

Small Cortical Infarcts Transformed to Lobar Cerebral Microbleeds: A Case Series

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Cerebral microbleeds (MBs) have been often observed due to the development of imaging devices, and are classified to deep and lobar MBs. Lobar MBs are strongly associated with cerebral amyloid angiopathy. Here, we report 3 cases of lobar MBs that developed after small cortical ischemic stroke. One case underwent carotid artery stenting for severe carotid stenosis, one was diagnosed with artery-to-artery embolism, and the other was embolic stroke of undetermined source. New small cortical infarctions were detected with diffusion-weighted magnetic resonance imaging (MRI). Initial MRI revealed no hemorrhage around the ischemic lesion on T2*-weighted gradient-recalled echo or susceptibility-weighted imaging (SWI) at the onset of stroke. Follow-up SWI after 12-20 months revealed lobar MBs in the previously detected ischemic lesions, and high-intensity lesions remained around the MBs on fluid-attenuated inversion recovery imaging. These cases revealed that cerebral MBs developed through the transformation of small cortical infarctions. All cases showed lobar MBs, and these MBs existed in the previously detected ischemic lesions at a chronic stage. Lobar MBs present around ischemic lesions may predict embolic infarcts.

Key Words: Embolism—microbleeds—cerebral amyloid angiopathy—atherosclerosis—carotid artery

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Universal usage of magnetic resonance imaging (MRI) techniques has made it possible to detect small iron deposits in brain tissue, which are known as cerebral microbleeds (MBs). Cerebral MBs can be characterized as small, hypointense, and round lesions on T2*-weighted

gradient-recalled echo or susceptibility-weighted imaging MRI sequences.^{1,2} Two types of vascular pathological changes have been identified as hypertensive vasculopathy, typically associated with deep MBs and cerebral amyloid angiopathy (CAA), associated with lobar MBs.³

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Here, we describe 3 cases of cerebral MBs developed after embolic infarction. The study was approved by the Ethics Committee of Mie University Hospital.

Cases

A 78-year-old man (case 1) was treated for the right carotid artery stenosis with carotid artery stenting. MRI was obtained the day after carotid artery stenting. Diffusion-weighted images revealed a small high-intensity spot in the left occipital lobe without signal changes around the ischemic lesion on gradient-recalled echo images (Fig 1, A and B). Follow-up MRI was performed at 20 months later. Susceptibility-weighted imaging indicated a cerebral MB at the site of the previous detected ischemic lesion (Fig 1, C). Fluid-attenuated inversion recovery image showed that the ischemic lesion remained, with smaller size (Figure 1D).

Case 2 (69-year-old man) was diagnosed with artery-to-artery embolism, and case 3 (66-year-old man) was embolic stroke of undetermined source. New small

cortical infarctions were detected with diffusion-weighted images (Fig 1, E and I). Initial MRI revealed no hemorrhage around the ischemic lesion at the onset (Fig 1, F and J). Follow-up MRI revealed lobar MBs in the previously detected ischemic lesions (Fig 1, G and K), and high-intensity lesions remained around the MBs on fluid-attenuated inversion recovery imaging (Fig 1, H and L).

These cases highlight 2 important issues. First, small cortical infarcts can be transformed to cerebral MBs. Second, cerebral MBs that exist in the previously detected ischemic lesions may develop due to the small infarcts.

A previous study indicated that new cerebral MBs can develop from ischemic stroke.⁴ On the other hand, lobar MBs have been associated with CAA based on histopathological studies.³ Both cerebral MBs and cortical microinfarctions have been detected in patients with CAA.⁵ Although our cases showed lobar-type cerebral MBs, there was no lobar MB at the onset and they were detected on follow-up MRIs. There was remaining ischemic scarring in proximity to the MBs in all cases. The presence of

