

Gray matter abnormality predicts neurodevelopmental problems in smaller premature babies

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Magnetic resonance imaging of the brain is increasingly used to predict neurodevelopmental outcomes in premature infants, but the existing systems of analyzing or "scoring" those MRIs rely heavily on expert opinion. A new study led by clinician-researchers at Nationwide Children's Hospital has explored a more objective system for scoring MRIs - and in the process found that an often unreported abnormality of the brain's gray matter can indicate future impairment.

The abnormality, called moderate-to-severe gyral maturational delay, emerged as the only significant predictor of overall neurodevelopmental impairment in the study group of [premature infants](#) with extremely low birth weights. Gyral maturation delay also predicted cognitive delay; a combined outcome of cognitive delay and death; and a combined outcome of neurodevelopmental delay and death.

In contrast, when researchers used a more opinion-based scoring system, gray matter scores did not show a significant association with neurodevelopmental impairment.

"We let the data drive our model," said Laurel Slaughter, MD, a neurologist at Nationwide Children's and lead author of the study. "We measured numerous individual imaging factors and their correlation to outcomes, instead of deciding ahead of time what we believed would be important. There is still some subjectivity, and neuroradiologists are

going to have slightly different readings or interpretations. But our model is more objective."

The study, published online today in the journal *Neonatology*, involved 122 infants born premature with a weight equal to or less than 2.2 pounds (1 kilogram). Brain MRIs were performed at term-equivalent age at Memorial Hermann Children's Hospital, Houston, under the supervision of Nehal Parikh, DO. Dr. Parikh, now a neonatologist at Nationwide Children's and principal investigator in the Center for Perinatal Research in The Research Institute at Nationwide Children's, is the study's senior author.

At 18 to 24 months of age, the infants were tested using the Bayley Scales of Infant and Toddler Development III, and all had a standard neurologic examination for the presence of cerebral palsy.

Along with the findings involving gyral maturational delay, researchers discovered that diffuse cystic abnormality was a significant predictor of cerebral palsy with the data-driven scoring system. This result is consistent with several previous studies.

These predictors exhibited high specificity (95% to 99%), so when gyral maturational delay and diffuse cystic abnormality were found, often impairments were as well. However, both predictors showed comparatively low sensitivity (30% to 67%), illustrating that the absence of gyral maturational delay and diffuse cystic abnormality does not always mean impairments are also absent.

"We can't predict with certainty that these babies are going to do well just because the MRIs looked good," said Dr. Slaughter, who is also an assistant professor of Clinical Pediatrics at The Ohio State University College of Medicine. "These are still significantly premature babies that we need to monitor."

According to Dr. Slaughter, the study may suggest to physicians that if these predictors are found, therapies should begin at the earliest moment that impairments become obvious. This research also focuses more attention on the brain's [gray matter](#), while previous studies have focused on white matter.

"A lot of counseling to families regarding outcomes is based on white matter," she says. "Our findings show that you can't just rely on white matter as a predictor."

More information: Slaughter L, Bonfante-Mejia E, Hintz S, Dvorchik I, Parikh NA. Early conventional MRI for prediction of neurodevelopmental impairment in extremely-low-birth-weight infants. *Neonatology*. 2016 Apr 7. [Epub ahead of print]

Provided by Nationwide Children's Hospital

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