

Successful Mechanical Thrombectomy for Bilateral Anterior Cerebral Artery Occlusions in a Rare Anatomical Variant: A Case Report

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Background: Acute ischemic stroke (AIS) is usually caused by acute occlusion of the cerebral artery. Bilateral anterior cerebral arteries (ACAs) originating from the anterior communicating branch of the same internal carotid artery are a rare anatomical variation in clinical practice. Mechanical thrombectomy (MT) of simultaneous acute occlusion of the bilateral ACAs with this variation has rarely been reported.

Case Presentation: A 49-year-old man was referred for sudden onset of right-side weakness and aphasia for almost 55 min. AIS was considered after no bleeding was observed on emergency head computed tomography. Digital subtraction angiography was performed, and bilateral ACAs were found to originate from the anterior communicating branch of the left internal carotid artery and were occluded in their A2 segment. After immediate emergency MT with a stent retriever, the symptoms obviously improved.

Conclusion: Simultaneous acute occlusion of the bilateral ACAs originating from the anterior communicating branch of the same internal carotid artery is rare in clinical practice. For such patients, MT with a stent retriever is feasible even if there is a risk of thrombectomy escape, and a stent retriever with aspiration or a direct aspiration technique may be more appropriate.

Keywords: acute ischemic stroke, anterior cerebral artery, mechanical thrombectomy, stent retriever, case report

Background

Vascular recanalization methods, including intravenous thrombolysis and mechanical thrombectomy (MT), are effective measures for the treatment of acute ischemic stroke (AIS).^{1,2} Following six randomized trials,³ MT has become the gold-standard treatment for AIS caused by acute large vessel occlusion in the anterior circulation, such as middle cerebral artery (MCA) M1 segment but not the anterior cerebral artery (ACA) occlusion. Most scholars tend to classify any segment of the ACA as distal arteries during MT.^{4,5} However, in the present guidelines, there is no consensus on whether to perform MT for patients presenting with AIS caused by distal arteries such as ACA(s).^{6,7} Furthermore, different first-line MT techniques remain unclear for ACA occlusion.⁸ We herein present a case of bilateral ACA occlusions with a rare anatomical variant that was successfully reperfused with MT by using a 4×20 stent retriever.

Case Presentation

A 49-year-old male was referred for sudden onset of right-side weakness and aphasia for 55 minutes, with an initial National Institute of Health Stroke Scale (NIHSS) score of 23 [(3 +2+2)+1+0+0+(0+4)+(0+4)+0+2+3+2+0] and a modified Rankin Scale (mRS) score 3. He had a history of rheumatic heart disease with atrial fibrillation and had been on oral warfarin anticoagulant therapy. AIS was considered after no bleeding was observed on emergency head

