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Case Report

Intra-Aneurysmal Coil Embolization of a Ruptured Distal Posterior Inferior Temporal Artery Aneurysm: A Case Report

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Objective: We report a case of a ruptured aneurysm at the posterior inferior temporal artery (PITA) of the posterior cerebral artery (PCA) treated by intra-aneurysmal coil embolization.

Case Presentation: A 93-year-old man presented with disturbance of consciousness. Angiography revealed a 3-mm aneurysm in the distal PITA of the left PCA. He was diagnosed with subarachnoid hemorrhage and intracerebral hemorrhage due to a ruptured aneurysm. This aneurysm was occluded by intra-aneurysmal coil embolization with preservation of the PITA.

Conclusion: Distal PITA aneurysm of the PCA is rare. Complete occlusion and preservation of the parent artery were achieved by intra-aneurysmal coil embolization, which may be an effective therapeutic option for such aneurysms.

Keywords ▶ posterior cerebral artery, ruptured aneurysm, endovascular treatment

Introduction

Aneurysms of the posterior cerebral artery (PCA) account for 0.7%–2.3% of all cerebral aneurysm cases, being relatively rare.[1,2] Most aneurysms are located at the main trunk, whereas development in a peripheral region is rare.[3] We report a patient with a ruptured cerebral aneurysm located in the peripheral region of the posterior inferior temporal artery (PITA), which is the temporal branch of the PCA, treated by coil embolization.

Case Presentation

Patient: A 93-year-old man.

Family history: Not contributory.

Medical history: Hypertension, chemoradiotherapy for prostate cancer.

Present illness: Mild disturbance of consciousness and hypertension (systolic blood pressure: 200 mmHg) were observed on the previous day, and a hypotensive drug was prescribed. As his condition did not improve, the patient visited his previous physician; cerebral hemorrhage and subarachnoid hemorrhage were observed on head CT, and the patient was transported by ambulance to our hospital.

Neurological findings during transport: The consciousness level was Japan Coma Scale 2 and Glasgow Coma Scale 14 (E4V4M6). There was no bulky visual field defect on the confrontation test, and no notable neurological deficit symptom was observed.

Imaging findings: On head CT, diffuse subarachnoid hemorrhage in the left Sylvian fissure, and basilar cistern and ventricular hemorrhage were noted. Also cerebral hemorrhage in the left temporal lobe (posterior inferior temporal gyrus) was noted, being diagnosed as Fisher classification Group 3. On head CTA, an aneurysm was present in the peripheral region of the left PCA and it was considered the source of bleeding (**Fig. 1A** and **1B**).

Based on the above findings, the patient was diagnosed with subarachnoid hemorrhage (Hunt and Kosnik grade II, World Federation of Neurosurgical Societies grade II). After admission, sedation and blood pressure

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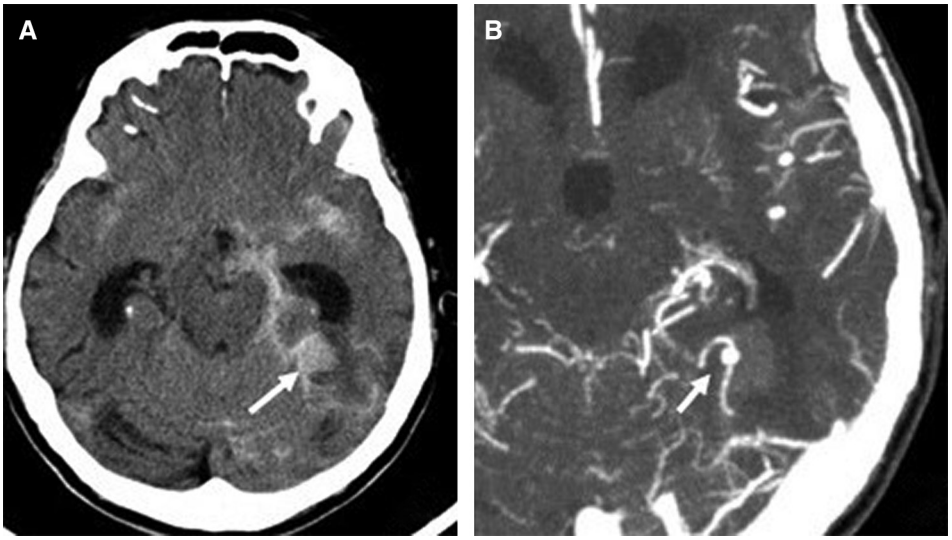

