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Endovascular Coil Embolization for Ruptured Aneurysm Associated With Persistent Primitive Anterior Choroidal Artery

—Case Report—

Takahito OKAZAKI,¹ Masaaki SHIBUKAWA,¹ Yoshihiro KIURA,¹ Shigeyuki SAKAMOTO,¹ Nobuhiko ICHINOSE,¹ Kuniki EGUCHI,¹ Kazuhiko SUGIYAMA,¹ and Kaoru KURISU¹

¹Department of Neurosurgery, Graduate School of Biomedical Sciences, Hiroshima University, Hiroshima

Abstract

An 18-year-old man presented with a rare case of a ruptured internal carotid artery (ICA)-persistent primitive anterior choroidal artery (PPAChA) manifesting as sudden onset of headache. Computed tomography (CT) showed subarachnoid hemorrhage. Three-dimensional CT angiography showed a saccular aneurysm at the right ICA-AchA region. Right internal carotid angiography showed a PPAChA and saccular aneurysm. Endovascular treatment of the aneurysm achieved complete aneurysm occlusion.

Key words: coil embolization, aneurysm, anterior choroidal artery, subarachnoid hemorrhage, anomaly

Introduction

Persistent primitive anterior choroidal artery (PPAChA) is a rare congenital vascular anomaly first described in 1984 as a second posterior cerebral artery (PCA),^{1,2)} and reported as an anomaly of the AchA in 1999.¹⁾ Five cases of PPAChA aneurysms have been described, with 3 cases (including the present case) involving a ruptured aneurysm^{1,9)} and 2 cases of unruptured internal carotid artery (ICA)-PPAChA aneurysm.^{5,8)} We report a case of ruptured aneurysm associated with ICA-PPAChA.

Case Report

An 18-year-old man was hospitalized with sudden onset of headache and vomiting without neurological deficit. He had no previous or familial history of note. Computed tomography (CT) showed subarachnoid hemorrhage classified as group 3 on the Fisher scale (Fig. 1A). Three-dimensional CT angiography revealed a saccular aneurysm at the C₁ portion of the ICA and a slightly thick AchA at the aneurysm neck distal to the posterior communicating artery (PcomA) (Fig. 1B). Right ICA-AchA aneurysm was diagnosed (Fig. 2C). Preoperative angiography found an anomaly of the AchA that supplied the occipito-parietal area (Fig. 2A, B). Emergency endovascular treatment of the aneurysm was performed. Angiography revealed complete occlusion of the aneurysm

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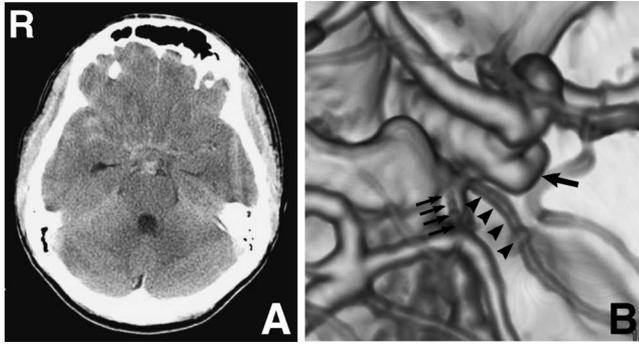


Fig. 1 A: Computed tomography (CT) scan on admission revealing subarachnoid hemorrhage in the basal cisterns and bilateral sylvian fissures. Subarachnoid hemorrhage is clearly apparent on the right side. B: Three-dimensional CT angiogram showing an extrorse saccular aneurysm (thick arrow) of the right internal carotid artery. Changes in threshold level allow identification of the posterior communicating artery (arrows) and anterior choroidal artery (arrowheads).

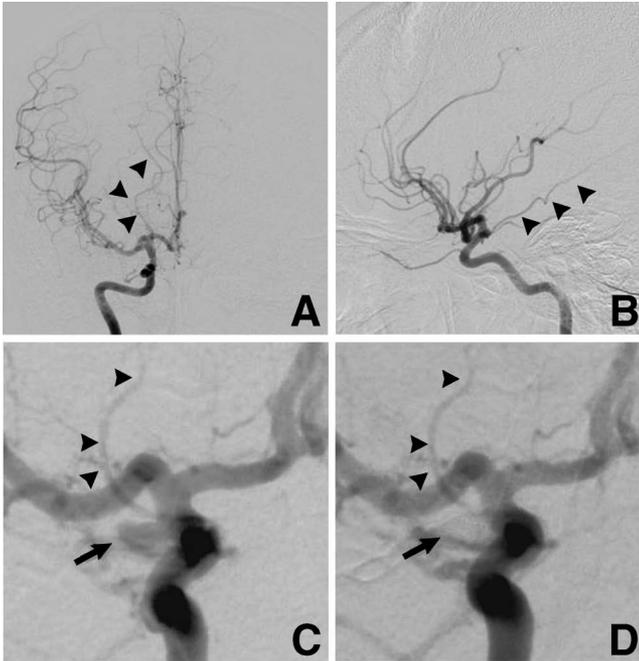


Fig. 2 A–C: Preoperative right internal carotid angiograms, anteroposterior view (A), lateral view (B), and right anterior oblique 10° caudal 10° view (C), showing a saccular aneurysm (arrow) of the right internal carotid artery and a persistent primitive anterior choroidal artery (arrowheads) originating from the internal carotid artery. D: Right internal carotid angiogram after endovascular treatment, right anterior oblique 10° caudal 10° view, showing complete occlusion of the aneurysm (arrow) and patency of the persistent primitive anterior choroidal artery (arrowheads).

