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From Image to Insight

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BOLD-DSC MRI 를 이용한 마우스 뇌 및 하퇴부 근육의 관류 매핑 연구

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Tissue perfusion is a fundamental physiological readout in both health and disease, yet mapping it repeatedly and non-invasively in small animals remains challenging. BOLD-DSC MRI, also termed deoxygenation-based dynamic susceptibility contrast (dDSC), uses a brief, controlled hypoxic gas challenge to generate a transient bolus of deoxyhemoglobin, an endogenous paramagnetic tracer, without an injected contrast agent.

For the brain, the method has been developed into an approach for quantitative whole-brain perfusion mapping in mice at 9.4 T. From the dynamic BOLD signal during a few seconds of transient hypoxia, subject-specific arterial input function estimation and deconvolution provide maps of cerebral blood flow (CBF), cerebral blood volume (CBV), and mean transit time (MTT); gradient- and spin-echo readouts help separate total from microvascular perfusion, with validation against an intravascular iron-oxide (MION).

The same framework has been extended beyond the brain to hindlimb skeletal muscle. A model-free analysis of the hypoxia-induced hemodynamic response is used, which appears reproducible and suggests altered, more heterogeneous responses in a motor neuron disease model.

Keywords: *BOLD-DSC, Perfusion mapping, Blood flow, Deoxyhemoglobin, Transient hypoxia*