

Acute Surgery for Ruptured Dissecting Aneurysm of the M₃ Portion of the Middle Cerebral Artery

—Case Report—

Shigeyuki SAKAMOTO, Fusao IKAWA, Hitoshi KAWAMOTO,
Naohiko OHBAYASHI, and Tetsuji INAGAWA

Department of Neurosurgery, Shimane Prefectural Central Hospital, Izumo, Shimane

Abstract

A 65-year-old woman presented with a ruptured dissecting aneurysm of the M₃ portion of the middle cerebral artery (MCA) manifesting as disturbance of consciousness and motor aphasia. Computed tomography revealed subarachnoid hemorrhage. Emergent angiography demonstrated segmental aneurysmal dilatation of the M₃ portion of the left MCA. Infectious aneurysm was excluded. Surgery was performed to prevent repeated hemorrhage from the aneurysm. The lesion was excised and flow to the distal MCA was preserved with an anastomosis of the superficial temporal artery to the MCA. Histological examination confirmed that the aneurysmal dilatation was due to arterial dissection caused by disruption of the internal elastic lamina. Distal dissecting aneurysm may occur in the absence of infectious disease. Such ruptured distal dissecting aneurysm should preferably be treated surgically in the acute stage, immediately after detection of the aneurysm. The parent artery of the proximal and distal sides of the aneurysm should be trapped because of the probable weakness of the arterial wall, and bypass surgery performed to preserve the distal circulation.

Key words: acute surgery, distal aneurysm, middle cerebral artery, ruptured dissecting aneurysm

Introduction

Distal intracerebral artery aneurysms usually occur as a result of head trauma, vasculitis, atherosclerosis, neoplastic emboli, or bacterial infection associated with endocarditis.^{6,10} Aneurysms unrelated to branching zones have been caused by arterial dissection,^{13,15} but no specific cause could be identified in most cases of intracerebral dissecting aneurysms. Dissecting aneurysms in the middle cerebral artery (MCA) are relatively rare, with 26 reported cases of spontaneous dissecting aneurysms of the MCA,^{1-9,11,14-19} of which only three were located on the M₃ portion.^{6,15,17} We describe a rare case of dissecting aneurysm of the M₃ portion treated through resection and anastomosis of the superficial temporal artery (STA) to the MCA.

Case Report

A 65-year-old non-hypertensive woman with disturbance of consciousness and motor aphasia was admitted to our hospital on July 22, 2000. She did not habitually smoke or drink. On admission, the Glasgow Coma Scale score was 10. Computed tomography on admission revealed subarachnoid hemorrhage and a slight hematoma in the left frontal lobe (Fig. 1). The Hunt and Hess grade was 3. Angiography revealed an aneurysmal dilatation of the M₃ portion unrelated to the branching zones of the left MCA (Fig. 2). The other vessels were normal. The etiology of the left distal MCA aneurysm was uncertain. The patient did not have a clear history of trauma. Hematological and laboratory examinations indicated no abnormalities, and arterial cultures were negative. Electrocardiography and ultrasonic cardiography revealed no abnormalities, including cardiac diseases and bacterial infections associated

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Author's present address: S. Sakamoto, M.D., Department of Neurosurgery, Hiroshima University School of Medicine, Hiroshima, Japan.



Fig. 1 Computed tomography scan on admission showing subarachnoid hemorrhage and high-density lesions in the left frontal lobe.

with endocarditis. The diagnosis was dissecting aneurysm.

The patient was treated surgically to prevent the risk of repeated hemorrhage on the day after admission (day 1). A left frontotemporal craniotomy was performed under mild hypothermia. The distal sylvian fissure was surgically exposed under the operating microscope, and the aneurysm was visualized arising from the M₃. The aneurysm did not have a neck and was probably a pseudoaneurysm. The normal proximal and distal sites of the parent artery of the aneurysm were trapped and the entire aneurysm was excised. The STA was anastomosed end-to-side to the MCA distal to the aneurysm. Histological examination revealed dissection with disruption of the internal elastic lamina (IEL) (Fig. 3). No infection was evident in the aneurysm, and staining for bacteria and fungi was negative.

