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Successful Mechanical Thrombectomy for Isolated Internal Carotid Artery Occlusion in a Patient with Monocular Blindness: A Case Report

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Abstract

We report a rare case of isolated internal carotid artery occlusion complicated by central retinal artery occlusion that was successfully treated with mechanical thrombectomy for internal carotid artery occlusion. A 59-year-old man visited the emergency room because of right monocular blindness. Magnetic resonance imaging showed multiple acute small embolic infarctions in the right frontal lobe, and magnetic resonance angiography revealed right internal carotid artery occlusion without the associated occlusion of the circle of Willis, which indicates the patency of the anterior and middle cerebral arteries. An electrocardiogram showed atrial fibrillation. Therefore, we performed mechanical thrombectomy with a stent retriever under continuous manual aspiration with a balloon-guiding catheter and confirmed complete recanalization, anterograde flow in the right ophthalmic artery, and retinal brush. The procedure was completed without complications, and the patient noticed an improvement in visual acuity immediately after the procedure. When a patient with atrial fibrillation complains of monocular blindness, it is important to consider internal carotid artery occlusion due to cardioembolism, to perform an examination promptly, and to consider early treatment, including mechanical thrombectomy.

Keywords: isolated internal carotid artery occlusion, mechanical thrombectomy, monocular blindness, central retinal artery occlusion

Introduction

Acute ischemic stroke is a major cause of mortality and morbidity worldwide.[1,2] Endovascular thrombectomy is widely performed for acute ischemic stroke with proximal anterior circulation occlusion, such as intracranial internal carotid artery occlusion (ICAO).[3,4] Typical symptoms of acute ischemic stroke include hemiplegia and speech disturbance, but sometimes, acute ischemic stroke may also cause ocular symptoms such as monocular blindness.[5,6] Monocular blindness, attributed to central retinal artery occlusion (CRAO), is an ocular and systemic vascular emergency requiring immediate diagnosis and treatment.[7] CRAO causes monocular blindness due to retinal ischemia. However, no definitive treatment has been established yet.[8] Recently, atrial fibrillation (AF), which causes ICAO, is being increasingly recognized as a contributor to CRAO risk.[9] However, there is no report on endovascular thrombectomy for ICAO detected due to monocular blindness. In this report, we have described a rare case of isolated ICAO (without the associated occlusion of the circle of Willis, which indicates patent anterior and middle cerebral arteries) complicated by CRAO, which was successfully treated with mechanical thrombectomy.

Case Report

A 59-year-old man visited the emergency room because of right monocular blindness from the time he woke up. The patient also complained of mild dysarthria 3 days ago.

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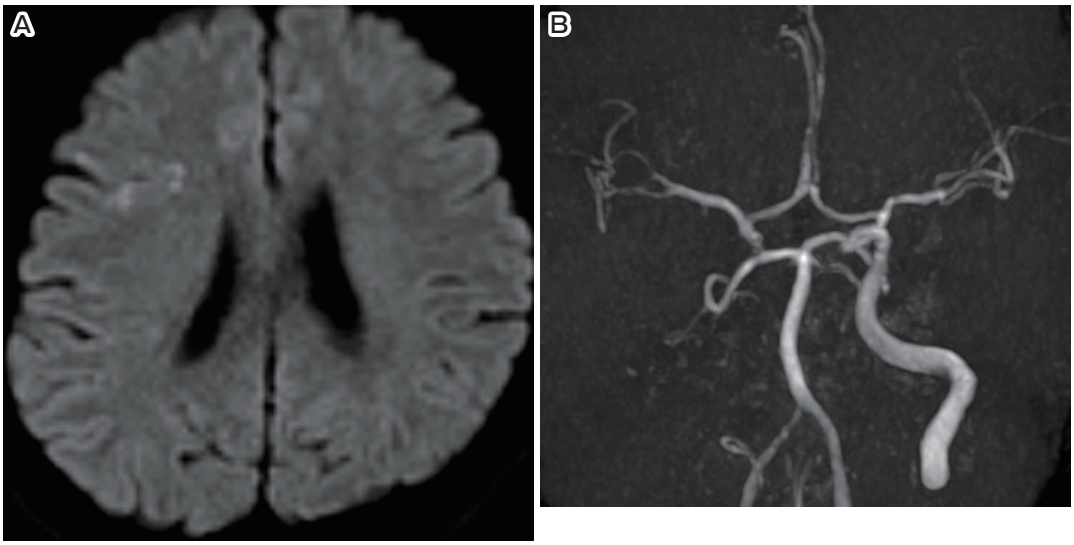

Fig. 1
A. Magnetic resonance imaging (MRI) shows multiple acute small embolic infarctions in the right frontal lobe.
B. Magnetic resonance angiography shows right internal carotid artery occlusion without the associated occlusion of the circle of Willis.