(Fig. 2D). After coil embolization, left vertebral angiography with carotid artery compression (Allcock test) confirmed the ICA and a PPachA via the PcomA (Fig. 3).

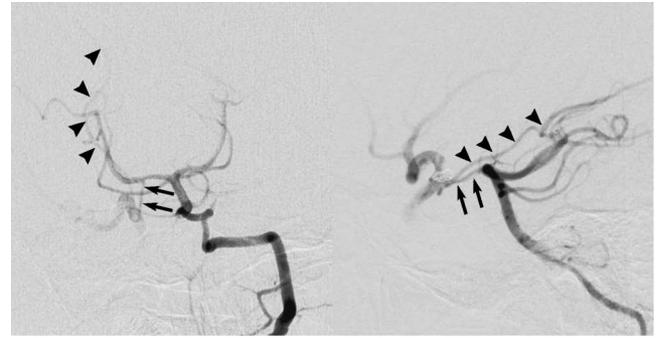


Fig. 3 Left vertebral angiograms (Allcock test) revealing the right internal carotid artery via the posterior communicating artery (arrows) and persistent primitive anterior choroidal artery (arrowheads).

Hypervolemia and hemodilution therapy were continued from day 3 to day 14. The patient was discharged with no neurological symptoms or signs.

Discussion

The AchA almost invariably arises from the ICA as the first single branch just distal to the PcomA³⁾ and supplies the anterolateral half and hilum of the lateral geniculate body, inferior half of the posterior limb of the internal capsule, retrolenticular portion of the internal capsule, and the optic radiation.¹²⁾ The AchA provides the main blood supply to the posteromedial aspects of the growing cortex during the early stages of development,¹⁾ and unsurprisingly, cortical branches of the AchA may persist as the main supply to the temporal, parietal, and occipital lobes.

The PPachA has been described as an anomalous hyperplastic AchA.¹⁰⁾ The anomalous hyperplastic AchA was classified into 4 types: type 1, a hypertrophic uncus branch supplying the anterior temporal branch of the PCA; type 2, an anomalous temporal artery that supplies the anterior and posterior temporal branches of the PCA; type 3, an anomalous occipito-parietal artery supplying the distribution of both the calcarine and occipito-parietal arteries; and type 4, an anomalous temporo-occipitoparietal artery with the PCA entirely replaced by the anomalous AchA. A total of 9 cases, including the present case, have been reported.^{1,5,7–11)} Five cases were associated with aneurysms. In all except our case, clipping was chosen for aneurysm treatment. Coil embolization in our case was readily performed, as in other aneurysms.

The treatment of AchA aneurysms involves a significant risk of ischemic complications. Eight of the 50 patients in the largest surgical series of AchA aneurysms had postoperative clinical and CT evidence of AchA territory infarction.²⁾ Five of these strokes manifested with delays of 6 to 36 hours after the operation, and progressed from mild to complete deficit over hours. Endovascular coil embolization for AchA aneurysms included intraprocedural transient AchA occlusion in five cases, and two of these five patients suffered postprocedural transient contralateral hemiparesis.⁴⁾ In 21 of the 38 patients, the AchA

was incorporated into the aneurysm neck. Therefore, near-complete or partial embolization with a neck remnant may be a safer treatment option for AchA-incorporated aneurysms. At the same time, we are concerned about recurrence of the aneurysm and recommend follow-up assessment for long periods.

The incidence of ICA-AchA aneurysm is reported as 0.4%.⁶⁾ However, 6 cases of PPAChA among 640 carotid angiograms included 1 of the 6 cases (0.16%) with aneurysm.⁹⁾ Analysis of variations of the AchA in 216 consecutive carotid angiograms from 108 patients found 5 cases (2.3%) of PPAChA and only 1 of these 5 cases (0.46%) displayed aneurysm.¹⁰⁾

This rare case of aneurysm was associated with PPAChA. The aneurysm formation may involve either increased local hemodynamic forces resulting from the PPAChA, or congenital arterial wall weakness associated with the PPAChA. Coil embolization of PPAChA aneurysm resulted in good outcome in our case.

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Address reprint requests to: Takahito Okazaki, MD, Department of Neurosurgery, Graduate School of Biomedical Sciences, Hiroshima University, 1-2-3 Kasumi, Minami-ku, Hiroshima 734-8551, Japan.
e-mail: okazaki@hiroshima-u.ac.jp