



Blind Date with an Aneurysm: Acute M1 Middle Cerebral Artery Thrombus with Native Computed Tomography Scan Suggesting Aneurysm Rupture

Marvin Darkwah Oppong¹, Ramazan Jabbarli¹, Alexander Radbruch², Ulrich Sure¹, Philipp Dammann¹

Key words

- Intracerebral hemorrhage
- Intracranial aneurysm
- Ischemic stroke
- Subarachnoid hemorrhage

Abbreviations and Acronyms

CT: Computed tomography
ICH: Intracerebral hemorrhage
MCA: Middle cerebral artery

From the ¹Department of Neurosurgery and ²Institute for Diagnostic and Interventional Radiology, University Hospital, University of Duisburg-Essen, Essen, Germany

To whom correspondence should be addressed:

Marvin Darkwah Oppong, M.D.
(E-mail: marvin.darkwahoppong@uk-essen.de)

Citation: World Neurosurg. (2019) 132:103-105.
<https://doi.org/10.1016/j.wneu.2019.08.206>

Journal homepage: www.journals.elsevier.com/world-neurosurgery

Available online: www.sciencedirect.com

1878-8750/\$ - see front matter © 2019 Elsevier Inc. All rights reserved.

INTRODUCTION

Spontaneous intracranial hemorrhages represent a heterogeneous group of diseases caused by, among many other possible factors, hemorrhagic transformation of ischemic stroke¹ or rupture of an intracranial aneurysm, especially one located at the middle cerebral artery (MCA).² Both disorders require a multidisciplinary approach that involves endovascular professionals in most centers, even though the primary treatment strategies differ significantly. It has been reported that thrombosed unruptured aneurysms can lead to occlusion of the aneurysm-bearing vessel, in most cases clinically asymptomatic.^{3,4} Furthermore, delayed occlusion of the affected vessel the event of a dissecting rupture might occur,⁵ along with concurrent rupture of a more distal intracranial aneurysm and thrombosis of a preexisting stenosed internal carotid artery.^{6,7} Concurrent rupture of an intracranial aneurysm and thrombosis of

■ BACKGROUND: We present a case of a concurrent rupture of a middle cerebral artery (MCA) aneurysm and thrombosis of the associated vessel.

■ CASE DESCRIPTION: A male patient presented with acute onset of hemiparesis and nuchal pain. A computed tomography scan revealed a right sided frontotemporal intracerebral hemorrhage and a basal subarachnoid hemorrhage. Owing to obliteration of the M1 segment of the MCA, no aneurysm was visible on digital subtraction angiography. Because of otherwise typical imaging for a subarachnoid hemorrhage, surgical exploration of the MCA was performed. During surgery, a thrombosed MCA bifurcation aneurysm was identified, clipped, and subsequently, endovascular (partly) recanalization of the MCA was performed.

■ CONCLUSIONS: In extremely rare cases of aneurysm rupture and subsequent thrombosis of the associated vessel, a 2-stage approach seems to be feasible. In the present case, initial surgical securing of the aneurysm followed by endovascular recanalization of the occluded vessel provided good results.

the associated vessel with masking of the aneurysm has not yet been reported.

Case Presentation

A 32-year-old man with an uneventful medical history was found unconscious by his coworkers. The responding emergency physician found a sleepy patient who was prompted awake to verbal commands and fully orientated with a Glasgow Coma Scale score of 14. He complained of acute onset of chest pain and mild nuchal pain. After admission to hospital, he developed a left-sided hemiparesis. His consciousness remained unaltered.

Diagnostic Workup

Computed tomography (CT) of the head revealed a right-sided frontotemporal intracerebral hemorrhage (ICH) with a mild mass effect and associated basal subarachnoid hemorrhage suggestive of a ruptured MCA aneurysm (Figure 1A and B). CT angiography showed an MCA occlusion at the distal M1 segment just proximal to the bleeding. The patient was transferred to our facility for further diagnostic workup and therapy. After induction of general anesthesia and

initiation of ventilation, an external ventricular drain was placed. Distal M1 occlusion was confirmed by digital subtraction angiography, which revealed no vessel aberration causative of the ICH and SAH (Figure 1F).

