

Surgical Treatment of a Lenticulostriate Artery Aneurysm

—Case Report—

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Abstract

A previously healthy 61-year-old man presented with basal ganglia hemorrhage caused by rupture of a small aneurysm arising from the distal lenticulostriate artery associated with moyamoya-like disease and manifesting as left hemiparesis and dysarthria. The patient underwent frontotemporal craniotomy. Neck clipping of the aneurysm was performed through the hematoma cavity. He was transferred for rehabilitation with left hemiparesis. Three-dimensional computed tomography angiography was very useful for preoperative planning and evaluation of the anatomical correlation between the aneurysm and the hemorrhage.

Key words: aneurysm, lenticulostriate artery

Introduction

Basal ganglia hemorrhage is common and most likely originates from a ruptured microaneurysm¹⁾ or arterial dissection of the penetrating arteries.⁸⁾ Cerebral angiography very rarely detects an aneurysm of the distal lenticulostriate artery (LSA). We performed neck clipping of a ruptured LSA aneurysm which had caused intracerebral hemorrhage in the right basal ganglia.

Case Report

A previously healthy non-hypertensive 61-year-old man experienced sudden onset of headache followed by loss of consciousness on April 4, 2003. On admission, he was alert with left hemiparesis (grade IV in the left upper limb and grade II in the left lower limb) and dysarthria. Computed tomography (CT) showed right basal ganglia hemorrhage (Fig. 1). Right carotid angiography and three-dimensional (3D)-CT angiography showed diffuse severe stenosis of the proximal middle cerebral artery (MCA) with moyamoya-like vessels arising from the M₁ segment as well as a small aneurysm arising from the distal portion of the right lateral LSA (Figs. 2 and 3 left). Left carotid and bilateral vertebral angiography detected no abnormality. 3D-CT angiography also



Fig. 1 Axial computed tomography scan on admission showing the right basal ganglia hemorrhage.

indicated the anatomical correlation between the small aneurysm and intracerebral hemorrhage in the right basal ganglia (Fig. 3 right).

The patient underwent right frontotemporal craniotomy on the 2nd day after the ictus to prevent rebleeding. After removal of the hematoma via the transcortical approach, a small saccular aneurysm was identified arising from the distal LSA bifurca-

tion (Fig. 4 left). The aneurysm neck was clipped with a permanent Sugita miniclip. The right sylvian fissure was opened and the stenotic proximal MCA was identified (Fig. 4 right).

Postoperatively, there was no worsening of the patient's neurological status. CT showed nearly complete removal of the intracerebral hematoma without a new appearance of low density area associated with clipping operation. Angiography showed complete obliteration of the aneurysm (Fig. 5). The patient was transferred to a rehabilitation facility at 12 weeks after the ictus, when he showed complete recovery from dysarthria although the left upper limb power was still in grade IV and lower limb power improved only up to grade III.

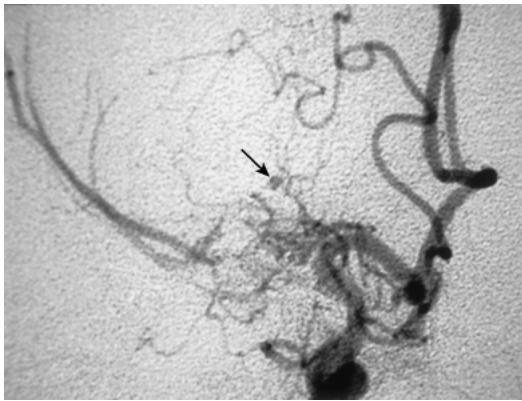


Fig. 2 Right carotid angiogram, anteroposterior view, showing severe stenosis of the proximal middle cerebral artery, moyamoya-like vessels, and a small aneurysm (arrow) arising from the distal lenticulostriate artery.

