MR cerebral metabolic rate of oxygen utilization in hyperacute patients.

Lee JM;Vo K;Hongyu;Hsu CY;Lin WL

Abstract

The purpose of this study was to explore the feasibility of obtaining magnetic resonance-measured cerebral metabolic rate of oxygen utilization (MR-CMRO(2)) in acute ischemic stroke patients. Seven stroke patients were serially imaged: 4.5 +/- 0.9 hours (tp1), 3 to 5 days (tp2), and 1 to 3 months (tp3) after symptom onset. Diffusion-weighted, perfusion-weighted, and multiecho gradient-echo/spin-echo images were acquired; cerebral blood flow and oxygen extraction fraction maps were obtained from which CMRO(2) was calculated as the product of cerebral blood flow and oxygen extraction fraction. The final infarct lesions obtained from tp3 T2-weighted images and the "penumbra" obtained from the tp1 perfusion-weighted image-defined lesion were coregistered onto tp1 CMRO(2) maps. CMRO(2) values in the region of brain that eventually infarcted were reduced to 0.40 +/- 0.24 of the respective region on the contralateral hemisphere. The "salvaged penumbra" defined by the area of mismatch between the final infarct and the tp1 perfusion-weighted lesion demonstrated an average CMRO(2) value of 0.55 +/- 0.11 of the contralateral hemisphere. Although our results are preliminary and require further evaluation, the ability to obtain in vivo measurements of MR-CMRO(2) noninvasively potentially can provide information for determining brain tissue viability in acute ischemic stroke patients.