On admission, the National Institutes of Health Stroke Scale was 2. Magnetic resonance imaging (MRI) showed multiple acute small embolic infarctions in the right frontal lobe (Fig. 1A). Diffusion-Weighted Imaging-Alberta Stroke Program Early Computed Tomography Score was 9. MR angiography revealed the right ICAO without the associated occlusion of the circle of Willis (Fig. 1B). The ophthalmic artery was not visualized. An electrocardiogram showed AF. Intravenous recombinant tissue plasminogen activator (tPA) was not administered because more than 4.5 h had elapsed since the onset. Initially, we performed cerebral angiography under local anesthesia after written informed consent was obtained from the participant and legal representative of the patient. A 4-Fr long sheath was inserted into the right femoral artery, and a diagnostic catheter was guided into the right common carotid artery. Common carotid angiography revealed a tapered occlusion of the cervical internal carotid artery (ICA) after the bifurcation (Fig. 2A). Vertebral angiography showed that the right ICA was patent distal to the posterior communicating artery (Fig. 2B). Ophthalmic artery was not visualized in both right common carotid and vertebral angiography. ICA was considered occluded in the segment from the cervical ICA to the bifurcation of the posterior communicating artery (C2 segment), including the bifurcation of the ophthalmic artery. Sequentially, we performed mechanical thrombectomy for the right isolated ICAO to prevent the worsening of symptoms. A 9-Fr long sheath was inserted into the contralateral femoral artery, and a 9-Fr balloon-guiding catheter (Optimo; Tokai Medical Products, Aichi, Japan) was guided into the right ICA. At first, manual aspiration was performed using the 9-Fr balloon-guiding catheter from the cervical ICA, but only a small amount of thrombus was aspirated, and recanalization was not achieved. Therefore, a 0.027-inch microcatheter (Phenom 27; Medtronic, Minneapolis, MN, USA) was lesion-crossed to the ICA occlusion site over a microguidewire (CHIKAI 14; Asahi Intecc, Aichi, Japan). A stent retriever (Solitaire X 6 × 40 mm; Medtronic, Minneapolis, MN, USA) was fully deployed from M1 to the ICA cavernous portion. After stent retrieval under continuous manual aspiration with the balloon-guiding catheter, we first confirmed ICA recanalization by vertebral angiography using a diagnostic catheter with the balloon inflated (Fig. 2C). Finally, internal carotid angiography revealed complete ICA recanalization (1 pass, TICI 3) and confirmed ophthalmic artery anterograde flow and retinal brush (Fig. 2D). A thrombus was found in the stent and aspiration syringe. The procedure was completed without complications, and the patient noticed an improvement in visual acuity immediately after the procedure. Ophthalmoscopy carried out by an ophthalmologist and fundus photography revealed a cherry-red spot in the right eye, which confirmed CRAO (Fig. 3). MRI on postoperative day 1 demonstrated no new lesions of ischemic stroke, and oral anticoagulation therapy was started to prevent a recurrence. The patient was discharged on postoperative day 8 without neurological deficits, and the visual field impairment gradually improved, leaving only a central scotoma. The Modified Rankin Score at 90 days was 1. This study was approved by the institutional ethical committee (approval number, 4-158; February 28, 2023).

