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Post-operative Corona Radiata Infarct in a High-flow EC-IC Bypass: Report of Unusual Complication

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Abstract

Long insular artery (LIA) infarct can occur after insular glioma surgery. LIA infarct after extracranial-intracranial (EC-IC) bypass is very rare, and so far, it is not reported in EC-IC bypass. Here, we report a case of high-flow EC-IC bypass, where postoperatively, the patient developed isolated LIA infarct. A 65-year-old female presented with recurrent severe headache along with altered sensorium. Computed tomography (CT) scan and CT angiography (CTA) of the brain showed ruptured large left internal carotid artery (ICA) fusiform aneurysm. She underwent left-sided, high-flow EC-IC bypass involving upper trunk of left middle cerebral artery (MCA) and ICA ligation at neck at its origin. Postoperatively, the patient developed right sided hemiplegia. Postoperative MRI of the brain showed left-sided external capsular infarct, extending up to the corona radiata resulted from LIA infarct. By the end of 6 months after operation, she could walk with support but her left upper limb remained more severely affected and magnetic resonance angiogram (MRA) showed almost disappearance of aneurysm with functioning bypass.

Keywords
- long insular artery
- infarct
- EC-IC bypass
- ICA aneurysm
- corona radiata infarct

Introduction

The prevalence of long insular artery (LIA) suppling the corona radiata is rare. Its isolated infarction is very rare. Possibility of its infarction in high-flow, extracranial-intracranial (EC-IC) is further rare, as middle cerebral artery (MCA) M2 upper trunk is not usually used as recipient artery. Here, we report a case of postoperative LIA territory infarct, resulting in hemiplegia in a high-flow, EC-IC bypass. So far, in our knowledge, such complication is not reported in the literature.

Case Report

A 65-year-old female presented with recurrent severe headache along with altered sensorium. Immediate computed tomography (CT) scan and CT angiogram (CTA) of the brain showed suspected ruptured large left internal carotid artery (ICA) fusiform aneurysm (►**Fig. 1A**). After counselling the patient family, we went for left-sided high flow EC-IC bypass (external carotid artery-radial artery graft-MCA [ECA-RAG-MCA]) and ICA ligation at neck at its origin. During operation, after opening the Sylvian fissure, we

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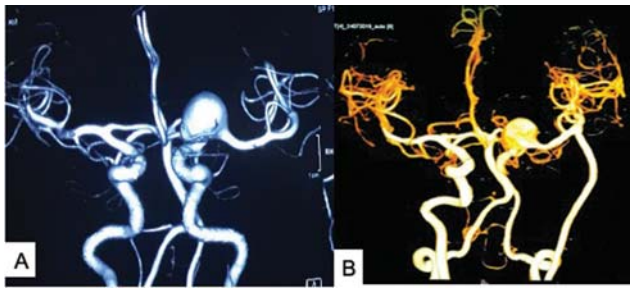

Fig. 1 (**A**) Computed tomography angiography (CTA) of the brain showing left internal carotid artery (ICA) bifurcation large fusiform aneurysm. (**B**) CTA of the brain just after operation showing disappearance of left ICA, patent extracranial-intracranial (EC-IC) bypass and slightly reduction in size of aneurysm.

found dominant upper trunk of MCA, and we decided to use upper trunk of MCA (M2) as a recipient artery for high-flow bypass. Before M2-RAG anastomosis, we did superficial temporal artery-middle cerebral artery (STA-MCA [M4]) bypass on frontoparietal side as an insurance bypass. M2-RAG anastomosis took 25 minutes (ischemic time). Preoperatively, we used systemic heparinization. Postoperatively, the patient woke up from anesthesia with right-sided hemiplegia along with normal speech. Immediate CT scan showed no infarction or hematoma with patent EC-IC high flow bypass, absent left ICA, and slightly reduction in the size of aneurysm (►**Fig. 1B**). Magnetic resonance imaging (MRI) of the brain showed left-sided external capsular infarct, extending up to the corona radiata resulted from LIA infarct (►**Fig. 2A**–**C**). By the end of 6 months after operation, she could walk with support, but her left upper limb remained more severely affected and MR angiogram (MRA) showed almost disappearance of aneurysm with functioning bypass (►**Fig. 2D**).

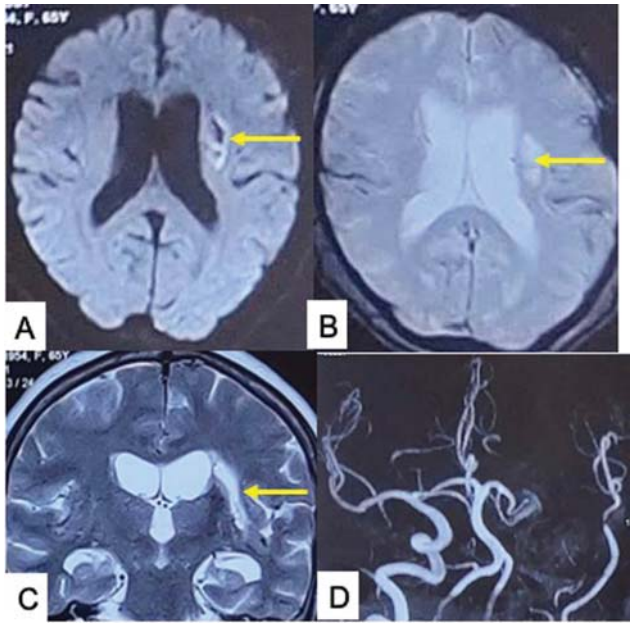

Fig. 2 (**A**, **C**) Magnetic resonance imaging of the brain showing old infarct of territory of long insular artery (LIA) including corona radiata (yellow arrow marked). (**D**) Magnetic resonance angiogram after 6 months showing disappearance of left internal carotid artery, patent extracranial-intracranial bypass and almost disappearance of aneurysm of aneurysm.

