

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.elsevier.com/locate/radcr](http://www.elsevier.com/locate/radcr)

## Case report

# Endovascular thrombectomy in the setting of occult cerebral artery aneurysm: Reducing the risk of iatrogenic rupture <sup>☆</sup>

Bryce David Beutler, MD<sup>a,\*</sup>, Karthik Raghuram, MD<sup>b,c,d</sup>, Burton J. Tabaac, MD<sup>e</sup>

<sup>a</sup> University of Southern California, Keck School of Medicine, Department of Radiology, Los Angeles, CA, USA

<sup>b</sup> Reno Radiological Associates, Department of Neuroradiology and Vascular and Interventional Radiology, Reno, NV, USA

<sup>c</sup> Renown Regional Medical Center, Department of Neurointerventional Radiology, Reno, NV, USA

<sup>d</sup> University of Nevada, Reno School of Medicine, Department of Radiology, Reno, NV, USA

<sup>e</sup> University of Nevada, Reno School of Medicine, Department of Neurology, Reno, NV, USA

## ARTICLE INFO

## Article history:

Received 7 August 2021

Accepted 11 August 2021

## ABSTRACT

Cerebral artery aneurysms are present in up to 10% of ischemic stroke patients, often within or adjacent to the occluded vessel. In some cases, the approach to intervention may need to be modified based on the size and location of the aneurysm. We describe a 99-year-old female with a known history of cerebral aneurysm who underwent successfully mechanical thrombectomy of a right middle cerebral artery thrombus; an 8-mm aneurysm involving the right M1 bifurcation was identified only on post-procedural digital subtraction angiography. In addition, we discuss strategies to reduce the risk of iatrogenic aneurysm rupture in the setting of endovascular thrombectomy.

© 2021 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

## Case report

A 99-year-old female with a past medical history of hypertension, osteoporosis, and aortic stenosis as well as a self-reported remote history of cerebral aneurysm presented with left-sided weakness and dysarthria of eight hours duration. Physical examination was significant for fixed right gaze deviation, left facial droop, left hemineglect, and left-sided up-

per and lower extremity hemiparesis. National Institutes of Health Stroke Scale score was 15. Laboratory studies – included complete blood count, complete metabolic panel, and urinalysis – showed mild normocytic anemia, but were otherwise unremarkable. History obtained from the patient and her granddaughter revealed that the patient was functionally independent and performed all of her own instrumental activities of daily living. There was no history of tobacco, drug,