Fig. 1 (**A**) CT on admission shows diffuse subarachnoid hemorrhage and intracranial hemorrhage (arrow). (**B**) CT angiography shows the distal left PCA aneurysm (arrow). PCA: posterior cerebral artery

control were performed, and endovascular treatment under general anesthesia was scheduled for the following day. On cerebral angiography, a saccular aneurysm with a diameter of 3.6 mm was present in the peripheral region of the PITA, which is the temporal branch of the left PCA, and the parent vascular diameter was 1.3 mm (**Fig. 2**). Based on the above findings, the lesion was diagnosed as subarachnoid hemorrhage induced by rupture of the cerebral aneurysm in the distal PITA of the left PCA. For treatment, endovascular treatment was selected because the surgical procedure for clipping is difficult. Although it was a distal cerebral aneurysm, it was saccular; therefore, intra-aneurysmal coil embolization conserving the parent vessel and switch to parent vessel occlusion in the case of difficult aneurysm embolization were planned.

Surgical findings: Under general anesthesia, a 6-Fr long sheath was inserted into the right femoral artery and a 6-Fr Roadmaster 90 cm (Goodman, Aichi, Japan) was guided to the second segment of the right vertebral artery as a guiding catheter. A TACTICS 3.4 Fr 120 cm (Technocrat Corporation, Aichi, Japan) was guided to the central region of the basilar artery as a distal access catheter (DAC). For the microcatheter, the tip of an Excelsior SL-10 STR 1.7 Fr 150 cm (Stryker, Kalamazoo, MI, USA) was curved by 90° using steam shaping. Using a Traxcess 14 0.012/0.014-inch 200-cm micro guidewire (Terumo, Tokyo, Japan), the microcatheter was guided to the distal region of the aneurysm and then pulled back, after which it was inserted into the aneurysm. Four coils, Target 360 Ultra 3 mm × 6 cm (Stryker), Target 360 Nano 2 mm × 3 cm (Stryker), HyperSoft 3D 1.5 mm × 2 cm (Terumo), and HyperSoft 3D 1.5 mm × 2 cm, were placed in the aneurysm, and complete occlusion of the aneurysm and conservation of the distal parent vessel were confirmed (**Fig. 3A** and **3B**).

Postoperative course: On MRI on the day following treatment, no novel infarction was noted in the left PCA region. On cerebral angiography performed on postoperative day 6, complete occlusion of the aneurysm was confirmed and visualization of the distal parent vessel was favorable (**Fig. 3C**). As the patient was elderly with reduced activities of daily living due to long-term bedrest, he was transferred to a hospital for rehabilitation on postoperative day 43 and was discharged from the facility 4 months after treatment.

Discussion

The development of aneurysms in the PCA is relatively rare, accounting for 0.7%–2.3% of all cerebral aneurysms.[1,2] According to the segment classification established by Zeal et al.,[4] aneurysms developed in P1 in 39%, at the P1/2 junction in 29%, in P2 in 21%, and in P3 in 11%, and the morphology was saccular in 76% and spindle shape in 24%.[3] There have been many reports on the treatment of PCA aneurysms, but the localization of aneurysms has been classified based on P1–P3, which is the main trunk, and it is unclear how many aneurysms that developed in the PCA temporal branch were included.[3,5] To our