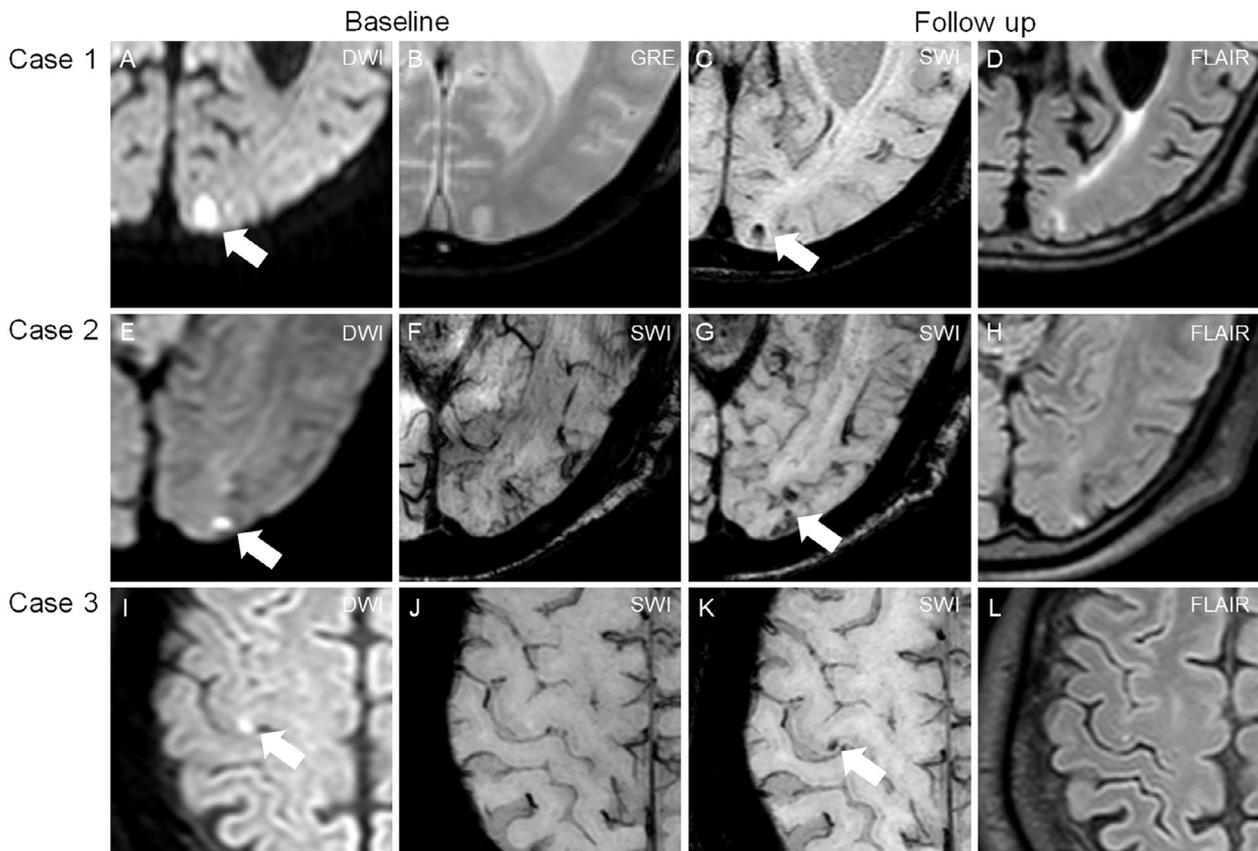


Figure 1. New cerebral MBs appeared in chronic phases. Case 1: DWI, 1 day after CAS, showed an acute embolic infarct in the left occipital lobe (A, arrow). GRE image showed no signal change (B). Follow-up MRI obtained 20 months later showed a new MB in the infarct area on SWI (C, arrow), and the ischemic lesion became smaller, as seen on FLAIR image (D). Case 2: Initial DWI showed an acute embolic infarct in the left occipital lobe (E, arrow). SWI showed no low-intensity lesion around the infarction (F). At 19 months after onset, SWI showed a new MB (G, arrow) in proximity to the infarct seen on FLAIR image (H). Case 3: DWI showed an acute infarct in the right precentral gyrus on the day of onset (I, arrow). SWI showed no MB at the onset (J). Follow-up MRI obtained 1 year later revealed a new MB in proximity to the ischemic lesion (K, arrow), and the infarct lesion became smaller, as seen on FLAIR image (L). Abbreviations: CAS: carotid artery stenting, DWI: diffusion-weighted imaging, FLAIR: fluid-attenuated inversion recovery; GRE: gradient recalled echo, MB: microbleed, MRI: magnetic resonance imaging, SWI: susceptibility-weighted imaging.

lobar MB adjacent to small ischemic lesions may indicate hemorrhagic transformation in ischemic stroke.

Disclosures

The authors have no conflict of interest to declare.

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