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Case Report

Partially thrombosed distal posterior cerebral artery aneurysm treated with surgical trapping through occipital transtentorial approach assisted by endovascular coil embolization

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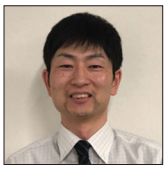

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ABSTRACT

Background: Posterior cerebral artery (PCA) aneurysms are relatively rare. PCA aneurysms tend to be large, giant, fusiform, and partially thrombosed. Surgical treatments, such as neck clipping and trapping with or without bypass surgery, are curative treatments for thrombosed intracranial aneurysms. Few cases of surgical treatment of distal PCA aneurysms have been reported. We treated a partially thrombosed distal PCA aneurysm by trapping through the occipital transtentorial approach (OTA) assisted by endovascular coil embolization.

Case Description: A 21-year-old woman presented with a sudden headache. Brain computed tomography, magnetic resonance imaging, and a cerebral angiogram revealed a partially thrombosed aneurysm in the left PCA P3 segment. Her headaches had improved once within several days, but reoccurred due to an enlarged thrombosed aneurysm. Endovascular coil embolization was performed to assist the surgery. The aneurysm and the distal artery of the aneurysm were embolized to interrupt the blood flow into the aneurysm. The following day, trapping of the aneurysm was performed through the OTA. Eventually, we performed aneurysm excision because trapping alone was considered to have the potential for regrowth of the aneurysm. The patient's postoperative course was uneventful. No recurrence of the aneurysm was observed at the 2-year follow-up.

Conclusion: OTA could be useful for the treatment of distal PCA aneurysms, whereas coil embolization may support the surgical treatment of partially thrombosed intracranial aneurysms.

Keywords: Endovascular treatment, Microsurgery, Posterior cerebral artery aneurysm, Stroke, Thrombectomy, Vasa vasorum

INTRODUCTION

Posterior cerebral artery (PCA) aneurysms are rare, accounting for <1–2% of all intracranial aneurysms.[8,10-12] Frequent aneurysmal recurrences have been reported with endovascular treatment alone since PCA aneurysms tend to be large or giant, fusiform, and partially thrombosed.[8] There

have been no reports regarding the importance of endovascular treatment as assistance for direct surgery for PCA aneurysms. We report a case of a partially thrombosed distal PCA aneurysm treated with trapping through the occipital transtentorial approach (OTA) assisted by endovascular coil embolization.

