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## Case report

# Emergency embolectomy for acute middle cerebral artery occlusion with chronic common carotid artery occlusion

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## ABSTRACT

Occurrence of acute middle cerebral artery occlusion with common carotid artery occlusion is rare, and its treatment may be complicated. If the approach route cannot be secured because of carotid artery occlusion, endovascular embolectomy may not be indicated. The best treatment approach for such cases remains controversial. A woman in her 70s was transferred to our hospital in ambulance following a sudden onset of dysarthria and left hemiparesis. Magnetic resonance imaging revealed an ischemic lesion in the right basal ganglia and occlusion of the right common carotid and intracranial middle cerebral arteries. Emergency embolectomy was performed for acute middle cerebral artery occlusion. Postoperative magnetic resonance imaging revealed complete recovery of the right middle cerebral artery blood flow. Emergency embolectomy can effectively treat acute middle cerebral artery occlusion with common carotid artery occlusion.

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## Background

Intracranial embolic middle cerebral artery (MCA) occlusion is associated with poor functional outcomes and high mortality. Occurrence of acute MCA occlusion with common carotid artery occlusion is rare, and its treatment may be complicated. At present, endovascular embolectomy is considered the

standard treatment for the acute intracranial main artery occlusion. However, if the approach route cannot be secured because of carotid artery occlusion, endovascular embolectomy may not be indicated. Thus, it is important to demonstrate the postoperative course of a case in which endovascular treatment was not indicated because of common carotid artery (CCA) occlusion and surgical embolectomy for MCA occlusion was performed instead.

Declaration of Competing Interest: None.

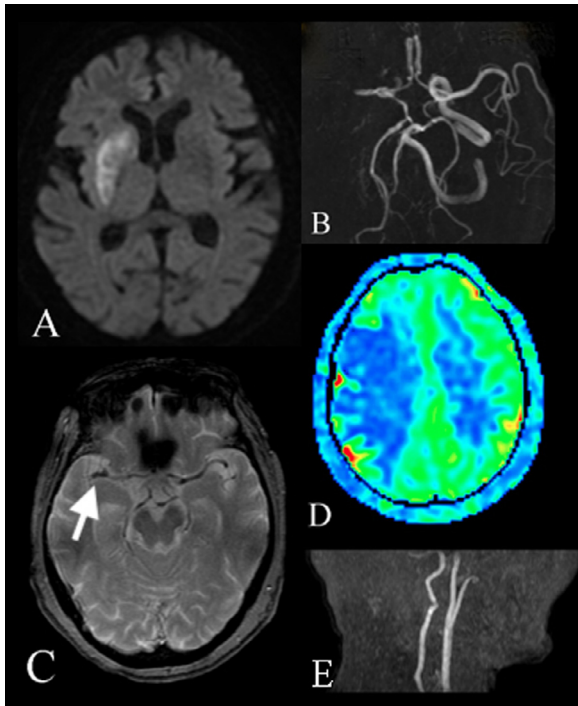
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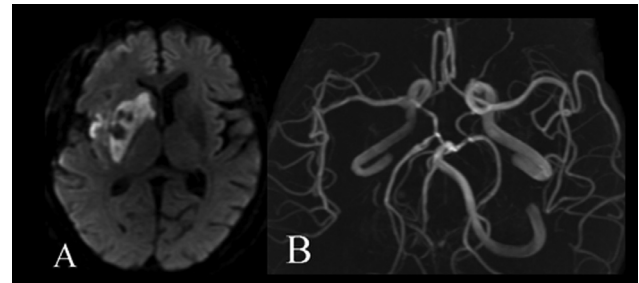


**Fig. 1 – Preoperative imaging results. (A)** Initial diffusion-weighted images showing ischemic lesions in the basal ganglia. **(B)** Head magnetic resonance angiography (MRA) showing right middle cerebral artery (MCA) and right internal carotid artery occlusions. **(C)** T2 star-weighted gradient echo imaging showing a hypointense signal (arrow) in the right MCA. **(D)** Perfusion MRI showing reduced cerebral blood flow in the MCA area. **(E)** Neck MRA showing the right common carotid artery occlusion.

## Case report

A woman in her 70s was transferred to our hospital in ambulance following a sudden onset of dysarthria and left hemiparesis. At admission, her National Institute of Health Stroke Scale score was 18 points. Noncontrast computed tomography revealed a dense right MCA sign without intracranial hemorrhage. Magnetic resonance angiography (MRA) revealed tandem right cervical CCA and intracranial MCA occlusions, and diffusion-weighted imaging revealed ischemic lesions in only some parts of the right basal ganglia. Arterial spin labeling showed decreased cerebral blood flow in the entire right MCA area. T2 star-weighted gradient echo imaging indicated hypointense signals in M1 MCA (Fig. 1), termed gradient echo imaging susceptibility vessel sign, suggesting thrombi [1,2].