INTERVENTION

The case was discussed by the interdisciplinary neuroradiologic-neurosurgical team. Differential diagnoses mainly included atypical secondary hemorrhagic stroke or intracranial (dissecting) aneurysm rupture with secondary M1 occlusion and "masking" of the aneurysm. Two different treatment strategies were evaluated: primary endovascular recanalization and primary surgical inspection of the MCA distal to the occluded segment to rule out or treat an underlying aneurysm. The latter option was chosen, mainly because a thrombosed aneurysm could not definitely be ruled out with existing imaging and would be likely to rerupture after recanalization.

The MCA and internal carotid artery were inspected in typical fashion with partial evacuation of the hematoma. Inspection revealed a thrombosed saccular

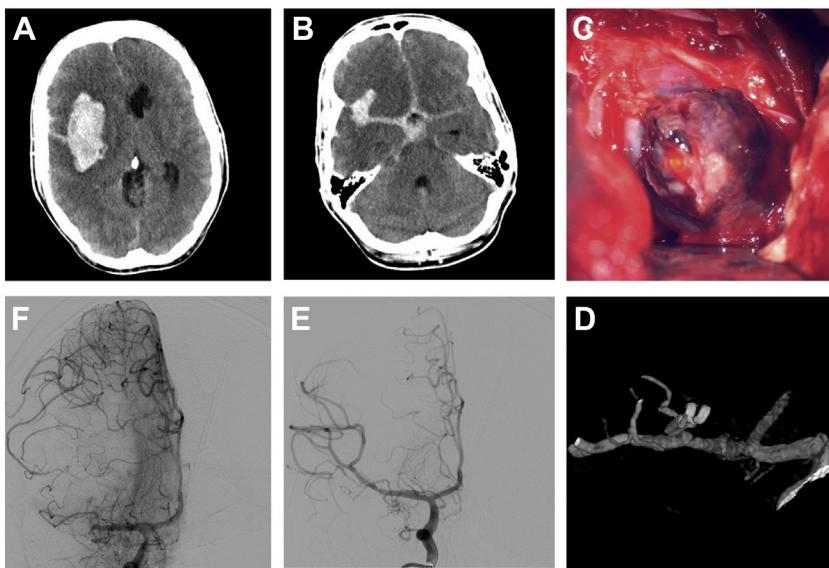


Figure 1. Right-sided intracranial and subarachnoid hemorrhage caused by an middle cerebral artery bifurcation aneurysm with consecutive M1 occlusion. (A and B) Preoperative computed tomography scan with intracerebral hemorrhage (A) and basal subarachnoid hemorrhage (B). (C) Intraoperative microscopic view of the aneurysm dome. (D–F) Preoperative digital subtraction angiography (DSA) showing distal M1 occlusion (F) and DSA after successful recanalization of M1 and one M2 branch (E) and as a 3-dimensional reconstruction with 2 aneurysm clips in place (D).

MCA bifurcation aneurysm with an identifiable rupture point (Figure 1C). The aneurysm was opened, and the thrombus was removed. However, normal M1 circulation was not restored. Further examination (indocyanine green angiography) revealed a remaining thrombus in the M1 segment. An attempt at open recanalization attempt was unsuccessful. Consequently, the aneurysm neck was clipped, and the patient was transferred to the angiography suite, where the M1 segment was successfully recanalized (Figure 1E).

DISCUSSION

This extremely rare case posed a complex treatment dilemma, with complete occlusion of M1 with insufficient collateralization and a lysis window allowing prompt recanalization on the one hand and imaging findings typical of a ruptured aneurysm that was masked by the thrombus on the other hand. Our rationale for surgical treatment was the potentially impossible control of intraprocedural aneurysm rebleeding by the endovascular route, which might have a negative impact on outcome.⁸ Especially in combination with the preexisting

intracranial hematoma, this might also increase intracranial pressure. In such a case, interrupting the endovascular procedure for decompressive craniectomy might have caused further complications and made clipping more challenging.

In contrast, the thrombosed aneurysm offered some advantages for surgical clipping. For example, owing to occlusion of the proximal vessel, proximal control was most likely already achieved at time of dura opening. Aneurysm rupture during further preparation was also unlikely, owing limited or absent inflow to the aneurysm.⁹ In addition, we expected the patient to remain within the thrombectomy window even when undergoing surgery in the meantime.

