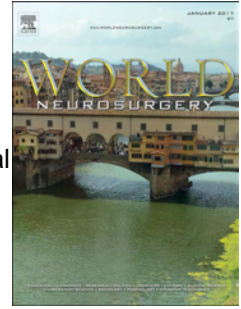


# Journal Pre-proof

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# **Acute Bilateral Internal Carotid Artery Occlusion Presenting With Symmetrical Cortical Infarctions Exhibits Dramatic Improvement After Mechanical Thrombectomy**

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**Key words:** Bilateral internal carotid artery occlusion; Symmetrical cortical infarctions; Mechanical thrombectomy

**Short title:** Bilateral ICA Occlusion with Improvement

## Abstract

**Background:** Acute bilateral internal carotid artery (ICA) occlusion has rarely been reported to exhibit an improvement in prognosis. Herein, we report a case of acute bilateral ICA occlusion presenting with bilateral symmetrical cortical and basal-ganglia infarctions that exhibited dramatic improvement after a mechanical thrombectomy.

**Case description:** The patient was a 72-year-old man with a history of hypertension who presented with a coma and quadriplegia during sleep and experienced moderate vomiting and diarrhea the day before admission to our hospital. Neurological examination revealed that the patient was in a coma (NIHSS 35). A brain computed tomography (CT) scan showed a hypodense lesion in the bilateral frontal cortex. An emergency cerebral angiography demonstrated complete occlusion of the bilateral ICA. Subsequently, a mechanical thrombectomy of the bilateral ICA was successfully performed. At a three-month follow-up, the patient had residual slight aphasia and quadriparesis (NIHSS 16).

**Conclusions:** Bilateral ICA occlusion should be considered if a patient presents with a coma, quadriplegia, and symmetrical cortical infarctions. In such a case, a bilateral mechanical thrombectomy may represent a potential treatment for improving the prognosis of the affected patient.

## Introduction

Acute bilateral internal carotid artery (ICA) occlusion is a rare condition, and it exhibits a dismal prognosis that often leads to coma, decerebrate status, and even death<sup>1</sup>. In this study, we report the case of a patient who developed both coma and quadriplegia during sleep and presented with bilateral symmetrical cortical infarctions on computed tomography (CT) imaging. This patient was diagnosed as having an acute bilateral ICA occlusion and was immediately treated via a mechanical thrombectomy. The individual was discharged with slight aphasia and quadriparesis three months later, suggesting that early identification and timely intravascular

treatment may provide a potential option for a better prognosis of acute bilateral ICA occlusion.

### **Case details**

A 72-year-old man with a history of hypertension presented with both coma and quadriplegia during sleep (last seen well 8 h before) and suffered moderate vomiting and diarrhea the day before being admitted to our hospital. The patient had a history of smoking but no history of toxic exposure, diabetes, coronary heart disease, or other chronic diseases. There was no history of similar disease onset in his family.

Vital signs were all normal, except blood pressure being 174/98 mmHg. Neurological examination revealed both coma and quadriplegia, while bilateral Babinski's signs were absent. His National Institutes of Health Stroke Scale (NIHSS) score was 35/42, and his Glasgow Coma Scale (GCS) score was 6/15 (E2V1M3). The results of his electrocardiographic examination were normal. An emergency head CT scan showed a hypodense lesion in the bilateral frontal cortex (Figure 1A). An acute macrovascular occlusion was considered as a possible diagnosis, but it was not possible to distinguish it from a metabolic or toxic encephalopathy. To confirm the diagnosis, a digital-subtraction angiography (DSA) was performed forty minutes after admission, which demonstrated complete occlusion of the bilateral internal carotid artery (ICA) terminus (Figure 1B, C), with moderate collateral filling via the posterior communicating artery. The patient presented a wake-up stroke secondary to bilateral large vessel occlusions and has an undefined time of onset. Considering that a small bilateral symmetrical anterior-circulation infarction of the patient resulted from bilateral ICA occlusion, mechanical thrombectomy may be the only beneficial choice for the best possible functional outcome. After family members fully understood the risks and signed the consent form, we immediately performed endovascular treatment at 9 h and fifty minutes from the last seen normal time. We placed an 8-French (8F) guide catheter into the beginning of the left ICA. A Navien intermediate catheter was chosen to aspirate clots, but this approach was unsuccessful at the left ICA. Injection

of the left carotid artery demonstrated complete occlusion of the left ICA terminus. We applied a microwire to more easily cross the left ICA lesion, after which a microcatheter first-pass effect was observed. Subsequently, a balloon dilation was performed. The left ICA was completely revascularized (TICI 3) (Figure 1D), as was the right ICA. Direct aspirations were unsuccessful. After the balloon dilation, the remaining stenosis rate of the right ICA terminus was 80%, and the blood flow could not be maintained. A solitaire stent was deployed and restored blood flow. Ultimately, the right ICA was completely revascularized (TICI 3) (Figure 1D). The total duration until complete bilateral revascularization was 180 min.