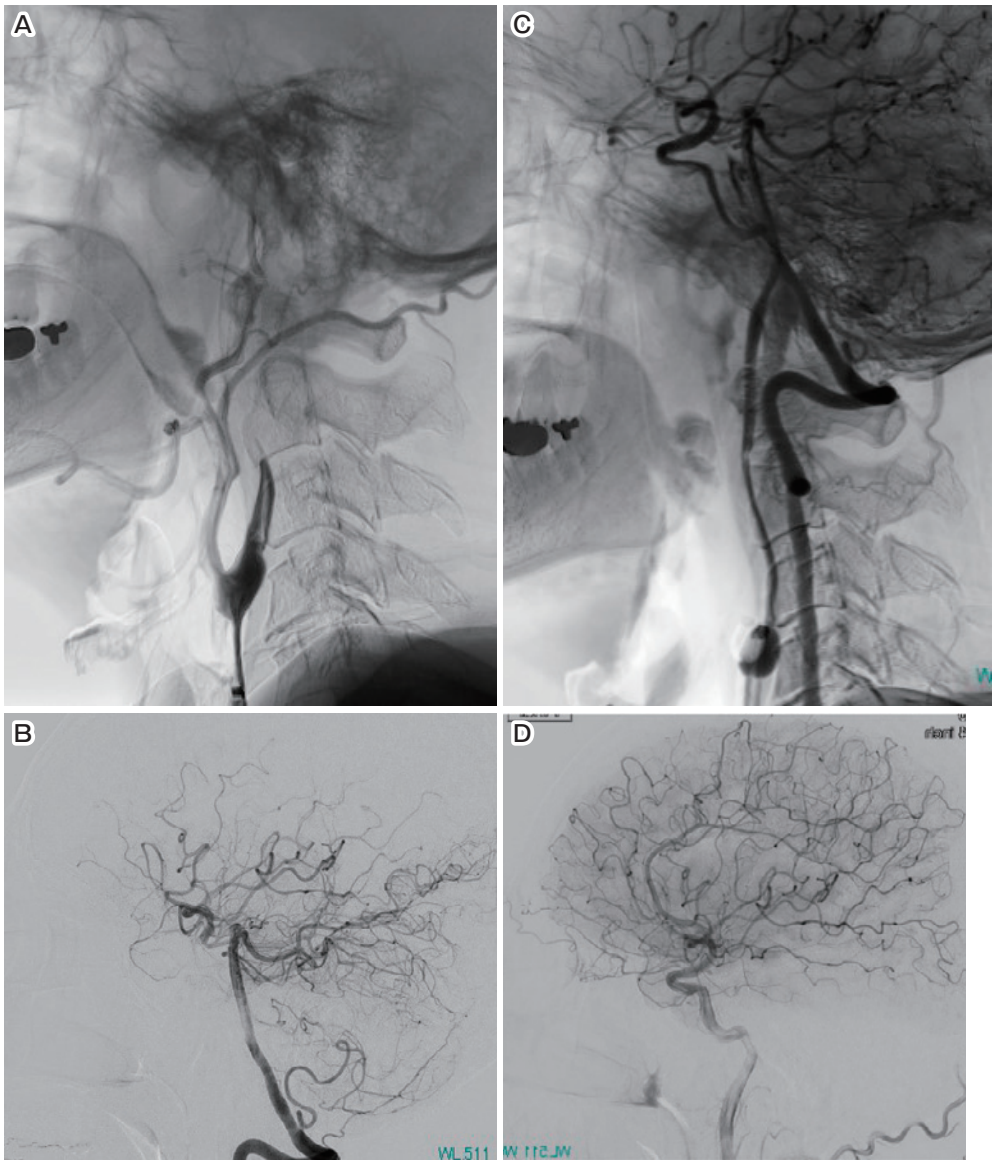

Fig. 2
A. Common carotid angiography (lateral view) reveals a tapered occlusion of the right internal carotid artery (ICA) after the bifurcation.
B. Vertebral angiography (lateral view) demonstrates the patency of the right ICA distal to the posterior communicating artery.
C. Vertebral angiography (lateral view) under continuous manual aspiration with a balloon-guiding catheter shows right ICA recanalization.
D. I nternal carotid angiography (lateral view) reveals complete right ICA recanalization (TICI 3), ophthalmic artery anterograde flow, and retinal brush.
ICA: internal carotid artery

Discussion

In this report, we have described a case of CRAO with isolated ICAO due to AF, in which successful recanalization was achieved by mechanical thrombectomy. Visual impairment following a stroke has been reported to be more common than estimated. A multicenter prospective observation study reported that 49% of stroke patients had visual field impairment.[10] Conversely, it is rare for patients with acute ICAO to present with only monocular blindness without typical symptoms of acute ischemic stroke, such as hemiplegia. This is the first report of endovascular thrombectomy performed for isolated ICAO, which presented as monocular blindness.

