Changes in blood flow in the brain may help doctors to predict brain injury in newborns with stroke

childhood disability LINK

Summary

Changes in perfusion, or blood flow, in the brain following stroke have been studied in adults but not in newborns. Findings from such studies have not been applied to newborns under the supposition that newborn brains differ significantly from adult brains. While this remains true, this study suggests that the newborn brain responds to stroke similarly to the adult brain. Like adults, newborns exhibit increased perfusion in the regions surrounding the stroke area. Combined with changes in diffusion of substances from the blood into the brain, these perfusion increases may be useful for identifying brain tissue that can be saved from injury and targeting individual newborns for more rigorous treatment. This study used magnetic resonance imaging (MRI) and arterial spin labeling (ASL) to assess diffusion and perfusion in the brains of four term newborns who had suffered AIS. MRI confirmed the perinatal stroke and was again performed during the first month of life to measure diffusion, while ASL was performed to measure perfusion. Diffusion was measured as the average diffusion constant (ADC) and perfusion was measured as the cerebral blood flow (CBF). ADC and CBF of brain areas affected and not affected by the stroke were compared to the same areas in the opposite brain hemisphere of the same newborn. All observations were made by neurologists blinded to the newborns' conditions.

What families should know

Arterial ischemic stroke (AIS) is caused by a blockage in an artery feeding the brain. In newborns, this blockage often occurs in the late stages of pregnancy, during birth, or in the first day or two of life. Newborns who suffer a stroke may display seizures immediately, in which case they are easier to identify and support, or they may only display symptoms of the stroke in the long-term. Long-term effects of perinatal stroke may include seizures, motor impairment, developmental delay, and cognitive and behavioral problems. It is possible that brain perfusion levels can be used to detect and treat salvageable tissues, mitigating these long-term effects.

What practitioners should know

Arterial spin labeling (ASL) gives a non-invasive measurement of perfusion in the brain, and its combined use with magnetic resonance imaging (MRI) may give doctors a clearer view of which brain tissues are salvageable following perinatal stroke. The ischemic core of the stroke area, where the initial obstruction takes place, is characterized by irreversible damage and, in the study presented here, by a decrease in perfusion. The area surrounding the core is the ischemic penumbra and can be rescued from injury with appropriate treatment. In this study, the ischemic penumbra displayed increased perfusion. Thus, perfusion measurements following perinatal stroke may be useful for identifying newborns who should be treated to minimize brain injury. Studies with longer follow-up of newborn subjects may also show that perfusion measurements can predict long-term neurological outcomes in perinatal stroke patients.

Reference

Wintermark, P. and Warfield, S. (2011). New insights in perinatal arterial ischemic stroke by assessing brain perfusion. Translational Stroke Research, 3(2), pp. 255-262. doi: 10.1007/s12975-011-0122-0.

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