Giant Aneurysm at the Junction of the Left Internal Carotid and Persistent Primitive Trigeminal Arteries

—Case Report—

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Abstract

A 67-year-old female presented with an unruptured giant aneurysm at the junction of the left internal carotid artery (ICA) and the persistent primitive trigeminal artery (PTA), manifesting as progressive left abducens nerve paresis. The PTA was clipped by the left suboccipital approach. The aneurysm was then successfully thrombosed by ligation of the left ICA at the cervical portion following left superficial temporal artery-middle cerebral artery anastomosis. The left abducens nerve paresis improved postoperatively. Magnetic resonance imaging was of considerable value in the pre- and postoperative evaluation of the giant aneurysm.

Key words: giant aneurysm, primitive trigeminal artery, magnetic resonance imaging

Introduction

Most carotid-basilar anastomoses are coincidental findings in angiographic examinations. The primitive trigeminal artery (PTA) occurs most frequently with an incidence of 0.1–0.3%.⁷⁾ Aneurysms are highly associated with this vascular anomaly, but aneurysms of the PTA or at the junction of the PTA and internal carotid artery (ICA) are extremely rare. We report a case of unruptured giant aneurysm at the junction of the left PTA and ICA, and discuss the treatment of this condition.

Case Report

A 67-year-old female presented with progressive left abducens nerve paresis. She had suffered from progressive right visual disturbance due to miotic retinopathy since age 18 years. One month before admission, her family noticed inadequate abduction of the left eye. She consulted an ophthalmologist and was transferred to our department. Past and family histories were not contributory.

Physical examination showed that she was general-

ly healthy. Her blood pressure was medically well controlled. Neurological examination disclosed no abnormality except for disturbances of right visual acuity and incomplete left abducens nerve paresis. No signs involving other cranial nerves were observed.

Computed tomographic (CT) scans revealed a clearly enhanced round mass at the left cavernous sinus (Fig. 1). Magnetic resonance (MR) images also

Fig. 1 Pre- (left) and postcontrast (right) CT scans on admission, showing a well-demarcated, enhanced round mass at the left cavernous sinus.

Fig. 2 Axial (*left*) and coronal (*right*) SE MR images on admission, demonstrating the mass as a signal void.

Fig. 3 *left*: Left carotid DSA, visualizing a giant aneurysm at the cavernous portion of the left ICA. A PTA branches from the aneurysm (*arrow*). *right*: Left vertebral DSA, showing the aneurysm from the PTA (*arrow*).

clearly visualized this lesion as a signal void (Fig. 2). Digital subtraction angiograms (DSAs) of the left ICA showed a giant aneurysm, $28 \times 26 \times 26$ mm, at the cavernous portion (Fig. 3 *left*). The PTA and the upper portion of the basilar artery were visualized *via* the aneurysm. Vertebral DSAs also visualized the aneurysm *via* the PTA (Fig. 3 *right*).

Proximal ligation of the ICA following extra-cranial-intracranial (EC-IC) bypass usually adopted to treat giant aneurysms at this site^{2,13)} was not considered appropriate because of the blood flow *via* the PTA to the aneurysm. Since the normal posterior circulation was maintained by the vertebral arteries in this case, the PTA anastomosing the aneurysm and the basilar artery could be occluded by clipping *via* the suboccipital approach. A distal portion of the artery close to Meckel's cave was located laterally to the trigeminal nerve and the PTA

Fig. 4 IR (*left*) and SE (*right*) MR images on the 7th postoperative day, demonstrating a thrombus in the aneurysm as a high-intensity area.

Fig. 5 IR (*left*) and SE (*right*) MR images on the 90th postoperative day. The aneurysm has shrunk markedly (*arrow*).

easily identified and clipped. Ten days later, the left ICA was completely occluded with an intravascular balloon catheter for 20 minutes and electroencephalograms and neurological signs monitored. This Matas test detected no abnormality. Therefore, the left ICA was ligated at the cervical portion after left superficial temporal artery-middle cerebral artery anastomosis, causing no neurological complications.

The postoperative course was uneventful. CT scans on the 7th postoperative day showed no enhancement due to the aneurysm. MR images demonstrated a well-demarcated, high-intensity round mass (Fig. 4). Left common carotid angiograms visualized the middle cerebral arteries through the anastomosed superficial temporal artery. She was discharged on the 10th postoperative day with mildly improved left abducens nerve paresis. Follow-up MR images on the 90th postoperative day showed marked shrinkage of the aneurysm (Fig. 5).

Discussion

At least 50 cases of PTA associated with an aneurysm located on the circle of Willis have been reported.^{7,14} George *et al.*³ found that 14% of 233 cases with this anomalous artery had associated aneurysms. 13% of these aneurysms were on the PTA. However, giant aneurysms at the junction of the PTA and ICA are extremely rare, with only five reported cases (Table 1).^{1,5,9,11} Four of these five cases were treated with an excellent outcome in the three most recent. Higashida *et al.*⁵ successfully thrombosed an aneurysm with a detachable balloon catheter. Miyatake *et al.*⁹ combined intravascular balloon obliteration and ICA ligation with an EC-IC bypass to thrombose the aneurysm. Our first operation was intended to occlude the PTA by direct clipping, so the suboccipital approach was selected. Other examples of direct surgical approaches to the PTA include a combined middle cranial fossa and suboccipital approach,⁸ and a suboccipital approach to Meckel's cave.⁹

The most effective treatment of giant ICA aneurysm is occlusion of the aneurysmal neck, but this is prevented in many cases including ours by the bulbous neck of the giant aneurysm.⁶ An alternative is aneurysm trapping with an EC-IC bypass.^{2,6,13} In our case, the intracranial portion of the left ICA distal to the aneurysm was not occluded because of difficulty in preserving the patency of the left ophthalmic artery, especially important to this patient with right visual disturbance. Eguchi *et al.*² considered trapping unnecessary to thrombose the aneurysm based on their analysis of 11 cases of giant intracavernous aneurysms of the ICA, because the immediate risk of trapping may be greater than the long-term cumulative risk of an untreated ruptured aneurysm.

MR imaging was very valuable in both pre- and

postoperative evaluation of the giant aneurysm. Preoperatively, the appearance was a signal void. Seven days after ICA ligation, the intra-aneurysmal clot appeared as a well-demarcated, high-intensity round mass on both SE and IR images, consistent with the appearance of intraparenchymal hematoma.^{4,12} MR imaging showed the same on the 21st postoperative day (data not shown). As organization of the intra-aneurysmal clot progressed, the MR intensity reduced reflecting the shrinkage of the aneurysm on the 90th postoperative day.

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Table 1 Reported cases of giant ICA aneurysms associated with PTA

Author (Year)	Age/ Sex	Treatment	Outcome
Bull (1969) ¹⁾	43/F	ICA ligation	died
Naruse and Odake (1979) ¹¹⁾	73/F	none	—
Higashida <i>et al.</i> (1987) ⁵⁾	69/F	detachable balloon	excellent
Miyatake <i>et al.</i> (1990) ⁹⁾	52/F	intravascular balloon, EC-IC bypass, ICA ligation	excellent
Present case	67/F	PTA clipping, EC-IC bypass, ICA ligation	excellent

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