The patient was transported to the Neuroscience Intensive Care Unit after receiving the mechanical thrombectomy. The follow-up viral, inflammatory, immunological, and oncological examinations were all negative. The patient was conscious and exhibited motor aphasia and quadriplegia (NIHSS 24) at 24 h after the mechanical thrombectomy. The follow-up magnetic resonance imaging (MRI) revealed extensive symmetrical infarctions involving the bilateral insular and frontal cortices, as well as the basal ganglia (Figure 2).

At the three-month follow-up, the patient had residual slight aphasia, pseudobulbar palsy, and quadriparesis (3/5 in limbs muscles). At this time, the patient had an NIHSS score of 16.

## Discussion

The phenomenon of a bilateral ICA occlusion, which was first reviewed and described by Fisher et al.<sup>2</sup>, exhibits various clinical manifestations and recurrent events. The initial clinical patterns—which include senile dementia, syncope, multiple neurological deficits, and even death—depend on the form of vessel occlusion and the affected collateral circulation. In general, an acute spontaneous bilateral ICA occlusion presenting with a symmetrical anterior-circulation infarction is rare; such cases often present with coma, quadriplegia, and decorticate/decerebrate rigidity, the symptoms of which also resemble posterior circulatory artery occlusion, metabolic

encephalopathy, and toxic encephalopathy.

Possible etiologies of bilateral ICA occlusion<sup>2-5</sup> include atherosclerosis, thromboembolism, cardioembolism, hemodynamic complications, radiation, angiitis, hypercoagulation, and injury to cervical arteries following head trauma, among which embolism is the most common cause.

In this case report, the patient presented with a history of hypertension and smoking but not atrial fibrillation, chronic disease, or trauma. Furthermore, the patient was not exposed to radiation or poison. Immunological and metabolic examinations were normal. During the endovascular treatment, we observed a microcatheter first-pass effect of the bilateral carotid artery and residual severe stenosis of right ICA. A previous study reported<sup>6</sup> that a microcatheter first-pass effect was more frequently observed in patients with atherosclerotic stenosis compared to those with embolisms. Although no definitive etiology was identified in our patient, we suggest that atherosclerosis may be a plausible underlying mechanism of his bilateral ICA occlusion.

In addition, a previous study reported<sup>2</sup> that unilateral ICA occlusion existed without any clinical symptoms, subsequently presented bilateral ICA occlusion after which a period of abnormal conditions occur, such as lowering of blood pressure.

Coincidentally, our patient experienced moderate vomiting and diarrhea the day before the onset of his bilateral ICA occlusion. Therefore, we hypothesize that hemodynamic complications may have contributed to the onset of infarction. Consequently, according to previous reports and the history of the patient in our present study, we suspect that our patient had asymptomatic atherosclerotic ICA stenosis or occlusion and that hemodynamic instability was induced by nausea and vomiting, resulting in the occurrence of a bilateral ICA occlusion and symmetrical bilateral anterior-circulation infarctions.

The prognosis of acute bilateral ICA occlusion is often catastrophic. Sum et al.<sup>1</sup> reported six patients with acute bilateral ICA occlusion, all of whom died within three days after the onset of their symptoms. Hence, early diagnosis is crucial for improving prognoses in patients with acute bilateral ICA occlusions. In our present study, the

initial symptoms of the patient included coma without hemiplegia. CT scans showed a hypodense lesion in the bilateral frontal cortex, suggestive of metabolic or toxic encephalopathy. In particular, the follow-up MRI scan revealed extensive bilateral symmetrical hyperintensities involving the insular and frontal cortices as well as the basal ganglia, which are features that are further suggestive of toxic and/or metabolic encephalopathic disorders <sup>7</sup>. Fortunately, considering that the patient had no previous chronic disease or history of poison exposure, we obtained the clinical diagnosis of acute bilateral ICA occlusion within 1 h upon his hospital admission and were able to immediately perform a mechanical thrombectomy to save the patient's life.

