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Influence of Intracranial Pressure on the Cerebral Microcirculation in Pig Models with Hydrocephalus ZENG ZHANG, Johns Hopkins University, MISUN HWANG, Childrens Hospital of Philadelphia; University of Pennsylvania, TODD J. KILBAUGH, THOMAS HALLOWELL, ANUSH SRIDHARAN, Childrens Hospital of Philadelphia, JOSHUA Y. CHOI, University of Pennsylvania, JOSEPH KATZ, Johns Hopkins University — Hydrocephalus involves abnormal accumulation of cerebral spinal fluid, resulting in elevated intracranial pressure (ICP) that often requires neurosurgical intervention. Delayed diagnosis can lead to ischemia and brain damage. There is a dire need for noninvasive techniques for assessing the ICP and brain health. This study applies contrast-enhanced ultrasound (CEUS) imaging, using a clinical system and contrast agent (Lumason, 1-3μm bubbles), to visualize the spatial distribution of cerebral microcirculation in brain sections of 5 pig models with varying ICP levels. PTV based on an optimization code involving multiple matching criteria is used for bubble tracking. The vascular maps are generated by super-positioning all the trajectories with more than 4 exposures and measuring the velocity in each vessel. To characterize the distribution of perfusion, we introduce the cerebral microcirculation (CMC) parameter by summing the velocity in all the micro vessels for each part of the brain. Results show that the CMC in the thalamus plateaus until a critical ICP, and then decreases sharply. In contrast, there is a high negative correlation between the ICP and the CMC in the cortex. Hence, the cortical CMC could potentially be used as a non-invasive quantitative indicator for the ICP.

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