Thrombosed Giant Aneurysm of the Pericallosal Artery With Inconclusive Findings of Multiple Neuroimaging Studies
—Case Report—

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Abstract

A 65-year-old woman presented with a thrombosed giant pericallosal artery aneurysm manifesting as headache and memory loss that developed over a 2-year period. Computed tomography (CT), magnetic resonance (MR) imaging, and conventional and CT angiography could not establish the differential diagnosis. Open craniotomy revealed the mass as thrombosed giant aneurysm from the pericallosal artery. Direct clipping with thrombectomy was performed successfully with an uneventful postoperative course. Thrombosed giant aneurysm of the distal anterior cerebral artery should be considered in the differential diagnosis of an unusual mass in the mid-frontal area, particularly in the presence of inconclusive angiographic and MR imaging findings.

Key words: anterior cerebral artery aneurysm, giant intracranial aneurysm, pericallosal artery, thrombosis

Introduction

Aneurysms of the distal anterior cerebral artery (ACA) are rare with an incidence ranging from approximately 5% to 8.7%. Giant aneurysms with a largest diameter of 25 mm or more comprise 3–13% of all intracranial aneurysms. Giant pericallosal artery aneurysms are rarer, with only 15 cases reported. Giant aneurysms show a high incidence of thrombus formation, which causes difficulties in the differential diagnosis between giant aneurysms and other mass lesions including hematomas associated with vascular malformation and tumors based on cerebral angiography, computed tomography (CT), and magnetic resonance (MR) imaging.

We report a case of almost totally thrombosed giant pericallosal artery aneurysm that appeared to be recurring hematoma originating in a cavernous malformation or an avascular tumor with obliteration of the pericallosal artery on cerebral digital subtraction angiography (DSA), CT angiography, and MR imaging.

Case Report

A 65-year-old woman was admitted to our hospital with headache and memory loss that had developed over a 2-year period. Her memory loss and headache had become aggravated over the previous few weeks. She had no history of trauma or other disease.

Neurological examination revealed drowsy mentality. She had grade 3 and grade 4+ motor weakness in her left upper extremity and other extremities, respectively. Routine laboratory analyses were within the normal limits. CT revealed a well-defined mixed density mass surrounded by severe edema with ring-like enhancement in the right frontal paramedian area (Fig. 1). T1- and T2-weighted MR imaging demonstrated this mass as heterogeneous. The lesion also contained tortuous hyperintense vascular-like portions, which were strongly enhanced after intravenous gadolinium infusion (Fig. 2). Conventional right carotid and CT angiography showed that the A2 portion of the right distal ACA and right callosomarginal artery were displaced anteriorly and superiorly, respectively. The pericallosal artery showed contrast stagnation proximal to the mass.
Fig. 1 Computed tomography scan revealing a large and mixed density mass with focal peripheral calcification and slight ring-like enhanced rim, surrounded by severe edema in the right frontal paramedian area.

Fig. 2 Axial T₂-weighted (A) and T₁-weighted (B) magnetic resonance images demonstrating the mass as generally heterogeneous intensity, with highly enhanced vascular-like portions and well enhanced thin wall after intravenous gadolinium infusion (C, D).

Fig. 3 A: Lateral carotid angiogram showing the right callosomarginal artery is shifted anteriorly, with faint leakage of contrast medium from the pericallosal artery proximal to the mass with no contrast filling in the distal area (arrows). The vessel-like tortuous portion, which was strongly enhanced on the magnetic resonance images, was not demonstrated in the cerebral angiograms. B, C: Computed tomography angiograms showing no other abnormal findings (arrows).

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Discussion

Pericallosal aneurysms can bleed irrespective of size, which may be the reason for the rarity of giant
pericallosal aneurysms.\textsuperscript{11,16} Although patients with giant intracranial aneurysms may become symptomatic after subarachnoid hemorrhage, most develop signs and symptoms associated with the aneurysmal mass effect.\textsuperscript{4,13} The mass effect in the anterior circulation can manifest as headache, visual field and acuity defects, as well as extracocular dysfunction. Dementia and mental disturbances, as well as hemiparesis and epilepsy, may also occur.\textsuperscript{13} Our patient presented with headache, memory disturbances, urinary incontinence, and bizarre behavior.

