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Case Report

Mechanical Thrombectomy of Primary Distal Anterior Cerebral Artery Occlusion: A Case Report

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Keywords
Acute ischemic stroke · Anterior cerebral artery occlusion · Mechanical thrombectomy

Abstract
Objective: Primary anterior cerebral artery (ACA) occlusion is a rare condition and sometimes leads to significant neurological deficits. We herein report on the efficacy of mechanical thrombectomy (MT) in treating the distal ACA occlusion in a clinical setting. ***Case Presentation:*** A 76-year-old woman presented with a sudden onset of right hemiparesis. Computed tomographic angiography and perfusion imaging and subsequent analysis with RAPID software revealed acute left ACA occlusion with salvageable penumbra. The patient obtained a score of 11 on the National Institutes of Health Stroke Scale. MT was performed for occlusion of the left ACA (A4), and successful reperfusion (Thrombolysis in Cerebral Infarction score of 3) was achieved on the first attempt using a stent retriever. The patient's recovery progressed well, and she was discharged 13 days after admission with a modified Rankin Scale score of 1. ***Conclusion:*** This case report demonstrates the clinical efficacy, safety, and favorable clinical outcome of treating a primary distal ACA occlusion with MT.

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Introduction

Randomized clinical trials have demonstrated mechanical thrombectomy (MT) to be the gold-standard treatment for large vessel occlusions. These studies included proximal occlusions involving the distal internal carotid artery and proximal middle cerebral artery (MCA). More distal occlusions of arteries may sometimes lead to significant neurological deficits [1–3]. Several case series provide evidence for the efficacy and high reperfusion rates of MT for distal occlusions of vessels [1, 2, 4–7]. However, the literature features a dearth of reports on the use of MT to treat anterior cerebral artery (ACA) occlusions. There is no consensus as to what cases of ACA occlusions should be treated with MT. We herein present a case of distal ACA occlusion that was successfully reperfused with MT by using a stent retriever.

Case Presentation

A 76-year-old female presented with a sudden onset of right hemiparesis and was referred to our hospital 20 min after onset. She had no history of atrial fibrillation. Neurologic examinations performed at admission revealed right hemiparesis, hemisensory disturbance, right facial palsy, and a score of 11 on the National Institutes of Health Stroke Scale (NIHSS). At admission, computed tomographic angiography and perfusion imaging were performed, and subsequent analysis with RAPID software revealed acute left ACA occlusion with salvageable penumbra (Fig. 1).

The patient was treated with intravenous recombinant tissue plasminogen activator according to current guidelines. Subsequent endovascular treatment was indicated, and written informed consent to conduct MT was obtained from the patient's family. The endovascular procedure was performed with a transfemoral approach under conscious sedation. Cerebral angiography revealed occlusion of the left ACA (A4) (Fig. 2a). The location of the occlusion was ascertained following the segmentation of the ACA as described by Fischer [8]. A 9-Fr balloon guiding catheter (Optimo; Tokai Medical Products Inc., Kasugai, Japan) was advanced into the left internal carotid artery. A 2.3-Fr microcatheter was navigated over a microguidewire distal to the occlusion site and successful reperfusion (Thrombolysis in Cerebral Infarction [TICI] grade 3) was achieved on the first attempt using a stent retriever (Trevo 3 × 20 mm; Stryker Neurovascular, Kalamazoo, MI, USA) which was fully deployed and retrieved (Fig. 2b, c); 16 and 221 min elapsed from puncture to reperfusion and from onset to reperfusion (Fig. 2d), respectively. No procedure-related complications occurred. On the day following the procedure, the patient's right hemiparesis receded, and her NIHSS score decreased to 2. Magnetic resonance imaging performed on the day following admission revealed infarcts in the left ACA territory and a small infarct in the left MCA territory (Fig. 3). The patient's recovery progressed well, and she was discharged 13 days after admission with a modified Rankin Scale (mRS) score of 1. Her 90-day mRS score was 0.

Discussion

The natural history of more distal occlusions has more favorable presentations and outcomes compared with large vessel occlusions owing to smaller infarct volumes. ACA occlusions account for 1.1–2.3% of all ischemic strokes [9–12] and tend to have a relatively favorable prognosis [13]. While prior research has demonstrated that distal occlusions of arteries

may lead to significant neurological deficits and have highly pleomorphic clinical presentations [1–3], data on the natural history of the distal artery occlusions and the efficacy in treating the condition with MT are limited. Grossberg et al. [5] reported that ACA occlusions may cause hemiparesis, motor neglect, apraxia, abulia, aphasia, and mutism due to the involvement of the supplementary motor area, corpus callosum, anterior diencephalon, and deep neural structures. As our patient exhibited moderate neurological disability (NIHSS score of 11), we decided to perform MT. The clinical severity of her condition was greater than that typical of distal ACA occlusions. A lack of collateral flow and the simultaneous occlusion of left MCA branches as evinced by the infarct in the left MCA territory revealed by postinterventional magnetic resonance imaging may account for the elevated clinical severity. However, while imaging revealed no occlusion of the left MCA, occluded left MCA branches may have already been reperfused by the time of diagnostic imaging.