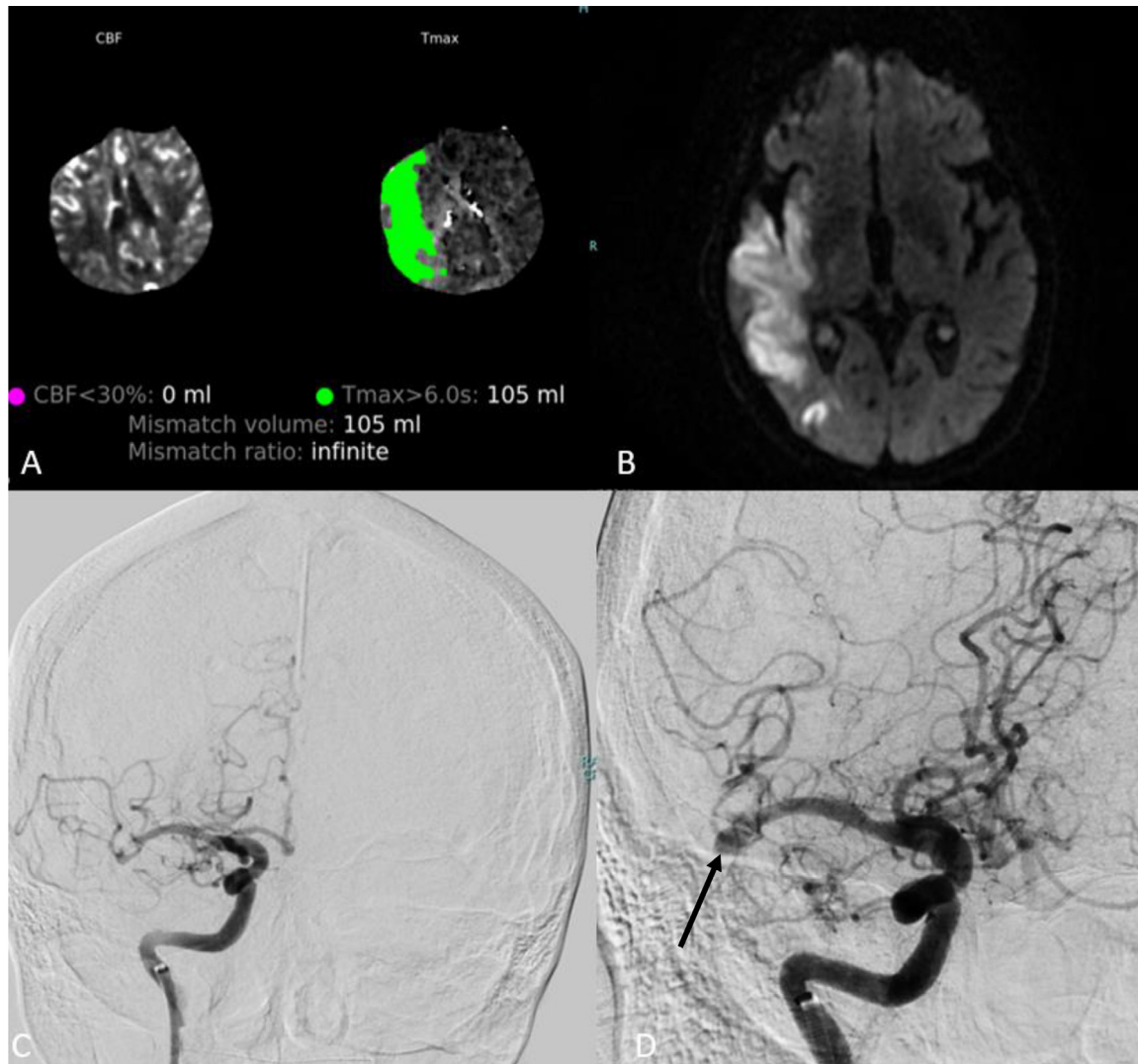
<sup>☆</sup> Competing interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

\* Corresponding author.

E-mail address: [brycebeutler@hotmail.com](mailto:brycebeutler@hotmail.com) (B.D. Beutler).

<https://doi.org/10.1016/j.radcr.2021.08.029>

1930-0433/© 2021 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)



**Fig. 1 – (A–D).** Computed tomography (CT) perfusion study obtained on presentation showed a large ischemic penumbra without evidence of completed infarct (A). Subsequent magnetic resonance imaging (MRI) shows an area of restricted diffusion within the right middle cerebral artery territory (B). Pre-procedural digital subtraction angiography (DSA) shows thrombus within the M1 segment of the right middle cerebral artery (MCA); no cerebral artery aneurysm is demonstrated (C). Post-procedural DSA shows a patent right MCA with an 8-mm aneurysm involving the M1 bifurcation (arrow) (D).

or alcohol use. Home medications included only aspirin 81 mg daily, furosemide 20 mg daily, and alendronate 70 mg weekly.

A non-contrast computed tomography (CT) scan of the head showed hyperattenuation of the right middle cerebral artery (MCA) as well as right temporal and inferior frontoparietal lobe edema with loss of gray-white differentiation. Subsequent CT angiography confirmed occlusion of the M1 segment of the right MCA. CT perfusion analysis demonstrated a large ischemic penumbra in the right MCA territory without evidence of completed infarct (Fig. 1A). Magnetic resonance imaging showed restricted diffusion in the right MCA territory (Fig. 1B). The reported cerebral artery aneurysm was not definitively identified on any of the imaging studies.

A care conference was held with the patient and her granddaughter. Based on the severity of the neurologic deficits, the previous level of functional independence, and

the large ischemic penumbra, the patient was deemed a candidate for endovascular thrombectomy. However, the reported cerebral artery aneurysm represented an important factor in pre-procedural planning, and outside imaging was not available for review. The risk of iatrogenic rupture was discussed at length. The patient elected to proceed with intervention.

