Medical Xpress

Pregnancy situations have impact on brain development in pre-term infants

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Brain development in infants who are born very prematurely is still incomplete. Factors that cause premature birth may have an impact on the development of the premature infant's brain both during pregnancy and later on after birth. A project conducted as part of the Academy of Finland Research Programme on Neuroscience (NEURO) is concerned to study brain growth and development invery premature or low-weight infants.

The central nervous system in small premature infants is highly susceptible to damage as the immature organism tries to adapt to the intensive care environment following release from the intrauterine environment. Scientists working on the PIPARI project at Turku University Central Hospital have followed premature low-weight infants and investigated factors impacting the growth and development of their brain as well as their two-year prognosis from pregnancy onwards. A total of 232 pre-term infants have been followed and compared to 246 full-term controls. The children will be followed for a total of six years, from birth through to school age.

The results of the project indicate that the redistribution of foetal blood flow, indicative of placental insufficiency, leads to smaller brain volume in preterm infants at term equivalent age. In this situation the foetus directs a larger proportion of the blood flow to its brain.

"The mean brain volume in preterm infants with abnormal blood flow distribution was 45 millilitres smaller than in other preterm infants," says

project director, Adjunct Professor Liisa Lehtonen from Turku University Central Hospital.

According to Lehtonen, the new research evidence on the impact of this volume difference on children's long-term prognosis will help to decide on the optimal timing of delivery in cases of placental insufficiency.

Degree of prematurity influences risk of brain injury

Scientists at Turku have studied the impact of placental inflammation on brain injury in preterm infants. It has been widely believed that inflammation of the placenta is responsible for many brain injuries in preterm infants. "We examined tissue samples from preterm placentas and classified them according to the amount of inflammation found in microscopic examinations. Inflammatory reactions were seen in 45 per cent of the placentas," Lehtonen says.

However, the findings suggest that placental inflammation has no independent effect on the number or severity of brain injuries or on brain growth. Inflammation of the placenta is the more common the more prematurely the infant is born, and the degree of prematurity is the single most significant risk factor for brain injury.

The project team have also investigated the impact of genetic regulation of an inflammatory transmitter (interleukin-6) on the inflammatory reaction in the placenta and on infections in the newborn infant. "A genotype causing strong inflammatory response increases the risk of placental inflammation, but on the other hand protects the child against inflammation. Our preliminary findings suggest that genetic regulation of interleukin-6 is also associated with the volume of the deep gray matter of the brain."

Lehtonen says that the follow-up results for their small preterm infants at

age 2 years are better than any reported to date. Retardation in intellectual development was observed in 3.7 per cent of small preterm infants, and developmental problems, including CP injuries, in 10.8 per cent.

"In order for us to create treatments that can help protect the development of the brain, it's essential that we systematically follow up the development of preterm infants: this should always be an integral part of the care of preterm infants," Lehtonen emphasises.

Source: Academy of Finland