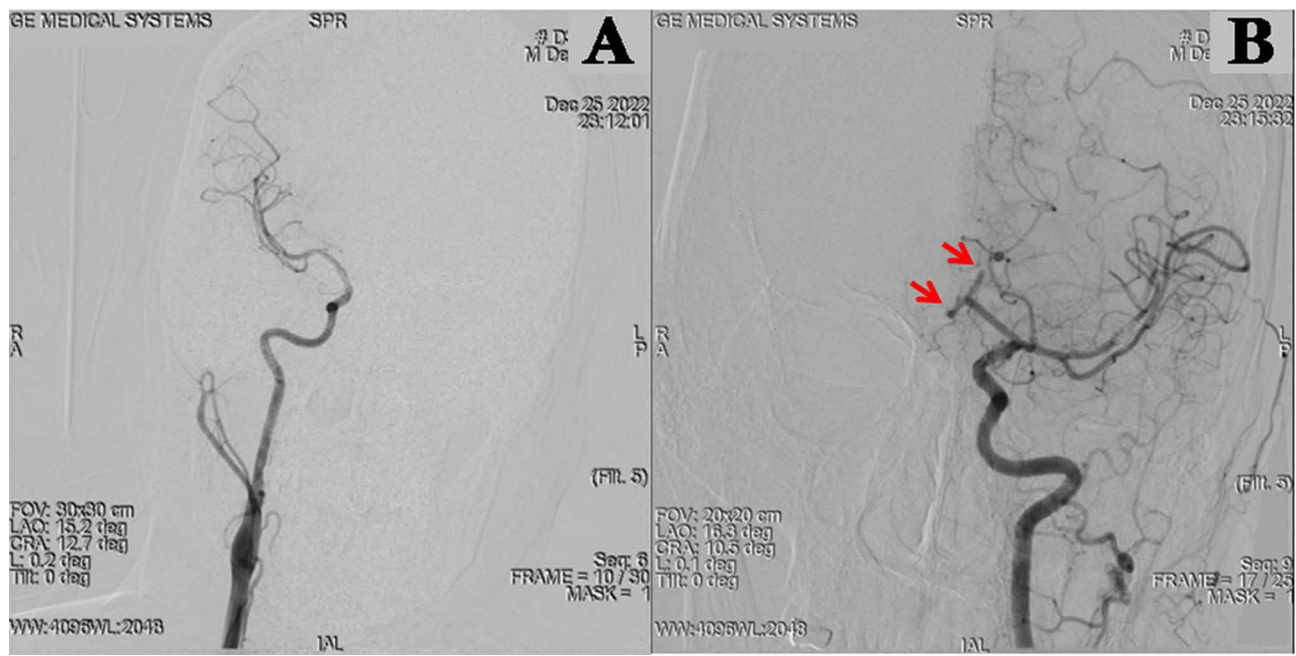


Figure 1 Digital subtraction angiography (DSA) of anterior circulation in posterior–anterior projection. **(A)** DSA in the posterior–anterior projection showed that the right internal carotid artery (ICA) did not send out the anterior cerebral artery (ACA). **(B)** DSA in the posterior–anterior projection showed bilateral ACAs originating from the left ICA, and both ACAs were occluded in their A2 segment (red arrow).

computed tomography. Considering that the specific value of the patient's international normalized ratio was unknown and given the risk of intravenous thrombolytic bleeding, we decided to perform MT directly after obtaining the consent of the patient's family. The patient was then taken to the catheter room and prepared for an endovascular thrombectomy and the door-to-puncture time was 36 minutes. Digital subtraction angiography (DSA) in the posterior–anterior projection showed the bilateral A2 segments ACAs originating from the left A1 segment, and both bilateral A2 segments ACAs were occluded (Figure 1). Consider this rare anatomical variation and the fact that the existing aspiration catheter hardly reaches the occlusive site, MT then was performed by using a 4×20 stent retriever (RECO; Minitech Medical, Wuxi, China) to revascularize the bilateral ACAs (Figure 2). After the respective first thrombectomy trial with the stent retriever, the bilateral ACAs were completely reperfused with modified thrombolysis in cerebral ischemia 3, but secondary thrombi were found in the MCA bifurcation. Most thrombi were removed in the MCA bifurcation after the use of direct aspiration technique. Imaging was performed within the following 24 h using magnetic resonance imaging. A recent infarction in the bilateral ACA territory and part of the left MCA territory was found. The patient achieved an NIHSS of 4 and a mRS of 1 at the 3-month follow-up.

Discussion/Conclusion

Acute occlusion of the ACA is infrequent and often has poor outcomes, with pleomorphic clinical presentations in clinical practice.^{9,10} Concerning the differential lumen diameter and the highly heterogeneous angioarchitecture of the ACA, most scholars tend to classify it as distal arteries during MT.⁴ Therapeutic options for ACA acute occlusion include intravenous thrombolysis or MT.⁸ The MT in patients with acute occlusions of distal ACA branches appeared safe and technically effective, with high recanalization rates in several studies.^{11–13} However, one study suggested that despite the high recanalization rate and low complication rate, the clinical outcome of MT of the ACA was unsatisfactory.¹⁴ Furthermore, the MT of the ACA has not been strongly recommended by the guidelines in China.⁷ Therefore, the MT of ACA is controversial.