CT and MR imaging might be helpful for making the differential diagnosis if angiography is inconclusive. CT images may show "ring enhancement" in the wall of the aneurysm with rim calcification, non-enhanced mural thrombus (so-called "target sign"), and central enhancement secondary to the residual blood flow.\textsuperscript{2,4,6,10,12,14,16} There may be no midline shift and surrounding cerebral edema despite the large size of the mass. MR imaging is more helpful and important for differentiating aneurysms from tumoral lesions.\textsuperscript{9,19} MR imaging demonstrates the blood flow inside the aneurysm as well as the age of the blood elements, and can also be helpful in demonstrating the relationship between the aneurysm and the vessels and brain parenchyma.\textsuperscript{10} However, the diagnosis may be difficult in the presence of hemorrhage from a completely thrombosed giant aneurysm and absence of patent lumen with noncontributory angiographic findings. Moreover, thrombosed giant aneurysms can be difficult to differentiate from some tumorous conditions, especially gliomas including oligodendroglioma and non-enhanced meningiomas.

A case of a giant P\textsubscript{2} aneurysm with a dural tail on MR imaging was initially diagnosed as a meningioma.\textsuperscript{2} Another giant P\textsubscript{2} aneurysm was totally thrombosed, but the differential diagnosis included torcular meningioma despite the use of MR imaging, with the definite diagnosis established by surgery.\textsuperscript{10} Only four of the 15 reported cases of giant pericallosal artery aneurysms were completely thrombosed.\textsuperscript{2,10,12,14} Three cases of totally thrombosed pericallosal aneurysms were examined by conventional angiography and CT.\textsuperscript{10,12,14} Totally thrombosed giant pericallosal artery aneurysm was initially identified as callosal hematoma secondary to cavernous malformation or glioma even though angiography and MR imaging had been performed.\textsuperscript{2} In all four cases, surgical exploration was the only way to make the diagnosis.

In our case, the diagnosis of thrombosed giant aneurysm could be established based on the low flow vascular lesion seen on DSA and MR imaging, and thin ring enhancement suggesting a vascular wall on CT and MR imaging. However, although the neuroimaging findings supported the diagnosis of thrombosed aneurysm, we could not differentiate thrombosed giant aneurysm from falx meningioma or repeated hematoma originating from vascular malformation. CT and MR imaging showed midline shift with cerebral edema, and the aneurysm sac was not clear by DSA and CT angiography, although faint leakage of contrast medium from the A\textsubscript{2} segment was observed by DSA.

Giant aneurysm can be trapped and excised if there is adequate retrograde flow.\textsuperscript{4} Proximal ligation of the parent artery reduces the probability of rupture by decreasing the pressure of the blood reaching the aneurysm, but can cause ischemic complications. Extracranial-intracranial anastomosis surgery can be performed to prevent the ischemic complications that can be caused by a proximal occlusion.\textsuperscript{10} Giant aneurysm often has a broad base but direct clipping with excision of the thrombus and aneurysm sac is generally recommended to eliminate the mass effect, preserve the patency of the parent artery, reduce the surgery time for the preparation of the anastomosis, and prevent rupture or recurrence. Another treatment option is endovascular coiling. However, endovascular treatment may be inadequate in cases such as ours if the preoperative evaluation is inconclusive, the parent artery is obstructed or too narrow, and there is severe mass effect. In our case, direct clipping of the aneurysm with thrombectomy was possible because the aneurysm neck was sufficiently narrow. During this procedure, no thrombus entered the systemic circulation, and the postoperative course was uneventful.

Thrombosed giant aneurysm of the pericallosal artery is quite rare and difficult to identify even with multiple neuroimaging methods. Therefore, thrombosed giant aneurysm of the distal ACA should be considered in the differential diagnosis of an unusual mass in the mid-frontal area, particularly if the angiography and MR imaging findings are inconclusive. However, the most suitable treatment can be selected by carefully examining all CT, MR imaging, and conventional and CT angiography data.

References

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