Recent Advances in Stroke Therapies

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Stroke is the second leading cause of death in Taiwan. Therapies for acute ischemic stroke are limited to thrombolytic interventions with tPA remaining to be the mainstay.. A therapeutic window of 3 hours has limited tPA therapy to approximately 1 – 2% of all acute ischemic patients. Identifying patients with salvageable ischemic brain tissue that is amenable to tPA therapy beyond the 3-hour window may broaden the scope of thrombolytic therapies. Diffusion weighted imaging (DWI) has been widely used to study patients with acute ischemic stroke. When coupled with perfusion weighted imaging (PWI), a mismatch has been suggested to delineate reversible ischemic lesions for therapeutic interventions. Selected clinical trials testing neuroprotective agents have applied DWI or DWI/PWI in the selection of patients with salvageable brain tissue. While DWI is highly sensitive in depicting an acute ischemic lesion, its value in predicting irreversible ischemic brain injury during the acute stage has been challenged. Furthermore, the ischemic lesions may not be defined in a strictly quantitative term using DWI/PWI. Newer MR techniques are being developed to aid in the delineation of the dynamic pathophyiology of brain injury following ischemia. Novel MR sequences based on the BOLD mechanism are useful in the assessment of the extent of deoxygenation in ischemic tissue and adjacent areas to derive the oxygen extraction fraction (OEF). In addition, an absolute measurement of cerebral blood flow (CBF) can also be obtained. By combining both MR based CBF and OEF, metabolic rate for oxygen (CMRO2) may also be estimated. Using this MR-CMRO2 method, significant difference between core lesions that are destined for infraction vs penumbra with viable brain tissue can be differentiated. Further advances in the development of MR-CMRO2 may obviate the need of PET scanners to measure CBF, OEF, and CMRO2, and may permit serial imaging to delineate the dynamic pathophysiology of brain ischemia. These MR-derived parameters may also supplement DWI/PWI in predicting the fate of acute ischemic lesions for individualization of ischemic stroke patients beyond the 3-hour window for thrombolytic therapies. (Supported by the Ministry of Education 94277-B10-4-E03, National Science Council, Department of Health, Taiwan; NIH National Institute of Neurological Disorders and Stroke and American Heart Association, USA)