The patient awoke from surgery without any new



Fig. 3 Photomicrograph demonstrating disruption (arrow) of the internal elastic lamina (double arrow). No infection was evident in the aneurysm, and staining for bacteria and fungi was negative. Elastica van Gieson stain, $\times 40$.

neurological deficit. Postoperative diffusion-weighted magnetic resonance imaging revealed no infarctions. Postoperative angiography on day 7 showed absence of the aneurysm, moderate vasospasm, and the STA-MCA anastomosis with good filling of the MCA distal to the excised aneurysm (Fig. 4). The patient gradually recovered with rehabilitation. The patient was discharged with a good recovery 4 months after admission.

Discussion

Histological studies have indicated that dissecting aneurysms may be produced by penetration of the circulating blood into the vascular wall with subsequent extensions of the effused blood for a varying distance between the layers of the vessel.¹³⁾ Recently, dissection has been classified based on the condition

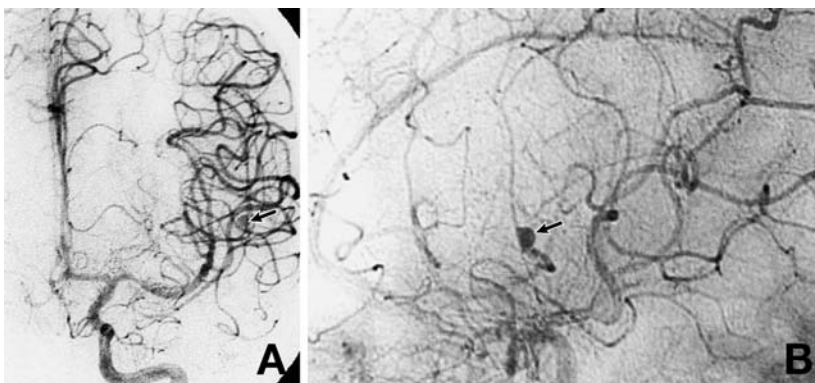
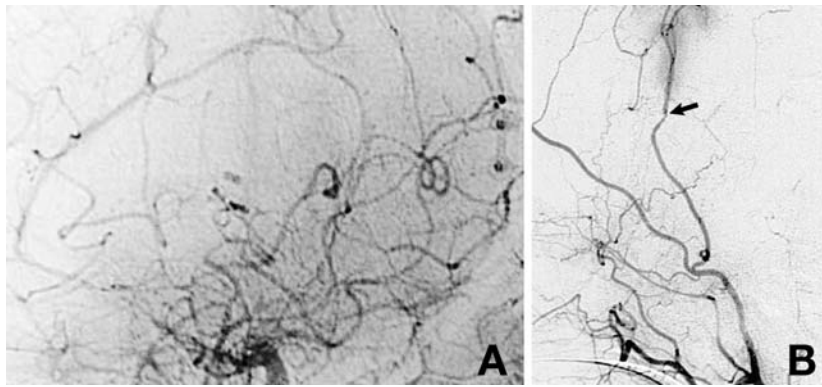


Fig. 2 Arterial phase of the left carotid angiogram, anteroposterior view (A) and left anterior oblique view (B), on admission showing an aneurysmal dilatation of the M₃ portion (arrow).



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Fig. 4 Postoperative left carotid angiograms on day 7 demonstrating absence of the aneurysm (A) and superficial temporal artery-middle cerebral artery (MCA) anastomosis (arrow) with good filling of the MCA distal to the excised aneurysm (B).

Table 1 Dissecting aneurysms of the M₃ portion of the middle cerebral artery

Author (Year)	Age	Sex	Onset	Side	Re-stroke
Sasaki et al. (1991) ¹⁷⁾	41	F	SAH	rt	rupture
Piegras et al. (1994) ¹⁵⁾	56	F	incidental	rt	none
Hashimoto et al. (1995) ⁶⁾	44	M	SAH	rt	none
Present case	65	F	SAH	lt	none

SAH: subarachnoid hemorrhage.