The patient was transported to the interventional radiology suite. Right cervical carotid artery angiography demonstrated a patent right internal carotid artery origin without evidence of significant stenosis. A 6-French guiding catheter and microcatheter were advanced into the distal cervical segment, at which time a right cerebral carotid artery angiogram showed a filling defect in the right M1 segment (Fig. 1C). An aspiration catheter was carefully advanced into the M1 segment. Thrombus was successfully engaged and removed. However,

post-aspiration angiography also revealed an 8-mm saccular aneurysm at the genu of the MCA immediately proximal to the site of the extracted thrombus (Fig. 1D). Coiling of the aneurysm was deferred; based on its small size and location, the risk of spontaneous rupture was low. Thrombolysis in cerebral infarction 2B recanalization was achieved without intraprocedural complication.

The patient was monitored in the intensive care unit. CT and MRI obtained at 24 hours showed no evidence of ischemia-reperfusion injury. Physical examination showed marked improvement in neurologic deficits; National Institutes of Health Stroke Scale score was 9 and modified Rankin scale score was 1 point. The patient was started on clopidogrel 75 mg daily for secondary stroke prophylaxis and discharged home in stable condition.

---

## Discussion

Cerebral artery aneurysms are present in up to 10% of stroke patients [1]. In some cases, as suspected in our patient, an aneurysm may serve as the source of thrombus [2]. The presence or absence of aneurysm is of no clinical consequence among patients presenting within the window for intravenous thrombolytics; tissue plasminogen activator can be safely administered to patients with pre-existing cerebral aneurysms [1,3]. However, in patients who are candidates for endovascular thrombectomy, careful evaluation for aneurysm is essential to reduce the risk of iatrogenic rupture and other potentially catastrophic complications.

Our patient presented with a reported history of cerebral artery aneurysm. However, outside imaging was not available for review, and no evidence of aneurysm was identified on CT angiography. Indeed, in some cases, aneurysms are below the spatial resolution of CT angiography and detected only during the course of endovascular intervention [4]. Thrombectomy was therefore approached with extreme caution and careful intraprocedural assessment for abnormal dilatation of both small and large vessels.

We employ several strategies to reduce the risk of iatrogenic aneurysm rupture when performing endovascular thrombectomy in stroke patients. First and foremost, close review of pre-procedural imaging is essential; although many small aneurysms cannot be detected on CT angiography, the area of interest should nevertheless be carefully scrutinized prior to intervention. Second, the guiding catheter is always

advanced cautiously with the J-shaped tip maintained, even if an aneurysm is not suspected. Third, if resistance is encountered, the catheter is gently retracted and the area re-imaged. Lastly, if an aneurysm is identified but does not preclude intervention, aspiration is performed rather than local fibrinolysis in order to reduce shear forces and thus decrease to risk of aneurysm rupture [5]. We believe that these techniques optimize both the safety and efficacy of endovascular intervention for stroke patients with cerebral artery aneurysms.

---

## Author contributions

BDB: Conceptualization; writing – original draft. KR: Investigation; validation; writing – review and editing. BJT: Conceptualization; writing – review and editing; supervision

---

## Patient consent

Written informed consent was obtained from the patient for publication of the case details.

---

## REFERENCES

- [1] Edwards NJ, Kamel H, Josephson SA. The safety of intravenous thrombolysis for ischemic stroke in patients with pre-existing cerebral aneurysms: a case series and review of the literature. *Stroke* 2012;43(2):412–16 PMID: 22156701. doi:10.1161/STROKEAHA.111.634147.
- [2] Fomenko A, Kaufmann AM. Spontaneous thrombosis of an unruptured saccular aneurysm causing MCA infarction. *Can J Neurol Sci* 2016;43(6):856–8 PMID: 27827296. doi:10.1017/cjn.2016.282.
- [3] Goyal N, Tsivgoulis G, Zand R, Sharma VK, Barlinn K, Male S, et al. Systemic thrombolysis in acute ischemic stroke patients with unruptured intracranial aneurysms. *Neurology* 2015;85(17):1452–8. doi:10.1212/WNL.0000000000002068.
- [4] Beutler BD, Rangaswamy R, Tabaac BJ. Endovascular Thrombectomy in the Setting of Angiographically Occult Cerebral Aneurysm: A Case for Caution. *J Vasc Interv Radiol* 2021;32(7):1090–2. doi:10.1016/j.jvir.2021.04.010.
- [5] Singh J, Wolfe SQ. Stent retriever thrombectomy with aneurysm in target vessel: Technical note. *Interv Neuroradiol* 2016;22(5):544–7. doi:10.1177/1591019916653257.