Simultaneous occlusion of the variant bilateral ACAs is clinically rare. The DSA of this case showed bilateral ACAs originating from the anterior communicating branch of the left ICA, and both ACAs were occluded in their A2 segment; this is related to the patient's underlying rheumatic mitral stenosis with atrial fibrillation. Leonardo Rangel-Castilla

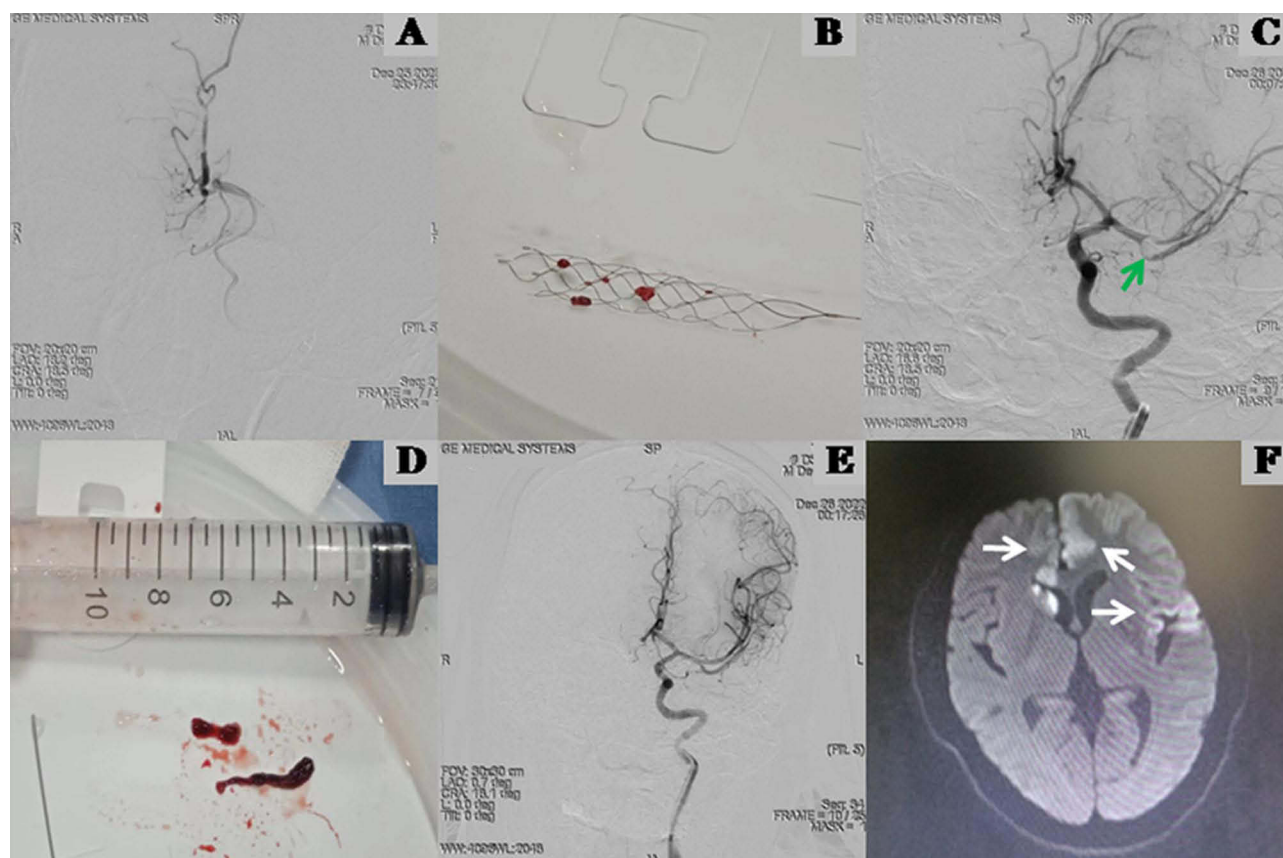


Figure 2 Mechanical thrombectomy of bilateral anterior cerebral arteries (ACAs) and left middle cerebral artery (MCA) and diffusion weighted imaging (DWI) images after thrombectomy. **(A)** A stent retriever (RECO RVV-I-4-20) was employed in the right ACA and good recanalization was achieved in the first pass. **(B)** Some clots were found in the stent retriever after the first thrombectomy trial with the stent retriever. **(C)** Bilateral ACAs were completely reperfused with modified thrombolysis in cerebral ischemia (mTICI) 3 after the respective first thrombectomy trial with the stent retriever, but secondary thrombi were found in the MCA bifurcation (green arrow). **(D)** Most thrombi were removed from the left MCA using a direct aspiration technique. **(E)** Bilateral ACAs and left MCA were completely reperfused with mTICI 3 after the first thrombectomy trial. **(F)** Postprocedural magnetic resonance angiography brain DWI showed a recent infarction in the bilateral ACA and part of the left MCA territory (white arrow).

presented a 2-dimensional operative video of MT of azygous ACA acute occlusion.¹⁵ There is also a study¹⁶ supporting the feasibility of ACA aspiration thrombectomy because it can effectively reduce the chance of fragmented clot escape. Considering the small calibre of the ACA with many acute angles and a tortuous vascular course, the lack of a suitable small-size aspiration catheter in our centre, MT with a stent retriever was adopted in this case. Though both ACAs originated from the same ICA and were occluded at the same time, good results with no complications were achieved in this case.

Successful reperfusion is an independent predictor of a good functional outcome for the MT of the ACA.⁵ However, in the process of anterior circulation intravenous thrombolysis or MT, the most common thrombus escape event is thrombus escape from the MCA to the ACA rather than the ACA to the MCA. Furthermore, thrombus escape is more common in the process of MT with only the stent retriever, but it is not reported in the process of direct aspiration or stent retriever with aspiration.