Intravenous recombinant tissue plasminogen activator infusion was judged unsuitable because of the time elapsed since onset. When no CCA was drawn by cervical MRA, the occlusion was considered to be both chronic and acute. In the present case, CCA occlusion was considered chronic owing to the lack of data to suspect cardiogenic emboli, such as atrial fibrillation and D-dimer elevation. Thus, endovascular treatment via the posterior or anterior communicating artery or



**Fig.2 – Postoperative magnetic resonance imaging results. (A)** Diffusion-weighted images on postoperative day 1 showing slightly expanded ischemic lesions. **(B)** Head magnetic resonance angiography showing total recanalization, including the right internal carotid artery.

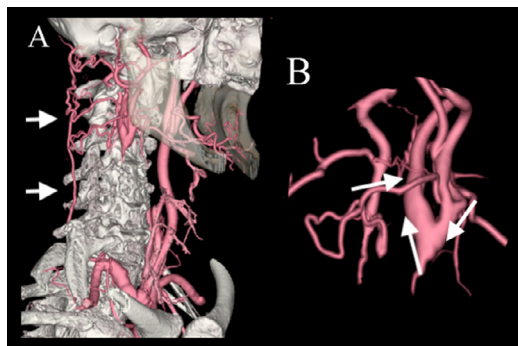
a direct carotid puncture distal to the ICA or CCA occlusion was considered. However, typical surgical embolectomy was deemed more reliable than atypical endovascular treatment due to limited experience of the latter. Priority was given to shortening the time until reopening, and emergency embolectomy for the MCA occlusion without using digital subtraction angiography and 3D-CT angiography was planned.

## Surgery

Right frontotemporal craniotomy was performed under general anesthesia. The sylvian fissure was opened to expose the right MCA bifurcation. A thrombus was observed in the M1-M2 area, and the emboli were completely removed via transverse arteriotomy of MCA inferior. Arteriotomy was closed using 9-0 nylon sutures. Complete recanalization in the right MCA territory was confirmed intraoperatively using a microvascular Doppler flow meter and indocyanine green video angiography. The recanalization time was 39 minutes from the commencement of the surgery. Thereafter, the intracranial internal carotid artery (ICA) was exposed; it appeared discolored, suggesting chronic occlusion. Doppler assessment also suggested C2 ICA occlusion. However, indocyanine green video angiography was not performed; therefore, ICA occlusion could not be confirmed.

## Outcome

Magnetic resonance imaging on postoperative day 1 revealed slightly increased high-intensity diffusion-weighted imaging signals in the right basal ganglia and full recovery of the right MCA blood flow. Furthermore, MRA revealed right intracranial ICA recanalization (Fig. 2). Contrast-enhanced computed tomography indicated chronic occlusion at right CCA origin. Additionally, collateral flow to the right vertebral artery and right external carotid artery from the right subclavian artery was detected; external carotid artery was back flowing to the CCA bifurcation and forward flowing to ICA (Fig. 3). Although the left hemiparesis gradually improved following embolectomy, the patient could not walk by herself for a month. Thus, she was moved to another hospital for rehabilitation.



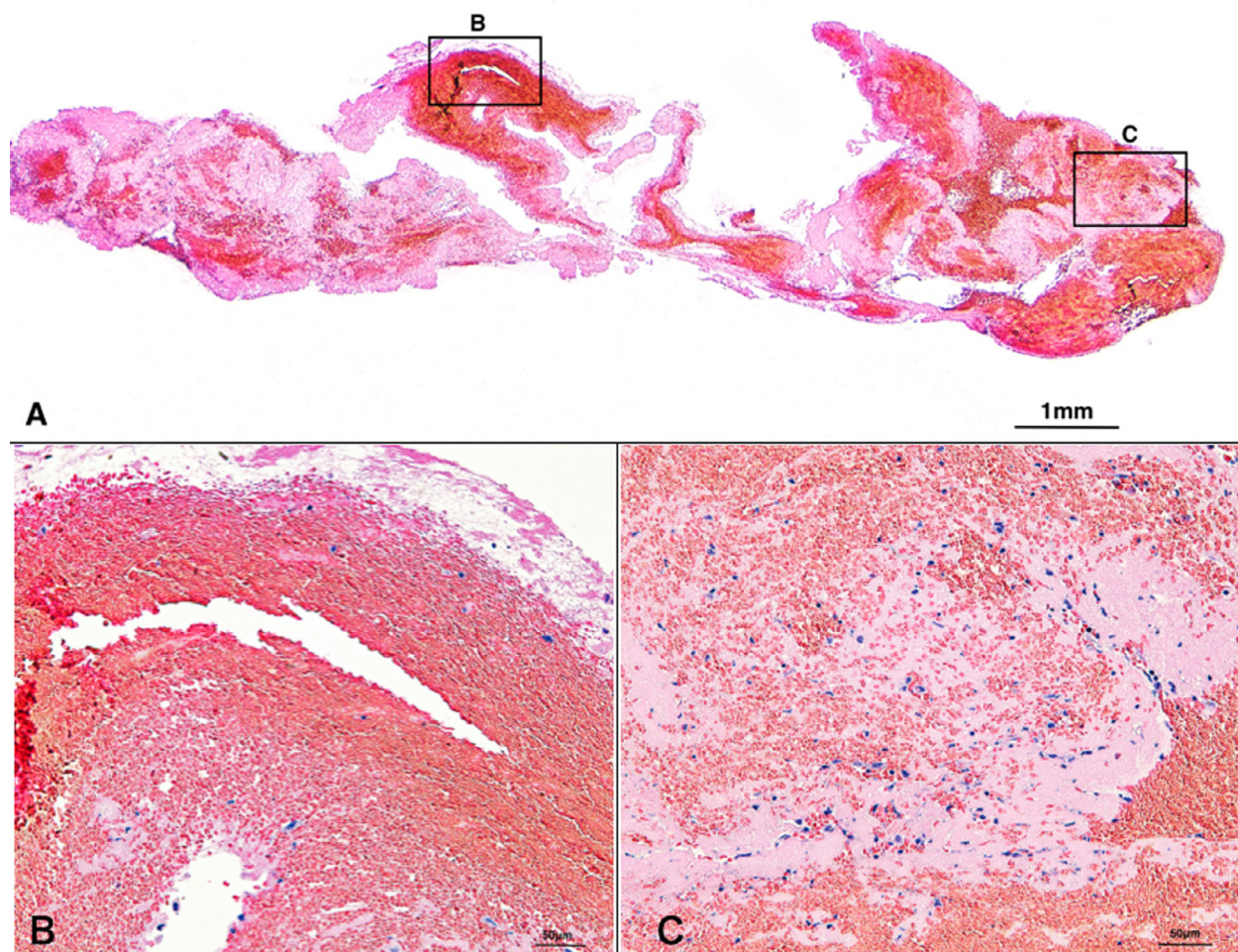
**Fig. 3** – Postoperative contrast-enhanced computed tomography results. (A) Collateral flow (arrow) from the right subclavian artery to the right vertebral artery and right external carotid artery (ECA) and (B) blood flow (arrow) from the ECA to the internal carotid artery.