Discussion

Periventricular white fibers has two major vascular zones irrigated by the deep and superficial penetrating arteries.[1–3] Among the deep penetrating arteries, the lenticulostriate arteries (LSAs) are branches of M1 segment of the MCA and supply the lower part of the corona radiata.[1,4,5] The superficial penetrating arteries, known as the white matter medullary arteries (WMMAs) and originating from the cortical branches of the MCA, supply the periventricular deep white fiber tract.[1–3]

LIA is a unique artery that supplies the periventricular white matter. It is one of the medullary arteries abutting the territory of deep perforators (►**Fig. 3**). The LIA infarction has been identified principally by neurosurgeons as interruption of this artery during the resection of opercular glioma often ended in postoperative hemiplegia/hemiparesis and classical corona radiata infarction.[1,4–6]

The LIA arises from the M2-upper trunk in the upper insular cleft and supplies the insular cortex, extreme capsule, claustrum, and external capsule and quite often extends to

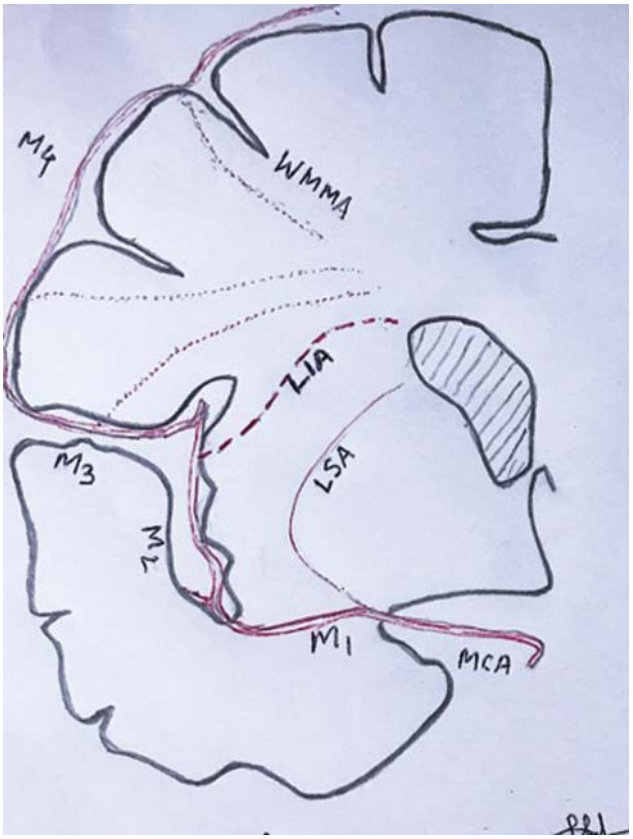

Fig. 3 A schematic hand drawing of arterial territories of subcortical white matter and basal ganglia on coronal plane. Arteries originating from middle cerebral artery (MCA), lenticulostriate artery (LSA) from M1, long insular artery (LIA) from M2, and white matter medullary artery (WMMA) from M3/M4, supply these areas.

the corona radiata (►**Fig. 3**). Clinically, isolated LIA infarction is due to a single or a few occluded LIAs with no involvement of the main trunk. The clinical features of LIA infarction have only rarely been reported,[6] because the sizes and shapes of LIA and LSA infarct lesions are similar and thus difficult to discriminate. These findings suggest that LIA infarcts are most likely frequently categorized as LSA infarcts.

In our case, temporary clumping (25 minutes) of M2 resulted in ischemic infarction of LIA (which is an end artery) territory including corona radiata which, in turn, caused right-sided hemiplegia. We usually prefer the lower trunk of MCA as a recipient, but in this particular case, lower trunk was smaller in caliber, so we chose the upper trunk as a recipient artery. The prevalence of LIA supplying up to corona radiata in general population is not exactly known, but in a series of 356 consecutive patients with acute ischemic stroke, there were 8 (2.2%) patients with an LIA infarct.[1] Although chance of LIA infarction in EC-IC bypass involving the M2 upper trunk is very low, our patient was an unfortunate sufferer.

Conflict of Interest
None declared.

References

1 Tamura A, Kasai T, Akazawa K, et al. Long insular artery infarction: characteristics of a previously unrecognized entity. AJNR Am J Neuroradiol 2014;35(03):466–471
2 Lee PH, Oh SH, Bang OY, Joo IS, Huh K. Pathogenesis of deep white matter medullary infarcts: a diffusion weighted magnetic resonance imaging study. J Neurol Neurosurg Psychiatry 2005; 76(12):1659–1663
3 Yonemura K, Kimura K, Minematsu K, Uchino M, Yamaguchi T. Small centrum ovale infarcts on diffusion-weighted magnetic resonance imaging. Stroke 2002;33(06):1541–1544
4 Lang FF, Olansen NE, DeMonte F, et al. Surgical resection of intrinsic insular tumors: complication avoidance. J Neurosurg 2001;95(04):638–650
5 Türe U, Yaşargil MG, Al-Mefty O, Yaşargil DC. Arteries of the insula. J Neurosurg 2000;92(04):676–687
6 Kumabe T, Higano S, Takahashi S, Tominaga T. Ischemic complications associated with resection of opercular glioma. J Neurosurg 2007;106(02):263–269