^{11,17} In this case, we found that the thrombus escaped to the MCA during the process of MT with a stent retriever in the ACA. After further direct aspiration, we successfully removed the thrombus that escaped to the MCA. The embolism removed from the ACA can easily escape to the MCA, which is related to the obtuse angle formed by the two, the large diameter of the proximal MCA, and its fast blood flow rate during the process of MT with a stent retriever. Therefore, we recommend a stent retriever with aspiration or a direct aspiration technique using suitable devices for the MT of the ACA to avoid thrombus escape and related complications.^{18,19}

To the best of our knowledge, this is the first reported case of simultaneous occlusion and successful MT with a stent retriever of bilateral ACAs originating in the anterior communicating trunk of the ipsilateral ICA. Although thrombus

escape occurred during MT with a stent retriever, the patient also achieved a good prognosis, with no complications, which also suggests the importance of using a stent retriever with aspiration or a direct aspiration technique in acute occlusions of ACA. While the case demonstrates technical success, its generalizability is limited by the unique anatomy and single-patient nature. Future low-profile stent retrievers and/or smaller microcatheters designed for distal application appear to be beneficial for patients with acute occlusions of ACA, and similar cases also need to be collected and reported in multicenter studies.

Abbreviations

ACA, anterior cerebral artery; AIS, acute ischemic stroke; DSA, digital subtraction angiography; ICA, internal carotid artery; MCA, middle cerebral artery; mRS, modified Rankin Scale; MT, mechanical thrombectomy; NIHSS, initial national institute of health stroke scale.

Ethics Approval and Consent to Participate

Ethical approval is not required for this study in accordance with local or national guidelines. The patient's informed consent was obtained during the assessment visits.

Consent for Publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Author Contributions

All authors made a significant contribution to this report, may that be in the conception, design study, execution, acquisition, analysis or interpretation of data; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors have no conflicts of interest to declare for this work.

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