Most previous reports have used a stent retriever during MT, particularly in cases of more distal ACA occlusions [1–3, 14]. In treating the occlusion of distal, small-caliber vessels such as the ACA, navigating a microcatheter and deploying/retrieving the stent retriever can be challenging; however, no procedural complications were observed during the clinical course of our case. Pfaff et al. [14] reported one case of dissection (3.3%), while other studies reported no procedural complications including our previous work [1, 3, 7]. With the introduction of a 2.3-Fr microcatheter, the stent was safely navigated in our case. Thus, the risk of procedural complications during the treatment of distal ACA with MT does not seem higher than that during the treatment of MCA with MT [14] because the ACA runs relatively straight. The introduction of a smaller microcatheter is also considered to be one of the factors that allows safe performance of MT for distal vessel occlusions.

Our previous investigation with MT associated occluded ACA with a high recanalization rate and risk of futility [3]. Five patients with primary ACA occlusion had multiple occlusions in contralateral ACA or ipsilateral MCA. There was no case of solitary ACA occlusion. This case report demonstrates that solitary ACA occlusion responds well to MT. However, the treatment of distal artery occlusions with MT requires careful evaluation of the risks and benefits of conducting the procedure.

Conclusion

Primary ACA occlusion is rare and may cause significant neurological deficits. We treated a 76-year-old female who developed left A4 occlusion. She presented with a sudden onset of right hemiparesis. Neurological examination revealed her NIHSS score to be 11. We performed MT to treat the occlusion, which was successfully reperfused (TICI grade 3) 16 min after the puncture. The patient's condition improved, and she was discharged without neurological deficit (mRS score of 1). This report may be used as a reference for the neurointerventional treatment of distal vessel occlusions.

Statement of Ethics

Informed consent was obtained from all individual participants of this study.

Disclosure Statement

None of the authors or co-authors have any conflict of interest to declare.

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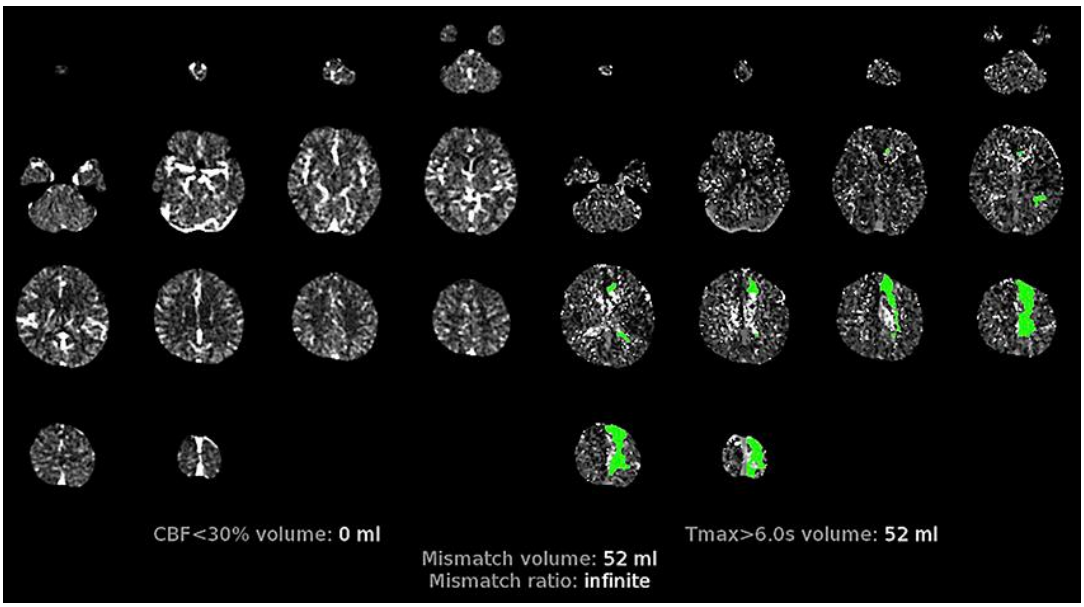

Fig. 1. The computed tomography perfusion mismatch map compares the ischemic core lesion, defined by the reduction of cerebral blood flow to <30% of the corresponding contralateral territory in pink (left), to regions with significant hypoperfusion, defined by a >6-s delay of the maximum of the tissue residue function (T_{max} >6 s) in green (right). The difference and ratio between these volumes (mismatch volume, mismatch ratio, respectively) were automatically calculated. This computed tomography perfusion map demonstrates salvageable penumbra in the left anterior cerebral artery territory and no ischemic core.