The most effective strategy for treating acute bilateral ICA occlusion remains poorly defined. According to a previous study <sup>8</sup>, treatment with intravenous rt-PA within 3 h of the onset of ischemic stroke improved the clinical outcome of the affected patient, but a low recanalization rate was observed for a large vessel occlusion <sup>9</sup>. At present, there has been no successfully reported case of bilateral ICA occlusion being treated via rt-PA alone. In the current study, we employed a mechanical thrombectomy—which has become a crucial treatment for large vessel occlusion <sup>10</sup> in the affected patient, but we did not have strong evidence of acute bilateral ICA occlusion. We used PubMed to review previous case reports that have combined acute bilateral ICA occlusion with mechanical recanalization; only one case met such criteria, and it involved bilateral ICA occlusion but not bilateral middle cerebral artery occlusion. Larrew et al. <sup>11</sup> presented the first case of simultaneous bilateral mechanical thrombectomy with poor collateral circulation, and this case ultimately resulted in death. Recent studies <sup>12-13</sup> suggest that the outcomes of thrombectomies may depend on the time window, clinical status, collateral circulation, and location of vessel occlusion. In our present case report, an atherosclerotic deposit within the carotid artery may represent a possible etiology as it exhibits a better capacity of collateral circulation compared with embolism. Our present study demonstrated that a sequential mechanical thrombectomy of the bilateral ICA was successfully performed in a timely manner and led to a favorable outcome, suggesting that this approach might be an effective choice for treating an acute bilateral ICA occlusion in acute

ischemic stroke.

## **Conclusion**

The present case report is noteworthy in terms of the bilateral presentation of ICA occlusion and the dramatic improvement after bilateral mechanical thrombectomy. Therefore, a bilateral ICA occlusion may be initially identified if a patient presents with coma, quadriplegia, and symmetrical cortical infarctions. In such cases, a mechanical thrombectomy may represent a potential strategy for improving the prognosis in affected patients.

## **CRedit author statement**

**Hailing Liu:** Conceptualization, Methodology, Writing- Original draft preparation.

**Jinbo Huang:** Resources, Data curation, Project administration, Writing- Original draft preparation. **Hai Chen, Li Yuan, Ling Fang, and Zhi Yang:** Writing-

Reviewing and Editing.

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## **Figure legends:**

Figure 1: Brain CT demonstrating a blurry hypodense lesion in the bilateral frontal lobe at the level of the cerebral cortex (A). Angiography of the internal cerebral artery



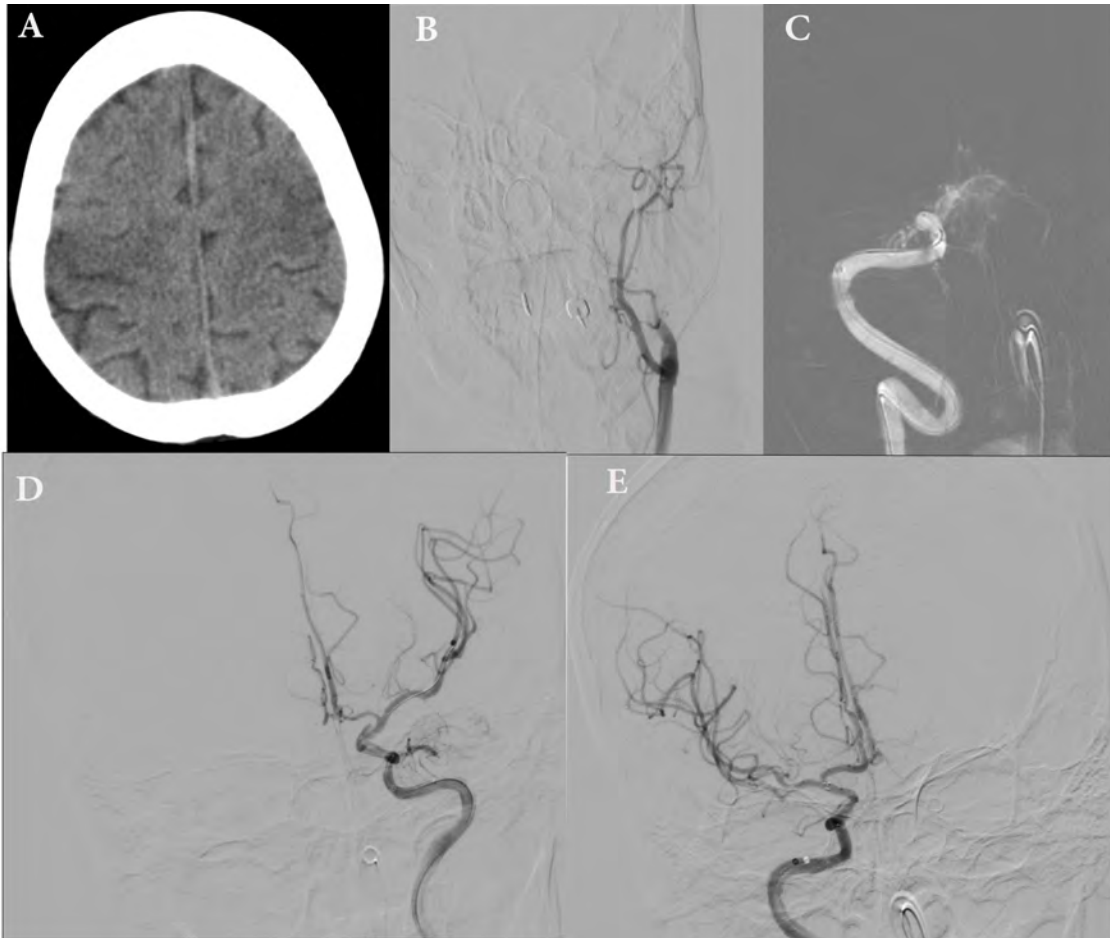
showing a bilateral ICA occlusion (B, C), recanalization after thrombectomy of the left side (D), and recanalization after rescue-stent angioplasty of the right side (E).

