Researchers show early developmental delays predict poor long-term outcomes in Leigh syndrome patients

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Researchers from the Mitochondrial Medicine Frontier Program at Children's Hospital of Philadelphia (CHOP) have found that

developmental delays associated with Leigh syndrome, the most common pediatric mitochondrial disorder, may occur earlier than previously recognized—even before metabolic stroke and regression—which could provide clinicians with an opportunity for earlier diagnosis and therapeutic interventions. The findings were recently published online by the journal *Molecular Genetics and Metabolism*.

Leigh syndrome has been characterized by neurodevelopmental regression, when a child loses previously achieved skills and developmental milestones, with metabolic strokes occurring in their deep brain regions typically early in life. Currently, no FDA-approved therapies or cures exist, and developmental delays associated with Leigh syndrome are often the primary symptom studied in clinical trials.

Historically, developmental disabilities were thought to mainly occur after the onset of metabolic stroke and neurologic regression. However, some rare instances have been reported in which primary developmental delays occurring prior to neurologic regression were observed in Leigh syndrome patients. The CHOP researchers decided to examine existing data to see if primary developmental delays were more common than previously believed.

"By looking at the pre-regression history of these patients, we were hoping to see signs that would allow us to diagnose Leigh syndrome at an earlier stage prior to their acute decompensation," said co-senior author Rebecca Ganetzky, MD, an attending physician, Assistant Professor, and Director of Biochemical Test Development in the Mitochondrial Medicine Frontier Program at CHOP. "Since we found that developmental delays were the presenting symptom for many of these cases, our study demonstrates that mitochondrial energetics impact developmental trajectories prior to their first episode of neurodevelopmental regression."

Among a cohort of 69 Leigh syndrome patients, 47 had a history of primary developmental delays prior to any regression and 53 had neurodevelopmental regression. The study team identified three distinct phenotypes among these patients: those with primary developmental delays followed by regression (31 patients), primary developmental delays without subsequent regression (16 patients), and regression without primary developmental delays (22 patients). Those with a history of primary developmental delays were more likely to have earlier disease onset and worse long-term educational outcomes.

"This study demonstrates that Leigh syndrome disorders should be considered a diagnostic possibility at the time when a child is recognized to have early developmental delays, even if the child hasn't yet had a serious regression episode that is often the trigger to begin the diagnostic process," said study co-author Marni Falk, MD, an attending physician, Professor, Distinguished Chair, and Executive Director of the Mitochondrial Medicine Frontier Program at CHOP. "We hope our findings will lead to prospective natural history studies that examine specific neurodevelopmental outcomes to help us design future clinical trials for therapies to help these patients at as early a stage in their disease course as possible."

More information: Rory J. Tinker et al, Early developmental delay in Leigh syndrome spectrum disorders is associated with poor clinical prognosis, *Molecular Genetics and Metabolism* (2022). DOI: 10.1016/j.ymgme.2022.02.006

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