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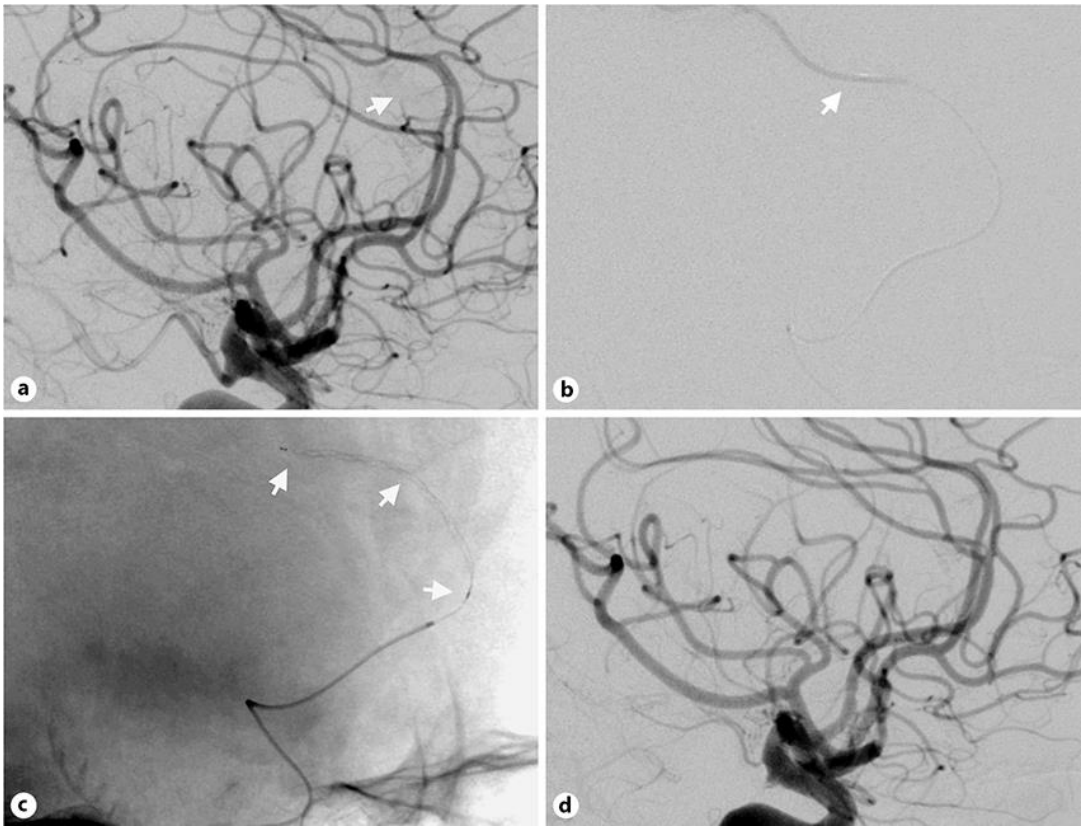

Fig. 2. **a** Cerebral angiogram reveals left anterior cerebral artery occlusion (A4). Arrow indicates occlusion site. **b** After positioning, a microcatheter contrast injection was performed to ensure intravascular positioning distally to the clot. Arrow indicates the tip of a microcatheter. **c** The stent retriever was fully deployed. **d** Immediately after mechanical thrombectomy, the occluded A4 was completely reperfused.

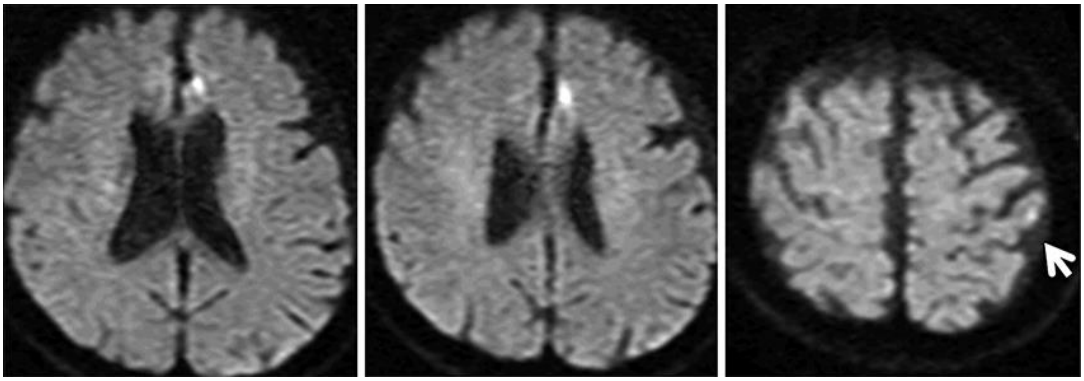

Fig. 3. Postinterventional magnetic resonance imaging shows infarcts in the left anterior cerebral artery territory and a small infarct in the left middle cerebral artery territory (arrow).