CRAO is a disease that causes monocular blindness due to retinal ischemia. However, the treatment of this condi-

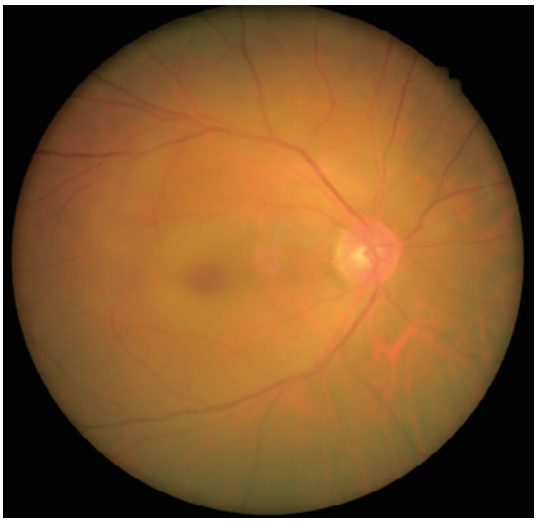

Fig. 3 Fundus photography shows a cherry-red spot in the right eye, which confirmed CRAO.

tion remains controversial.[8] It includes oxygen restoration via retinal arterial vasodilation, embolic dislodgement with ocular massage, and improvement in retinal perfusion pressure via the reduction of the intraocular pressure with acetazolamide or mannitol.[11] Recently, the use of tPA for CRAO has been reported.[12-14] Although the golden time for human retina rescue is not precisely known, animal studies in rhesus monkeys have reported that CRAO lasting approximately 240 min causes massive irreversible retinal damage.[15] In clinical practice, recovery of vision has been reported in eyes treated up to 12 h after blindness.[16] There is collateral circulation from the external carotid artery to the ophthalmic artery in most cases with ICAO, so blindness may improve even if it is acted on after 240 min. CRAO secondary to ICAO is a stroke of the retina, and it is important to consider treatment for ICAO as soon as possible from the onset of CRAO, paying attention to distal embolization.

In addition, AF is becoming better recognized as a contributor to CRAO risk, and it was reported that the cumulative incidence of new AF at 2 years was 49.6% after CRAO.[9] Cardioembolism due to AF is a major cause of stroke, and retinal ischemia can be caused by ophthalmic artery occlusion following ICAO.[11,17] Although there has been a report describing the efficacy of cervical surgical embolectomy for internal and external carotid artery occlusions in a patient with CRAO, endovascular thrombectomy for ICAO in a patient with CRAO has not been reported to date.[18]

The other most well-known cause of monocular blindness is amaurosis fugax, which is characterized by transient symptoms attributed to retinal ischemia.[19] Amaurosis fugax is known to be associated with ipsilateral cervical carotid artery stenosis as a result of atherosclerotic changes, and the 3-year stroke risk was reported to be 10%.[20,21] Antiplatelet therapy is recommended for carotid artery stenosis to prevent the onset of acute ischemic stroke.[22-24] In addition, endarterectomy and carotid artery stenting may be considered in cases with a high degree of stenosis.[25-27] Regarding monocular blindness, cardioembolism has been less frequently reported than amaurosis fugax associated with ipsilateral carotid artery stenosis. In patients with AF complaining of monocular blindness such as the present case, it is essential to consider not only cervical carotid artery stenosis but also ICAO due to cardioembolism. Spontaneous common carotid artery dissection is also included in the differential diagnosis of CRAO.[28] In patients with monocular blindness, it is important to perform a prompt examination such as carotid ultrasonography. In some cases, even digital subtraction angiography may need to be considered.

The benefit of mechanical thrombectomy in patients with stroke presenting with mild deficits (National Institutes of Health Stroke Scale score < 6) due to emergency large-vessel occlusion remains uncertain.[29] The meta-analysis suggested similar outcomes of mechanical thrombectomy and medical treatment in patients with mild stroke with large-vessel occlusion.[29] Conversely, the best treatment for ischemic stroke due to isolated ICAO also remains unclear, although medical treatment alone based on anticoagulant therapy in isolated ICAO patients reportedly caused neurological deterioration in approximately 20% of patients.[30] In addition, endovascular thrombectomy for isolated ICAO has been demonstrated to have a high rate of recanalization.[31] When performing endovascular thrombectomy for isolated ICAO, it is necessary to consider treatment while paying attention to embolization of a new territory. We performed mechanical thrombectomy in combination with contralateral angiography with the balloon inflated to avoid distal dispersal of emboli. Further studies with larger sample sizes are required to evaluate the safety of this treatment.

We reported a rare case of isolated ICAO complicated by CRAO in which mechanical thrombectomy was effective. When a patient with AF presents with monocular blindness, it is important to consider the possibility of ICAO due to cardioembolism, to perform a prompt examination, and to consider early treatment, including mechanical thrombectomy.

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Conflicts of Interest Disclosure

There are no competing interests to declare.

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