Vulnerable Lesion correlates to accelerated recurrence of Cerebral Infarction: Carotid Magnetic Resonance Imaging Study

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Purpose: To test the hypothesis that morphologic vulnerable lesion (VL) in carotid artery defined by Magnetic Resonance Imaging (MRI) correlates to quick reoccurrence of cerebral infarctions (CI) and to evaluate potential usage of MRI in secondary prevention of ischemic stroke.

Materials and methods: 50 symptomatic participants were recruited from patients suffering second time MRI-confirmed CI. 8 were women, and 42 were men; the mean age was 69.3 years (range, 55-94 years). Patients were imaged within 7 days after reoccurrence of CI. Classification of lesion based on the shape of lesion and signal in it. Considering the complexity of tissue components and interobserver for different contents, we chose a simple classification system divided the lesions into two types with a view of clinical convenience. VL was of eccentric shape and appeared idiosyncratic heterogeneous signal. Corresponding to AHA type IV, V, and VI, the lesion might contain a big lipid core or an incomplete fibrous cap or hemorrhage signal, all of which would cause the lesions heterogeneous. When type IV, V, and VI were excluded, lesions containing homogeneously thickened artery wall with or without calcification signal (always low signal intensity in multi-weighted images) were defined as stable lesion, referring to type I, II, III, VII and VIII. We identified a VL when two consecutive slices matched the criteria. Then, we compare interval of CI between patients with and without vulnerable lesion and prevalence of VL in patients recurrent within and after 1 year (365 days). A Cox proportional hazards model was constructed to calculate the affection of VL to interval of CI.

Result: The typical images of VL are shown below:

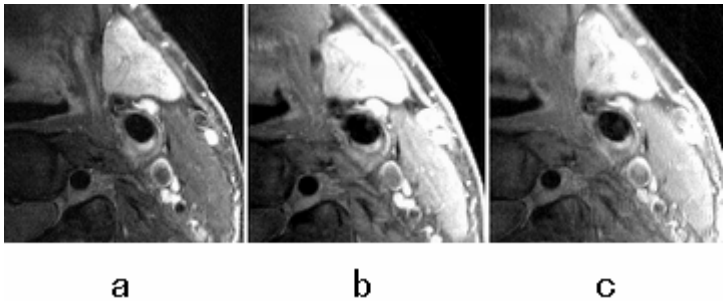

Figure 1 A 55 years old male suffered new CI 15 days after his first stroke. The Lumen of left common carotid artery is not stenosis. A High signal material within left common carotid artery wall was covered by a low signal layer. (a)T2WI (b)PDW (c)T1WI

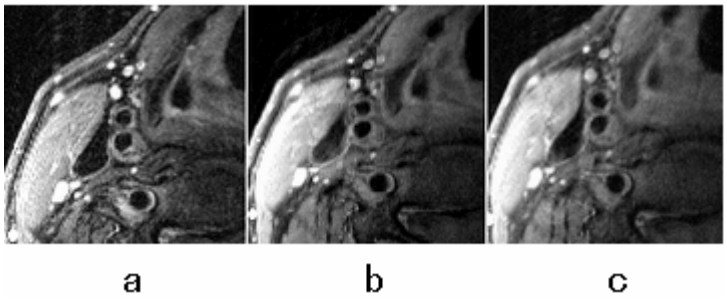

Figure 2 A 65 years old male suffered new cerebral infarction 1630 days after his first stroke. The lumen of right inner carotid artery was stenosis. An eccentric shape plaque was found in vessel wall and protruded to the lumen. (a)T2WI (b)PDW (c)T1WI

The mean recurrence interval of patients with vulnerable lesion was shorter than that of patients without VL (296.2 vs. 1623.0, P <0.001). In patients have a recurrent cerebral infarction within a year, VL was more frequent to be detected (80% vs. 13.3%, P <0.001). The patients with VL had a 5.596-fold higher HR (HR=5.596, P< 0.001, 95% CI 2.766-11.326) than those without did after adjustment of other risk factors.

Conclusion: MRI-defined vulnerable lesion in carotid artery related to accelerated recurrent cerebral infarction. Magnet Resonance Imaging demonstrated its potential value in secondary prevention of cerebral infarction.