CASE REPORT

A 21-year-old woman presented with a sudden headache. Brain computed tomography (CT) and magnetic resonance imaging (MRI) revealed a thrombosed aneurysm on the quadrigeminal cistern [Figures 1a and b]. A cerebral angiogram revealed a partially thrombosed aneurysm in the left PCA P3 segment [Figure 1c]. We performed a balloon test occlusion (BTO) to evaluate whether bypass was required when the parent artery was occluded. A dual-lumen balloon catheter (Scepter C; MicroVention Terumo, Tustin, CA, USA) was placed in the PCA P2 segment just proximal to the aneurysm. The patient presented no changes in neurological status during the 20-min vessel occlusion, and rich collateral blood flow through the anterior circulation was observed. Based on the results of the BTO, we planned trapping without bypass through the OTA. Her headaches improved within several days, and we decided to proceed with elective surgery 3 months later. However, she was admitted to the hospital unscheduled because of recurrence of a severe headache 1 month after the initial attack. Except for the headache, no abnormal neurological findings were observed. CT scans demonstrated an enlarged thrombosed aneurysm without subarachnoid hemorrhage [Figure 1d], while MRI and cerebral angiography revealed that the blood flow into the aneurysm had changed [Figures 1e, f, and 2a], indicating the progression of thrombosis in the aneurysm. We considered that thrombectomy of the aneurysm might be necessary when it would be difficult to secure the proximal artery of the aneurysm, which is thought to be behind the aneurysm through OTA approach, due to the narrow surgical corridor and large aneurysm size. Therefore, endovascular coil embolization is performed in cases of partial thrombectomy to obtain a wider space. In addition, the distal artery of the aneurysm was embolized to make it a landmark during surgery. The aneurysm was roughly packed only near the proximal neck so that the coil would not interfere with the thrombectomy [Figure 2b]. Cerebral angiography after embolization showed the disappearance of blood flow into the aneurysm [Figure 2c]. The following day, trapping of the aneurysm was performed through the OTA. Intraoperative findings exhibited that the coils of the distal vessel embolized the previous day were visible during the approach to the aneurysm, which were good landmarks [Figure 3a]. Due to the disappearance of the blood flow into the aneurysm, we could retract the aneurysm effectively to confirm the proximal vessel and trapping of the aneurysm [Figure 3b]. However, some blood vessels feeding the wall of the aneurysm were observed. We decided to perform a partial thrombectomy to obtain a wider view of the abnormal vessels. The coils in the aneurysm were observed; however, were not disturbed during partial thrombectomy [Figure 3c]. Endodecompression and detachment from the surrounding tissue revealed some blood vessels through nearby arteries feeding the wall of the aneurysm [Figure 3d]. All arteries coagulated and the aneurysm was completely removed [Figure 3e]. Indocyanine green video angiography showed no avascular area in the operative field after the aneurysm resection. The patient's postoperative course was uneventful. Postoperative MRI showed no residual lesions or ischemic changes [Figure 3f]. At the 2-year follow-up, no recurrence of the aneurysm was observed.

DISCUSSION

In this case, a hybrid strategy including endovascular coil embolization and microsurgical trapping through the OTA was effective for a partially thrombosed distal PCA aneurysm.

PCA is often divided into P1-P4 segments.[17] Most PCA aneurysms occur in the P1 and P2 segments, and relatively fewer occur in the P3 and P4 segments.[8,12,14] Several approaches for distal PCA aneurysms, such as the subtemporal approach and posterior interhemispheric approach, have been reported.[6,8] Although there have been few reports, OTA is also applicable to distal PCA aneurysms.[15] The OTA is a suitable approach for pineal lesions, the anterosuperior surface of the cerebellum, and the ambient and quadrigeminal cistern. We assumed that would be challenging to treat the aneurysm through a subtemporal approach because the aneurysm was located near the center of the quadrigeminal cistern and the temporal lobe would greatly interfere. Therefore, we decided to use OTA for the treatment of this aneurysm. Sufficient working space was provided by excising the tentorium and retracting the aneurysm, without angiographic blood flow.

It had been reported that parent artery occlusion (PAO) is needed to treat complicated PCA aneurysms, such as large or giant, fusiform, and thrombosed cases.[2,8,11] PCA distribution is copiously collateralized and relatively resistant to infarction;[4,14,17] however, PAO may cause ischemic complications.[11] Adding bypass to the distal artery of the PCA can be considered to prevent ischemic complications of PAO for such aneurysms, although the determination should be made carefully based on its difficulty and high complication rate.[8] Chang *et al*. reported that the failure rate of treating distal PCA aneurysms with a bypass was 53%, and concluded that careful patient selection for the procedure was needed.[1] Selective BTO for PCA before PAO was reported to help determine whether surgical revascularization was needed. However, its necessity remains controversial because there are risks of procedure-associated complications and false-positive or false-negative results from BTO. Park