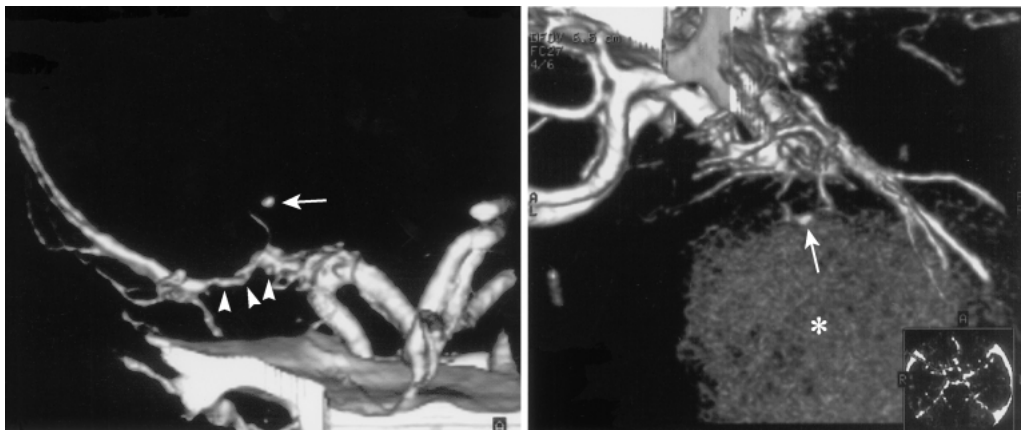


Fig. 3 Three-dimensional computed tomography angiogram showing not only severe stenosis of the proximal middle cerebral artery (arrowheads) and a small aneurysm (arrow) (left, anteroposterior view) but also the correlation between the aneurysm and a ganglia hemorrhage (asterisk) (right, pterional view).

Discussion

Only 13 cases of distal LSA aneurysms including our case have been reported (Table 1).^{2-7,9-14} The six male and seven female patients were aged from 2 months to 69 years (mean 37 years). The aneurysms occurred on the right in five patients and on the left in eight. CT scan was performed in 12 patients, which demonstrated a basal ganglia hemorrhage in 11 cases, an intraventricular hemorrhage in seven, and a subarachnoid hemorrhage in two.

Etiological risk factors related to LSA aneurysm included moyamoya or moyamoya-like disease in five patients, arteriovenous malformation, systemic lupus erythematosus, brain tumor, and hypertension in one patient each. The etiology was unknown in the other four patients. Our patient presented with spontaneous unilateral MCA stenosis associated with development of moyamoya-like ganglionic collateral vessels. Microscopic examination of the aneurysm wall was performed in five cases, all of which revealed a true aneurysm. Most of the peripheral artery aneurysm in the collateral or moyamoya vessels associated with moyamoya disease is thought to be a pseudoaneurysm secondary to rupture of the fragile collateral vessel.^{13,15} The pseudoaneurysm spontaneously regresses on serial angiography. On the histological examination, the wall of pseudoaneurysm is composed of concentric layers of fibrin with red blood cells between them.¹⁵⁾

The most appropriate treatment of LSA aneurysm remains controversial because of the very small number of patients and the uncertainty of the natural history. The conservative treatment and careful

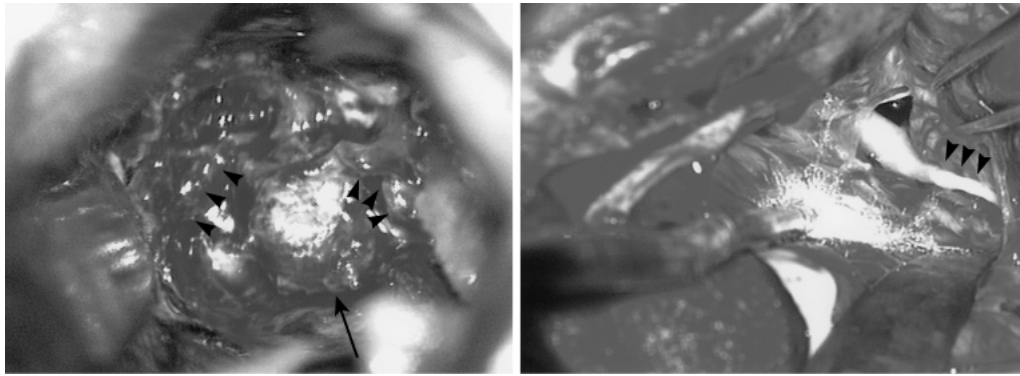


Fig. 4 Intraoperative high-power photograph showing a small saccular aneurysm (arrow) arising from the distal lenticulostriate artery bifurcation (arrowheads) through the hematoma cavity (left), and after opening of the right sylvian fissure, the stenotic proximal middle cerebral artery (arrowheads, right).