Table 2 Changes in angiographical findings and timing of treatment for dissecting aneurysms of the M₃ portion of the middle cerebral artery (MCA)

Author (Year)	Initial angiographical findings (Timing)	Preoperative angiographical findings (Timing)	Timing of treatment after the onset	Treatment
Sasaki et al. (1991) ¹⁷⁾	stenosis (1 day after onset)	aneurysmal dilatation (50 days after onset)	7 mos	resection with STA-MCA anastomosis
Piegras et al. (1994) ¹⁵⁾	saccular aneurysm (6 mos after onset)	enlarged saccular aneurysm (7 mos after onset)	7 mos	resection with STA-MCA anastomosis
Hashimoto et al. (1995) ⁶⁾	stenosis (1 day after onset)	aneurysmal dilatation (9 mos after onset)	9 mos	resection
Present case	aneurysmal dilatation (1 day after onset)	none	2 days	resection with STA-MCA anastomosis

STA: superficial temporal artery.

of the IEL and the state of the intima as follows: type 1 has acute widespread disruption of the IEL without intimal thickening; type 2 shows extended and/or fragmented IEL with intimal thickening; and type 3 manifests fragmentation of the IEL, multiple dissections of thickened intima, and organized thrombus in the lumen.¹³⁾ In the present case, the diagnosis was dissecting aneurysm because the proximal and distal branches of the aneurysm exhibited normal intraoperative findings, and histological examinations revealed disruption of the IEL without infection.

Dissecting aneurysms tend to occur proximally in the anterior circulation. The arterial pressure is weaker in the distal branches than in the proximal

branches, but dissecting aneurysms may occur in the distal branches. Reported cases of spontaneous dissecting aneurysms of the MCA include 23 cases of dissecting aneurysm of the M₁ and/or M₂ portion,^{1-5,7-9,11,14,16,18,19)} and only three of the M₃ portion^{6,15,17)} (Table 1). The routine surgical treatment for dissecting aneurysms of the M₁ portion is bleb clipping and wrapping because of the presence of a perforating artery, whereas that for aneurysms of the M₂ or M₃ portion is resection or trapping of the dissecting aneurysm, and if possible STA-MCA anastomosis to maintain MCA flow distal to the lesion.

Indications and timing of surgical treatment for ruptured dissecting aneurysms of the MCA have not

been established, because of the perceived ambiguity in the natural history of ruptured dissecting aneurysms of the MCA. Preoperative repeat angiography demonstrated enlargement of the aneurysm in two of the three cases of M₃ dissecting aneurysms, by 2 fold at 6 weeks and 1.5 fold at 7 months after angiographical detection of the aneurysm^{6,15)} (Table 2). Furthermore, rebleeding occurred twice in the acute stage of one case associated with subarachnoid hemorrhage, although angiography revealed the absence of concurrent aneurysms.¹⁷⁾ All three cases were treated by surgery in the chronic stage involving resection of the dissecting aneurysm. However, early surgical obliteration of the parent artery to prevent rebleeding is essential for a dissecting aneurysm with subarachnoid hemorrhage, since rebleeding increases the mortality.^{8,12)}

Acute surgery was performed in our present case of a ruptured dissecting aneurysm of the M₃ portion. Aneurysmal dilatation of the M₃ portion unrelated to any branch with no indications of infectious disease may be a dissecting aneurysm. Such dissecting aneurysm tends to enlarge gradually and/or eventually rupture, as shown by the three previous cases of dissecting aneurysm of the M₃ portion.^{6,15,17)} Surgery should be performed promptly to prevent critical rerupture and subarachnoid hemorrhage. Ideally, the surgical intervention should be done immediately upon detection of the aneurysm. Furthermore, we emphasize that the proximal and distal sites of the aneurysm should not be coated or wrapped but definitively trapped because of the probable weakness of the dissecting wall of the vessel, followed by bypass surgery to preserve the circulation distal to the aneurysm.

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Address reprint requests to: S. Sakamoto, M.D., Department of Neurosurgery, Hiroshima University School of Medicine, 1-2-3 Kasumi, Minami-ku, Hiroshima 734-8551, Japan.
e-mail: sakamoto@hiroshima-u.ac.jp.