion indicates neurological disorders or damage to the brain tissue," Dr. Urbanik said.

To noninvasively study metabolism in the brains of the children, the researchers used proton (hydrogen) magnetic resonance spectroscopy (HMRS), a common adjunct to structural MRI studies. HMRS results showed a complex collection of metabolic changes.

"In individual cases, we found a high degree of metabolic changes that were specific for particular locations within the brain," Dr. Urbanik said.

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