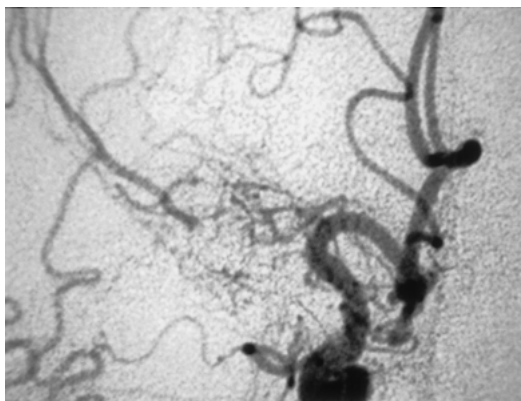


Fig. 5 Postoperative right carotid angiogram, anteroposterior view, showing complete obliteration of the lenticulostriate artery aneurysm.

follow-up angiography seem appropriate for lesions consistence with a pseudoaneurysm, whereas the direct surgery should be considered in the case of a typical saccular aneurysm. Four of the 13 patients were treated conservatively. Three aneurysms disappeared completely on serial angiography, which were presumed to be a pseudoaneurysm. The outcome of these three patients was good recovery. Another patient who was treated conservatively died due to rerupture of the aneurysm. One patient underwent removal of the intracerebral hematoma only but a LSA aneurysm had not rebled for 8 years. Other eight patients were treated surgically to prevent recurrent bleeding. Their clinical outcomes were good or fair in six cases and poor in two cases. Surgical interventions included extirpation of the aneurysm in four cases, proximal clipping in two, and endovascular embolization and neck clipping in

one case each. The parent artery occlusion by proximal clipping or endovascular embolization as well as the extirpation of an aneurysm may induce cerebral infarction of the perforating artery leading to postoperative further clinical deterioration. Our patient underwent a neck clipping of the aneurysm by using Sugita miniclip. We believe that this procedure preserves the blood supply of parent artery. Direct surgery of the LSA aneurysm is usually difficult because the lesion is deeply located in the basal ganglia. 3D rotational angiography is useful for preoperative planning and intraoperative evaluation of the surgical anatomy.¹⁰⁾ In the present case, we used preoperative 3D-CT angiography for guidance, which clearly indicated the anatomical correlation between the small aneurysm and the ganglia hemorrhage.

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Table 1 Summary of reported cases of ruptured lenticulostriate artery aneurysms

Author (Year)	Age (years)/ Sex	CT findings	Other disease	Treatment of aneurysm	Pathology of aneurysm	Outcome
Okuma et al. (1980) ¹³	29/F	not performed	moyamoya	conservative	—	GR
Ohta et al. (1980) ¹¹	26/M	ICH, IVH	AVM	extirpation	true	VS
Murakami et al. (1984) ⁹	33/M	ICH, IVH	moyamoya- like	conservative	true	D
Kidoguchi et al. (1987) ⁶	24/F	SAH, ICH	SLE	extirpation	true	D
Gupta et al. (1989) ⁴	36/F	ICH	—	conservative	—	GR
Grabel et al. (1989) ³	60/M	ICH	moyamoya- like	conservative	—	GR
Oka et al. (1991) ¹²	44/F	SAH, ICH	HT	removal of ICH only	—	GR
Endo et al. (1996) ²	12/F	ICH, IVH	—	proximal clipping	—	GR
Kaptain et al. (2001) ⁵	2 months/M	ICH, IVH	—	extirpation	true	GR
Larrazabal et al. (2001) ⁷	57/F	ICH, IVH	moyamoya- like	endovascular embolization	—	MD
Vates et al. (2001) ¹⁴	35/M	IVH	neurocytoma	extirpation	true	MD
Narayan et al. (2004) ¹⁰	69/F	ICH, IVH	—	proximal clipping	—	GR
Present case	61/M	ICH	moyamoya- like	neck clipping	—	MD

AVM: arteriovenous malformation, D: death, GR: good recovery, HT: hypertension, ICH: intracerebral hemorrhage, IVH: intraventricular hemorrhage, MD: moderate disability, SAH: subarachnoid hemorrhage, SLE: systemic lupus erythematosus, VS: vegetative state.

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