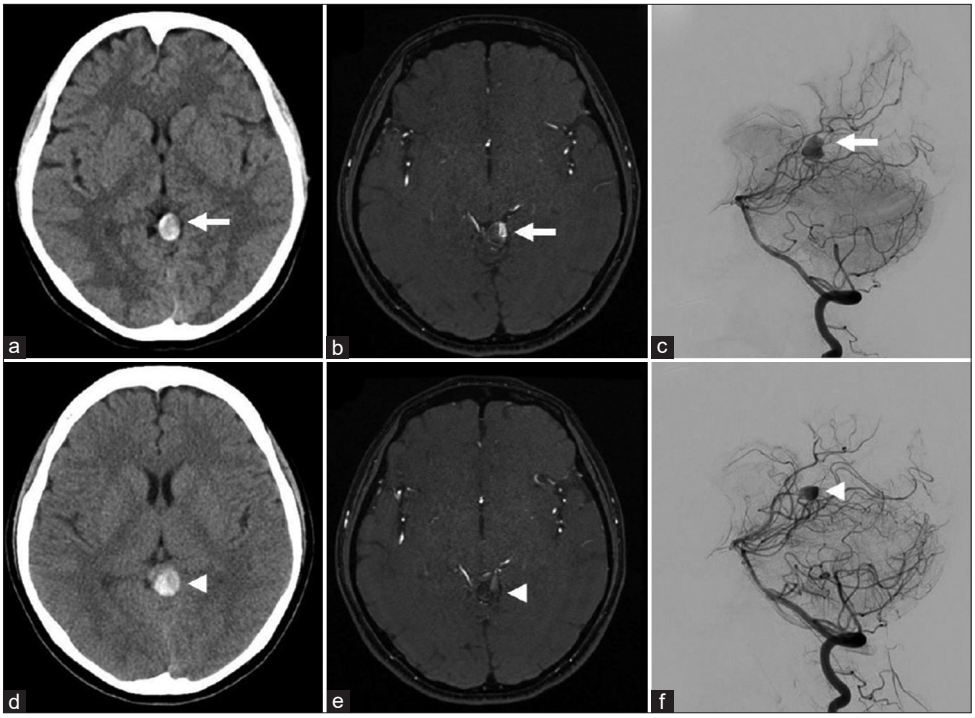

Figure 1: (a) Computed tomography (CT) showing a hyperdense lesion suspected to be a thrombosed aneurysm on the quadrigeminal cistern (arrow). (b) Magnetic resonance angiography (MRA) demonstrating partial blood flow in the aneurysm (arrow). (c) Left vertebral angiography image showing an aneurysm located in the P3 segment of the left posterior cerebral artery (arrow). (d) Enlargement of the aneurysm on CT (arrowhead). (e and f) MRA and left vertebral angiography showing decreased blood flow into the aneurysm compared to 1 month before (arrowheads).

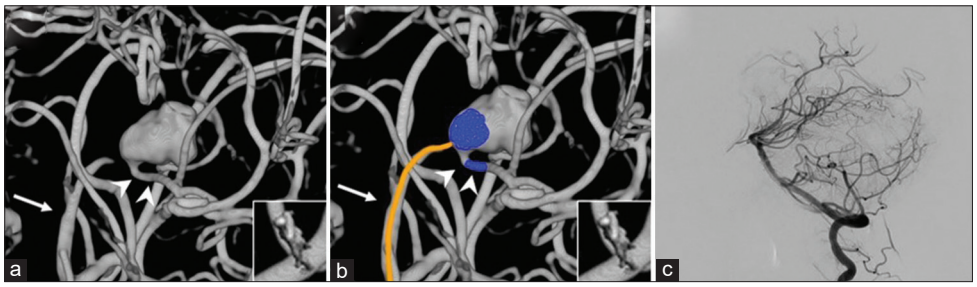

Figure 2: (a) Three-dimensional rotational angiography showing the proximal (arrow) and distal arteries (arrowheads). (b) The schematic drawing of the case during the coil embolization (orange line: microcatheter, blue mass: embolized coil, arrow: proximal artery, arrowheads: distal artery). (c) Left vertebral angiography at the end of coil embolization showing the disappearance of blood flow into the aneurysm.

et al. reported that six of ten patients experienced ischemic complications without BTO before PAO for PCA aneurysms, and only one of the five patients passed BTO. There were no BTO-associated complications in their study, concluding that selective BTO might help minimize ischemic complications after PAO for PCA aneurysms.[11] In our case, trapping was performed without bypass because the patient passed BTO. No ischemic complications were observed after surgery.