Pathologic examination revealed that the resected thrombus comprised 2 parts. The red parts mainly comprised red blood cells, and the white parts comprised fibrins (Fig. 4).

## Discussion

Emergency embolectomy is effective in treating acute MCA occlusion with chronic CCA occlusion. When carotid artery occlusion is involved, it is important to assess the artery route, including the collateral blood circulation, prior to treatment. Additionally, it is difficult to immediately determine whether to ligate ICA to prevent recurrent emboli.

First, we found that emergency embolectomy was effective in treating acute MCA occlusion with chronic CCA occlusion. Endovascular embolectomy is considered the standard treatment for acute MCA occlusion; however, endovascular treatment may not be indicated for various reasons, such as the presence of chronic ipsilateral CCA occlusion. Several studies have reported endovascular treatment for acute



**Fig. 4** – Pathological images from embolectomy. (A) Sections of the resected thrombus (hematoxylin and eosin [H&E] staining; magnification,  $\times 1$ ). (B) The parts mainly comprised red blood cells (H&E staining; magnification,  $\times 20$ ). (C) The parts mainly comprised fibrins (H&E staining; magnification,  $\times 20$ ).

MCA occlusion with severe stenosis of cervical ICA [3,4]. However, in cases of acute MCA occlusion with chronic carotid artery occlusion, the approach route to the occlusion site is complicated and endovascular treatment thus becomes difficult. Although a previous report showed successful stent retriever embolectomy via the posterior communicating artery for acute MCA occlusion with chronic ipsilateral ICA occlusion, this treatment strategy has not yet been widely established [3]. The effectiveness of emergency embolectomy has not been proven in randomized clinical trials, although some studies have reported good outcomes [5–9]. In the present case, MRA revealed CCA occlusion to be chronic. Thus, we deemed embolectomy more appropriate than endovascular treatment in terms of safety and efficacy; therefore, we performed emergency embolectomy and achieved favorable outcomes.

Second, in cases of carotid artery occlusion, we found it important to assess the artery route, including the collateral blood circulation, prior to treatment. It is critical to assess the embolic source of the MCA occlusion when deciding on the treatment for ICA. In a previous study, ligation was performed for ICA to prevent recurrent embolization in addition to a superficial temporal artery–MCA bypass to compensate for the blood flow in this area [6]. In another study, good outcomes were obtained even without ICA occlusion treatment; no treatment was administered because the ICA occlusion was considered chronic and MCA thrombus was formed through a patent posterior communicating artery [5]. In the present case, ICA ligation was considered inappropriate because CCA was chronically occluded; however, considering the postoperative course, ICA may not have been chronically occluded. Perhaps, MRA could not delineate ICA because the ICA blood flow became sluggish as a result of the MCA occlusion. Had we performed ICA ligation, how the postoperative course would have transpired and what the best treatment would have been remain unclear. Although it is important to shorten the time, there is a risk of misjudging treatment indications by assessing blood flow using MRA alone.

## Conclusions

Emergency embolectomy is effective in treating acute MCA occlusion with chronic cervical artery occlusion. Conversely, it was difficult to diagnose whether the occlusion of carotid

artery is chronic or acute using MRA. There remains a risk of misjudging treatment indications by assessing blood flow using MRA alone.

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