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High-Resolution Magnetic Resonance Vessel Wall Imaging of Chronic Intracranial Internal Carotid Artery Occlusion

Keywords: High-resolution Magnetic Resonance Imaging (HRMRI), Intracranial arterial stenosis, atrial fibrillation, Intracranial internal carotid artery (ICA),

Case Report

A 61-year-old woman was admitted due to weakness and numbness of right limbs. Atrial fibrillation was diagnosed after admission. Brain MRI demonstrated subcortical lacunar infarct at left frontal lobe (Figure 1, A), which progressed to multiple infarcts over anterior and internal border zone (Figure 1, B). MRA revealed occlusion of left distal ICA (Figure 1, C). Anticoagulant medications and anti-hypertensive drugs were given. Follow-up MRA performed 14 months after stroke onset demonstrated partial recanalization of the previously occluded vessel (Figure 1, D). Non-enhanced T1-weighted (T1w) vessel wall images in the axial plane revealed a concentric organization of hyperintensity within the lumen (Figure 1, E), consistent with residual non-occlusive embolus adherent to the artery wall. The pattern of diffuse, concentric arterial wall thickening and enhancement of the vessel wall was observed on contrast-enhanced T1w images (Figure 1, F), an appearance like inflammatory conditions such as central nervous system vasculitis [1].

Discussion

Intracranial arterial stenosis (ICAS) is the most common cause of ischemic cerebrovascular disease in China [2]. High-Resolution Magnetic Resonance Imaging (HRMRI) emerged as a feasible technique to visualize intracranial arteries pathology by vessel wall imaging, making it possible to differentiate different intracranial vasculopathies. Recanalization of an occluded ICA has been observed by traditional luminal imaging techniques, such as computed tomography (CT) angiography [3,4] and digital subtraction angiography [5]. But little is known about the MRI characterization during the natural course of embolic occlusion of intracranial ICA. The aim of the study was to explore the MRI features of emboli and determine the long-term effects of an embolism on the appearance of the arterial wall.

A previous study demonstrated that mechanical thrombectomy could result in intracranial arterial wall thickening and enhancement at the site of a recent arterial occlusion, potentially mimicking the MRI appearance of primary arteritis [6]. Our study observed similar MRI characteristics of primary intracranial arteriopathy in a patient treated with medical therapy alone, presumably a consequence of arterial wall injury by the embolism itself. Unfortunately, the histopathologic validation for MRI findings was difficult to perform due to the

inaccessibility of obtaining intracranial large arteries. But our finding indicated that the application of HR-MRI could enable the understanding of the underlying pathophysiologies, which may aid risk stratification and treatment decision-making in symptomatic ICAS.

Teaching Point

In patients suffering from chronic internal carotid artery occlusion, emboli itself may cause plaque characteristics similar to primary arteritis on HRMRI.

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Figure 1.

Diffusion-weighted imaging (A) showing lacunar infarct at left frontal lobe. Repeated CT (B) demonstrating new infarct over anterior and internal border zone. MRA (C) showing near-complete occlusion of left distal internal carotid artery (ICA) (white arrow). Follow-up MRA (D) indicating partial recanalization of the occluded ICA (white arrow). High-resolution T1-

weighted non-enhanced (E) and contrast-enhanced (F) images revealing hyper-intensity adherent to the vessel wall (black arrow), suggestive of residual non-occlusive embolus. T1-weighted contrast-enhanced image (F) showing concentric arterial wall thickening and enhancement.