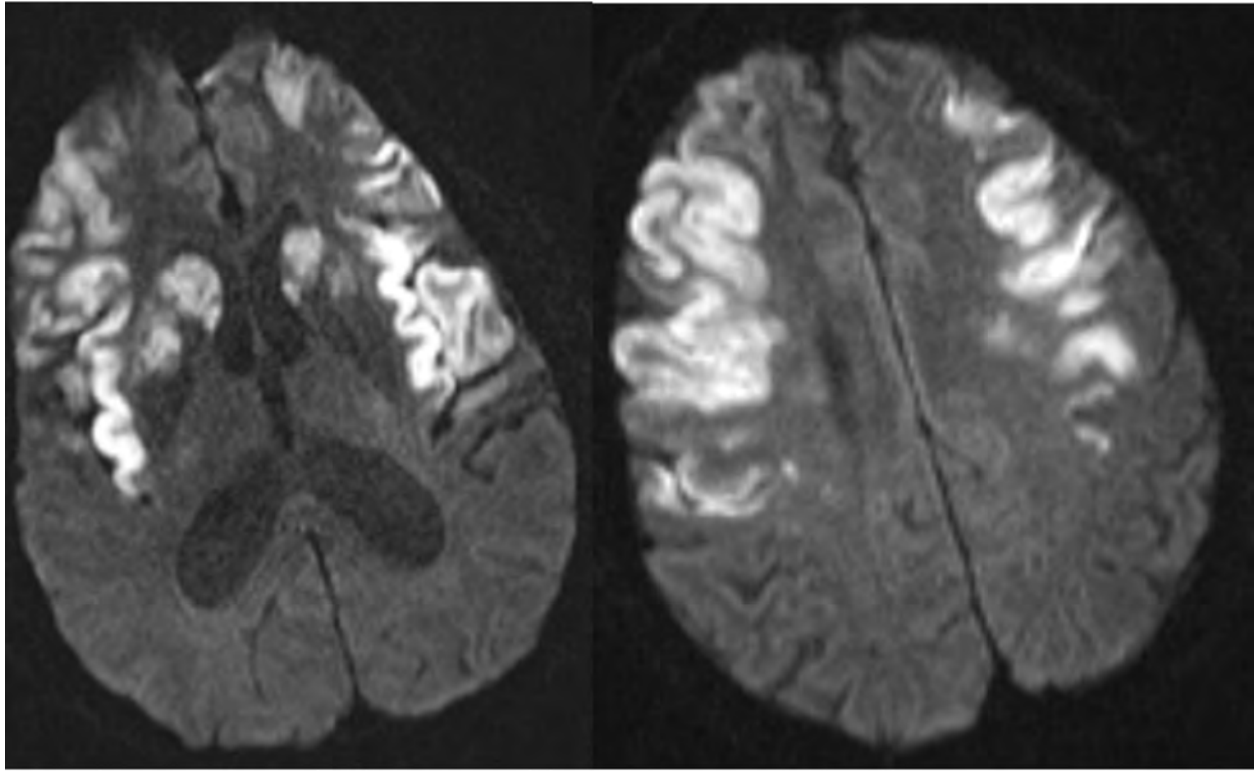
Figure 2: Diffusion-weighted MRI showing a high-signal lesion in the bilateral insular and frontal cerebral cortices, as well as a symmetric lesion in the head of the caudate nucleus and putamen.

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**Abbreviations and Acronyms:** ICA, internal carotid artery; CT, computed tomography; NIHSS, National Institutes of Health Stroke Scale; DSA, digital-subtraction angiography; MRI, magnetic resonance imaging.

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**Disclosure-Conflict of Interest Statement**

The authors declare that they have no competing interests.

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