Successful endovascular recanalization of an M1 thrombus occurring during clipping of a giant MCA aneurysm with consecutive clip reconstruction of the effected vessel segment has been described previously.¹⁰ In contrast, the total occlusion time in our case was significantly longer, because vessel occlusion occurred during rupture instead of during securing of the aneurysm. Nonetheless, we were still able to achieve a comparably good outcome for the patient.

CONCLUSIONS

On the day after treatment, a cranial CT scan revealed an ischemic lesion in the supplied area of an M2 branch that remained occluded. Histopathological workup of the intraoperatively resected aneurysm wall revealed a classic wall alteration for an intracranial aneurysm. The patient was discharged to rehabilitation with a moderate left-sided hemiparesis, with the ability to walk with assistance. At a 3-month follow-up, the paresis of the right leg had completely resolved but mild paresis of the right arm persisted.

In the extremely rare case of aneurysm rupture and subsequent thrombosis of the associated vessel, a 2-stage approach appears to be feasible. Initial surgical securing of the aneurysm followed by endovascular recanalization of the occluded vessel led to good results in our case.

REFERENCES

1. Cordonnier C, Demchuk A, Ziai W, Anderson CS. Intracerebral haemorrhage: current approaches to acute management. *Lancet.* 2018;392:1257-1268.
2. Darkwah Oppong M, Skowronek V, Pierscianek D, et al. Aneurysmal intracerebral hematoma: risk factors and surgical treatment decisions. *Clin Neurol Neurosurg.* 2018;173:1-7.
3. Whittle IR, Williams DB, Halmagyi GM, Besser M. Spontaneous thrombosis of a giant intracranial aneurysm and ipsilateral internal carotid artery. Case report. *J Neurosurg.* 1982;56:287-289.
4. Sato K, Fujiwara S, Yoshimoto T, Onuma T. Two cases of spontaneous internal carotid artery occlusion due to giant intracranial carotid artery aneurysm. *Stroke.* 1990;21:1506-1509.
5. Endo H, Otawara Y, Ogasawara K, Ogawa A, Nakamura S. Ruptured vertebral artery dissecting aneurysm followed by spontaneous acute occlusion and early recanalization: case report. *Neurol Med Chir (Tokyo).* 2005;45:400-403.
6. Bidzinski J, Bonicki W, Kolity GV, Zareba A. Ruptured intracranial aneurysm associated with spontaneous occlusion of internal carotid artery: experience with 5 cases. *Acta Neurochir (Wien).* 1989;100:43-45.
7. Porter RW, Lawton MT, Hamilton MG, Spetzler RF. Concurrent aneurysm rupture and thrombosis of high-grade internal carotid artery stenosis: report of two cases. *Surg Neurol.* 1997;47:532-539 [discussion: 539-540].
8. Zhang Y, Li G, Cai Y, et al. Rupture during the endovascular treatment of intracranial aneurysms: outcomes and technical aspects. *Acta Neurochir (Wien).* 2013;155:569-577.

9. Dhandapani S, Pal SS, Gupta SK, Mohindra S, Chhabra R, Malhotra SK. Does the impact of elective temporary clipping on intraoperative rupture really influence neurological outcome after surgery for ruptured anterior circulation aneurysms? A prospective multivariate study. *Acta Neurochir (Wien)*. 2013;155:237-246.
10. Prickett JT, Klein BJ, Cuoco JA, Patel BM, Fraser JC, Marvin EA. Microsurgical clipping of a giant middle cerebral artery aneurysm with

successful postoperative endovascular mechanical thrombectomy for emergent treatment of large vessel occlusion. *World Neurosurg*. 2018;110: 359-364.

Conflict of interest statement: The authors declare that the article content was composed in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received 18 July 2019; accepted 26 August 2019

Citation: *World Neurosurg*. (2019) 132:103-105.

<https://doi.org/10.1016/j.wneu.2019.08.206>

Journal homepage: www.journals.elsevier.com/world-neurosurgery

Available online: www.sciencedirect.com

1878-8750/\$ - see front matter © 2019 Elsevier Inc. All rights reserved.