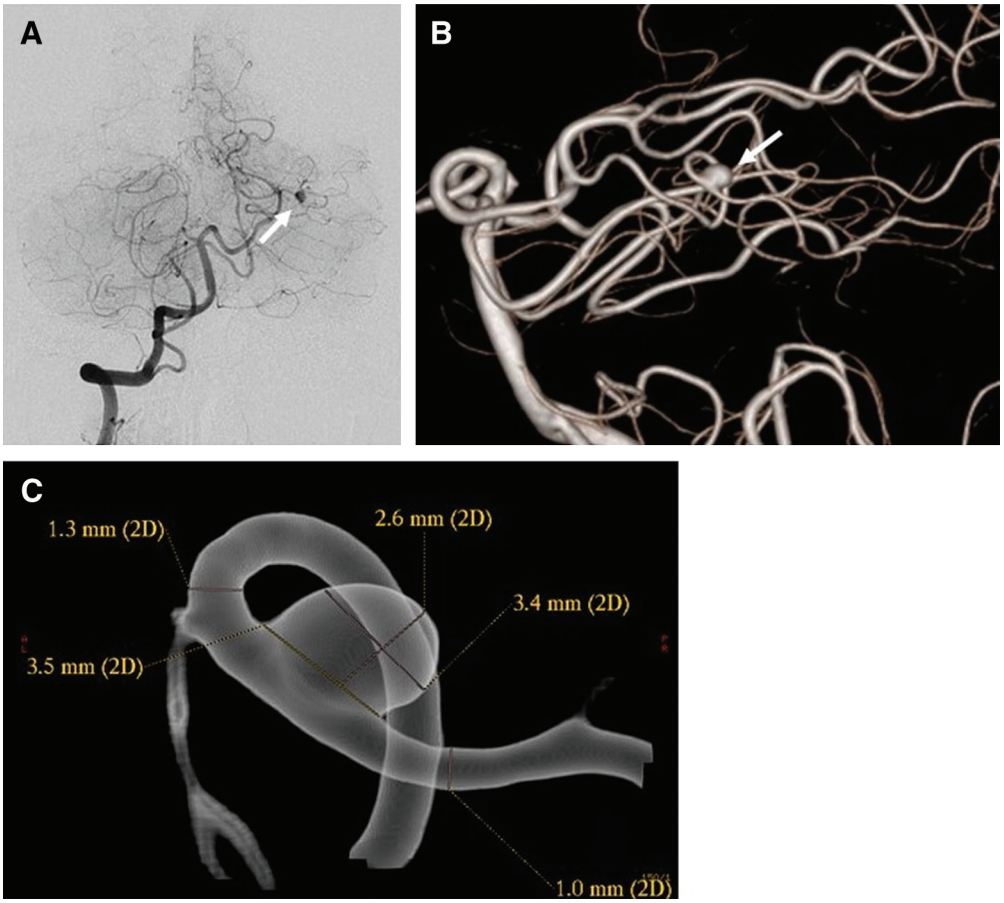

Fig. 2 (**A**–**C**) Right vertebral angiography (anterior and 3D view) shows a saccular aneurysm (arrows) in the temporal branch of the left posterior cerebellar artery.

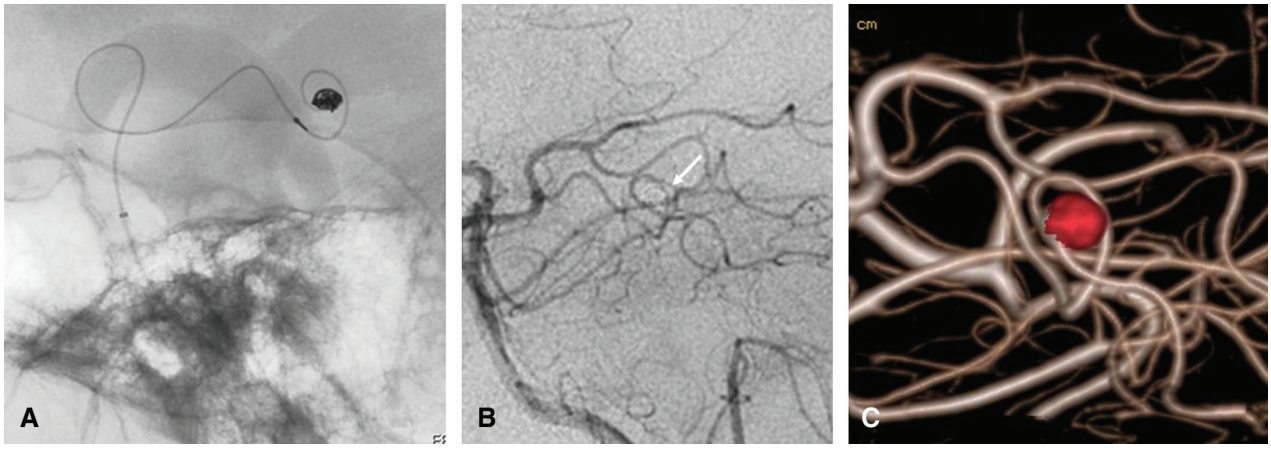

Fig. 3 (**A**) Right vertebral angiography (lateral view) just after coil embolization. (**B**) Right vertebral angiography (lateral view). The aneurysm disappeared (arrow). (**C**) Right vertebral angiography (3D view) 6 days after coil embolization reveals no recanalization.

knowledge, there has been only one report on the treatment of aneurysms that developed in the PCA temporal branch,[6] and the present case that developed in the peripheral region may be rarer. Two classifications of the PCA temporal branch have been reported. Haegelen et al. classified the PCA temporal branch into 7 segments, whereas Cilliers and Page classified it into 4 segments based on reports from Zeal and Haegelen.[4,7,8] The aneurysm in the present patient was located in the posterior temporal artery in the former classification and PITA in the latter. The location in

