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Neuroimaging: Introduction

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During the 2012 Princeton Conference, imaging of cerebrovascular disorders was addressed by a series of topics that incorporated current controversy about advanced modalities for evaluation of patients with acute ischemic stroke and also emerging, cutting-edge technologies on tissue metabolism and cerebrovascular reactivity.

Howard Rowley reviewed the role of multimodal CT and MRI, including vascular and perfusion/penumbral imaging.[1] Patient selection for IV thrombolytic and endovascular stroke treatments outside of standard time windows is not the only reason to perform advanced neuroimaging. Indeed, there are numerous uses of vascular and perfusion/penumbral imaging in the evaluation of cerebrovascular disorders. Vascular and perfusion/penumbral imaging can identify patients at high early risk of stroke after transient ischemic attacks. They can prognosticate outcome and guide disposition decisions, such as the need for ICU admission, or frequency of neurological monitoring.

Weili Lin stressed that cerebral oxygen metabolism plays a critical role in maintaining normal brain function.[2] Abnormalities in oxygen metabolism occur in various neuropathologic conditions, such as ischemic stroke, cerebral trauma, cancer, Alzheimer disease, and shock. Therefore, the ability to measure tissue oxygenation and oxygen metabolism quantitatively is essential to the understanding of pathophysiology and treatment of various diseases. He described a novel imaging method using blood oxygenation level–dependent contrast to measure tissue oxygenation and oxygen metabolism, and explained how this approach can be used to select patients with acute ischemic stroke for revascularization.

David Mikulis described an imaging method to measure cerebrovascular reactivity as an indicator of cerebral hemodynamics.[3] In adults with cerebrovascular disease, impaired cerebrovascular reactivity has been shown to be associated with an increased risk of stroke.

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The degree of impairment of the cerebrovascular reactivity is also related to the burden of chronic microvascular disease, and assessing cerebrovascular reactivity can be used to quantify the results of revascularization therapies.

Thilo Hölscher, presented an emerging therapeutic modality called MRI-guided focused ultrasound, a new stereotactic technique, that uses high-intensity focused ultrasound to mechanically enhance clot lysis within the proximal intracranial arteries.[4] MRI allows for precise intraprocedural localization of the targeted clot and real-time monitoring of such sonothrombolysis.

These presentations generated a rich and interesting discussion about the pivotal role of imaging in various cerebrovascular disorders, to streamline diagnosis and therapy, while discerning key pathophysiology of cerebral ischemia. This session underscored the role of stroke imaging in 2012 as an integral component of therapeutic strategies and avenue for future translational research.

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