
RSNA Press Release

New Tool Tracks Brain Development in Babies

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OAK BROOK, Ill.—Researchers have used a new technique to monitor brain development in infants and detect disturbances in white matter, according to a study in the July issue of *Radiology*.

Carola van Pul, Ph.D., and colleagues from Máxima Medical Center in Veldhoven, the Netherlands, studied seven normal infants and 10 infants with perinatal hypoxic ischemia, a type of brain injury caused by a period of oxygen and nutrient deficiency, usually as a result of complications during delivery. Hypoxic ischemic injury can result in severe motor problems.

"The pattern and extent of the brain injury largely determine the neurological and developmental consequences for the newborn," Dr. van Pul said. "The detection of injury at an early stage is essential for the development of strategies to limit permanent brain damage and to improve prognosis."

The researchers used 'diffusion tensor' magnetic resonance imaging (MRI), which depicts the diffusion, or displacement, of water molecules through tissue. Ischemia results in tissue changes that are visible with diffusion tensor imaging at least two to three hours before they can be seen on conventional MRI. The team then applied fiber tracking to construct a 3-D visualization of the brain's white matter tracts based on the diffusion tensor images. The procedure was repeated after three months to monitor the development of the injured regions. This is the first time a group of newborns has been evaluated with fiber tracking at birth and at three months.

At birth, fiber tracking showed a different fiber pattern in eight of the 10 neonates with ischemia, compared to the images obtained from the normal infants. The fiber pattern of the brain's white matter was disturbed in several areas of the brain, including the corpus callosum, which allows communication between the two hemispheres of the brain, and, most significantly, the corona radiata, which is associated with finely coordinated movement. Six of the 10 infants continued to exhibit disturbed fiber patterns at follow-up.

At A Glance

- Fiber tracking shows white matter development in newborns.
- Hypoxic ischemia, typically caused by delivery complications, may result in infant brain abnormalities.
- Abnormalities in the corona radiata may cause severe motor skill deficits.

All of the infants who had disturbed patterns in the corona radiata at three months had major motor problems.

"Minor white matter abnormalities seen with fiber tracking tended to resolve at three months, while marked changes persisted," Dr. van Pul said. "Further investigation is needed to determine whether the detected fiber abnormalities ultimately correlate with outcomes."

Hypoxic ischemia remains an important cause of infant mortality and morbidity, with an incidence of between one and two per 1,000 live births in the United States.

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Journal attribution required.

Radiology is a monthly scientific journal devoted to clinical radiology and allied sciences. The journal is edited by Anthony V. Proto, M.D., School of Medicine, Virginia Commonwealth University, Richmond, Va.

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"Infants with Perinatal Hypoxic Ischemia: Feasibility of Fiber Tracking at Birth and 3 Months." Collaborating with Dr. van Pul on this paper were Jan Buijs, M.D., Anna Vilanova, Ph.D., F. George Roos, M.D., and Pieter F.F. Wijn, Ph.D.