Table 1 Features of patients with PCA temporal branch aneurysms

Authors	Year	Age/ Sex	Clinical presentation	Site	Aneurysm type	Treatment	Materials	6-month mRS
Xu et al.[6]	2018	62/F	Dizziness, memory deterioration	ATA	Saccular	Selective	Coil	0
		60/M	Left-sided weakness	ATA	Saccular	Selective	Coil	1
		61/F	SAH	ATA	Saccular	PAO	Coil	0
		54/F	Incidentally	ATA	Saccular	Selective	Coil	0
		58/M	Dizziness, lags in response	ATA	Saccular	Selective	Coil	0
		71/F	SAH	ATA	Saccular	PAO	Coil + glue	6
This study	2021	93/M	SAH	PITA	Saccular	Selective	Coil	4

ATA: anterior temporal artery; mRS: modified Rankin Scale; PAO: parent artery occlusion; PCA: posterior cerebral artery; PITA: posterior inferior temporal artery; SAH: subarachnoid hemorrhage; Selective: selective aneurysm embolization

our patient was the PITA. Development in the PITA was observed in 80%–96% of all PCA cases, 68.8%–89.6% of these branched from P2P (latter half of P2), and the aneurysms were distributed mainly in the posterior parahippocampal gyrus and posterior occipitotemporal gyrus.[7] In the present patient, the aneurysm formed in the region in which the PITA was distributed in the posterior occipitotemporal gyrus.

PCA aneurysms are treated surgically, endovascularly, or by their combination. When selecting a treatment method for ruptured PCA aneurysms, the development site and size of the aneurysm, surgical approach, curability, patient's condition, and surgical complications are taken into consideration. The advantages of surgical treatment are fewer retreatment cases and capability of applying bypass surgery to the peripheral blood vessel if the parent vessel becomes occluded by trapping of the aneurysm. Problems include the deep surgical field, increasing difficulty of treatment, and risk of brain damage by compression of the brain by the surgical procedure. Regarding the surgical approach, a transsylvian approach, subtemporal approach, and occipital interhemispheric approach are frequently employed for P1 and P2, P2 and P3, and P3 and P4, respectively.[9,10] Endovascular treatment has been increasingly reported with recent advances of microcatheter and embolization materials.[2,3,6,11] The advantages of endovascular treatment are that the lesion can be relatively easily approached and the risk of brain damage is low. Problems include the risk of cerebral ischemia induced by parent vessel occlusion and possibility of retreatment for incomplete aneurysm occlusion. For the present patient, endovascular treatment was selected because he was elderly and the lesion was a PCA aneurysm in the peripheral region, which increases the difficulty of surgical treatment, being a risk for surgical procedure-induced new brain damage.

To our knowledge, limiting to studies on endovascular treatment for PCA aneurysms involving 25 or more patients, 5 studies have been reported.[2,3] In a review of 4 reports by Goehre et al., endovascular treatment was performed for 19 of 135 PCA aneurysms.[3] Qin et al. reported endovascular treatment of 59 PCA aneurysms in 55 patients, in which 21 of 23 saccular aneurysms were treated by intra-aneurysmal coil embolization and complete occlusion was acquired in 90% of followed up cases.[2] Endovascular treatment of aneurysms that developed in the PCA temporal branch was clearly described only in one report. Xu et al. reported endovascular treatment for 6 aneurysms that developed in the anterior temporal artery, which is the temporal branch of the PCA.[6] The aneurysm diameter was 2.5–5.0 mm and intra-aneurysmal coil embolization was applied to 4 cases of unruptured cerebral aneurysm, and 2 cases of ruptured cerebral aneurysm were treated by the combination of parent vessel occlusion and intra-aneurysmal coil embolization. The parent vessel was conserved in 3 of the 4 cases treated by intra-aneurysmal coil embolization on follow-up cerebral angiography, demonstrating it to be an effective treatment (**Table 1**).

To our knowledge, coil embolization for a ruptured cerebral aneurysm of the distal PITA, such as that in the present case, has not been reported. For endovascular treatment of cerebral distal PCA aneurysms, parent vessel occlusion is safe and effective for aneurysms in P2 or the peripheral region because of the presence of abundant collateral circulations, but cases in which a visual field defect was generated have also been reported.[12] The neck remodeling technique concomitantly using a balloon catheter is difficult because of a thin vascular diameter, but Qin et al. reported that intra-aneurysmal embolization can be safely performed when the aneurysm is saccular with a narrow neck and small size.[2] In the present patient, the use of

DAC enabled stable guiding of the microcatheter into the aneurysm and the use of the flexible coils enabled safe intra-aneurysmal coil embolization conserving the parent vessel. Further accumulation of cases is necessary to establish the treatment method, but intra-aneurysmal coil embolization may be an effective treatment method for aneurysms in this region.

Conclusion

Intra-aneurysmal coil embolization may be an effective treatment method for ruptured cerebral aneurysms in the distal PITA.

Disclosure Statement

The authors declare no conflict of interest.

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