Stroke is one of the leading causes of mortality in China. Recent decades, the mortality and morbidity have decreased in the urban area of China from 127.98/100,000 population in 2000, to 125.15/100,000 population in 2010. In contrast, these numbers are elevated obviously in rural area from 115.00/100,000 to 145.70/100,000, respectively in the same period. Chinese population presents the highest recurrent rate of stroke: among 9M new stroke cases and 30M survivors of stroke each year globally, one-third of cases came from China. The higher incidence of the intracranial arterial occlusive lesions and predominant small vessel disease are believed to be the one of main causes of the high recurrent rate of stroke in Chinese population. In clinical practice, the intracranial occlusive lesions present a variety of outcomes. It is not rare that the progressive occlusive lesion is not consequentially destined to the occurrence of stroke, while the appearance of intact vessel wall may relate to a poor outcome. Therefore, it is critically important in clinical to predict the outcome of the occlusive lesion. Small vessel disease swings between ischemic and hemorrhages, which makes the clinical irresolution of the secondary prevention.

Recent years, we have developed the MRI software for the purpose of evaluation of the degree of perfusion deficiency, automatic counting of the severity of the brain white matter lesions, and the number of the cerebral microbleeds, and assessment of the neuron function during ischemic lesion.

1. We evaluated the distal branches of the intracranial arteries, such as the second and third segment of the middle cerebral artery (MCA), anterior cerebral artery (ACA) by use of the targeted arterial spin labeling technique (ASL). We were successful in selecting A2 and A3 segments of ACA and etc.

2. We used an extended FixHugh and Nagumo reaction diffusion mode to calculate the volume of the white matter lesion. The result is well-matched with the manual measurement; therefore, it can be used for comparison between cohort studies during the follow-up period.

3. The software of autonomic quantity of cerebral microbleeds (CMB) was developed in our university based on T2 weighted-image. The technique can be divided into different steps. First, we selected the series of T1 and T2 weighted images to make a mask. Second, we...
made a global verse local statistical thresholding. Then, third, we selected the roundness and other 12 parameters to define the features extraction of the CMB. We classified the CMB and counted the numbers. With this method we assessed the risk factor of the progress of CMB, and found that it is valuable to predict the cerebral infarction and hemorrhage.

4. We developed a system to assess the neuron metabolism, based on the mechanism of volume fraction of erythrocytes in the blood. It can be used in dynamic assessment of the neuron metabolism in the mitochondrial disease like MELAS to predict the coming lesions (Figure-1) 6).

This new technique provides a promising method, although validation is necessary, for the clinical utility for the analysis of brain small vessel disease and the intracranial occlusive lesions, especially for the optional assessment of the severity of small branches occlusive, the deficiency of regional perfusion, the quantity of the white matter lesion and the CMBs, and the condition of neuron metabolism.

References