As treatment for partially thrombosed aneurysms, endovascular treatment is considered inferior to surgical treatment due to a higher recanalization rate.[3,5,11,16] Vasa vasorum is thought to be associated with growth and recurrence after endovascular treatment of these aneurysms.[7,9,13] We observed some blood vessels around the aneurysm arising from nearby arteries that might have fed on the wall of the aneurysm. Although recurrent cases after surgical trapping for partially thrombosed intracranial aneurysms have not been reported, we performed aneurysm excision because trapping alone was considered to have the potential for regrowth of the aneurysm caused by the vessels

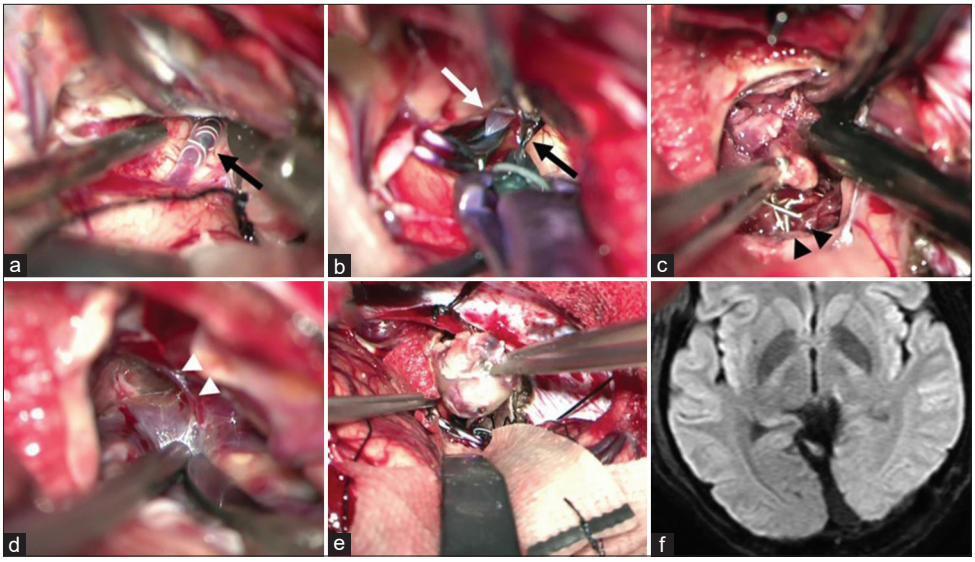

Figure 3: Intraoperative views. (a) Embolized coils the day before in the distal artery (arrow). (b) Clips are applied to the proximal (white arrow) and distal (black arrow) arteries of the aneurysm. (c) Embolized coils the day before in the aneurysm not interrupting the thrombectomy (arrowheads). (d) Vessels feeding the wall of the aneurysm (arrowheads). (e) The aneurysm removed in one lump. (f) Postoperative magnetic resonance imaging showing no residual lesion and no ischemic change.

arising from nearby arteries, which might function as a vasa vasorum.

We performed endovascular coil embolization to assist the surgery, considering the possibility that a thrombectomy of the aneurysm would be necessary when reaching the artery proximal to the aneurysm. We observed that the coils of the distal vessel embolized the day before, which were good markers during surgery. The coils in the aneurysm did not interfere with thrombectomy because they were packed near the proximal neck. Even if we had not been able to secure the proximal vessels beforehand, we would have been able to perform a thrombectomy before trapping. In our case, endovascular coil embolization was safe and helpful for assisting surgery through the OTA. Endovascular coil embolization might be useful in supporting the surgical treatment of partially thrombosed intracranial aneurysms.

CONCLUSION

OTA is a useful approach for distal PCA aneurysms and endovascular coil embolization might be useful in supporting surgical treatment of partially thrombosed intracranial aneurysms.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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