Transpetrosal Approach for a Giant Thrombosed P2 Segment Posterior Cerebral Artery Aneurysm

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Abstract

Objective: Posterior cerebral artery (PCA) aneurysms are extremely rare and can be difficult to treat. We report successful trapping and thrombectomy of a giant thrombosed P2 segment aneurysm via a transpetrosal approach. **Case Presentation:** A 62-year-old woman was admitted to our hospital with a progressive left hemiparesis. Magnetic resonance imaging (MRI) showed a 30 mm mass lesion in the right ambient cistern. On vertebral angiography, the right P2 trunk was deviated medially and inferiorly, and the right posterior temporal artery (PTA) was not visualized. We diagnosed a giant thrombosed aneurysm of the right PTA. Surgery was performed via a right posterior transpetrosal approach. The proximal P2 was identified above the oculomotor nerve in the ambient cistern, and a giant PTA aneurysm was found. After coagulating the distal PCA, a temporary clip was applied to the proximal P2, the aneurysm wall was incised, thrombus was removed, and a permanent titanium clip was applied to complete trapping. Postoperative MRI showed disappearance of the aneurysm. The patient's left hemiparesis was resolved 2 months after the operation, and she was discharged home. **Conclusion:** Although trans-sylvian and subtemporal approaches are often performed for P2 aneurysms, they have difficulty identifying the distal PCA and may require excessive brain retraction. The transpetrosal approach can also be effective for giant thrombosed P2 aneurysms.

Keywords: posterior cerebral artery, giant thrombosed aneurysm, transpetrosal approach

Introduction

Posterior cerebral artery (PCA) aneurysms are extremely rare and account for 0.7%–2.3% of all intracranial aneurysms.^{1–5)} They are often difficult to treat because of their scholarly characteristics. Complete understanding of the various surgical approaches to these aneurysms is necessary to select the best treatment method. We report successful

trapping and thrombectomy of a giant thrombosed P2 segment aneurysm causing brainstem compression via a transpetrosal approach.

Case Report

A 62-year-old woman with a history of breast cancer was admitted to our hospital because of a several-month history of progressive left hemiparesis, which was confirmed on neurological examination (4/5 on manual muscle testing). Magnetic resonance imaging (MRI) showed a 30 mm diameter mass in the right ambient cistern compressing the brainstem; the periphery of the lesion exhibited contrast enhancement, and the signal intensity within the mass suggested thrombus (Figs. 1A–1C).

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Fig. 1 (A) Axial T2-weighted magnetic resonance imaging (MRI) on admission demonstrates an extra-axial mass in the right ambient cistern causing marked compression of the right cerebral peduncle. Coronal (B) and sagittal (C) T1-weighted enhanced MRI shows homogeneous peripheral enhancement. Magnetic resonance angiography (D) demonstrates the lesion as an avascular area, and the right posterior cerebral artery is occluded distally. On anteroposterior (E) and lateral (F) left vertebral angiography, the right P2 is shifted medially and inferiorly, elongated, and tenuous; no contrast is visualized in the posterior temporal artery.

The vasculature distal to the right P2 segment was poorly visualized on magnetic resonance angiography (Fig. 1D). Cerebral angiography showed medial and inferior displacement of the main trunk of the right P2 segment (Figs. 1E and 1F). On the basis of the above, we diagnosed a giant thrombosed aneurysm of the right posterior temporal artery (PTA) and surgery is planned to relieve the brainstem compression.

To open the dura overlying the middle and posterior fossa and divide the tentorium, a petrosectomy was conducted after inserting a lumbar drain and performing a right temporo-suboccipital craniotomy in the left park bench position. The right oculomotor nerve was identified in the ambient cistern, with the proximal P2 above. The PTA was then followed distally to reveal a completely thrombosed giant aneurysm. Before coagulating the distal PTA, the back flow from the distal side could be confirmed using temporary clip, suggesting good

development of collateral blood flow. A temporary clip was applied to the proximal PTA; then, the aneurysm wall was incised, the intra-aneurysmal thrombus was removed as much as possible, and a permanent titanium clip was applied to the proximal PTA (Figs. 2A–2C). Postoperative MRI showed a shrunken residual aneurysm (Fig. 2D) and no cerebral infarction (Fig. 2E). Two months after the operation, the left hemiparesis was resolved, and she was discharged home.

Discussion

According to Zeal and Rhoton,⁶⁾ direct surgery for P2 aneurysms mainly uses the trans-sylvian or subtemporal approach. Yasargil found that most anteriorly located P2 aneurysms can be reached by the trans-sylvian approach; however, in some cases, excision of the anterior hippocampus is required after accessing it via a transinsular, transchoroidal

Fig. 2 Intraoperative photograph showing the view after a right posterior transpetrosal approach (asterisk: aneurysm; black arrow: oculomotor nerve; white arrow: P2 main trunk; white arrowhead: proximal posterior temporal artery (PTA); black arrowhead: distal PTA). (A) The right oculomotor nerve and proximal P2 can be seen in the ambient cistern; the giant aneurysm is located distally along the right posterior temporal artery. (B) The distal P2 is coagulated. (C) Intra-aneurysmal thrombus is excised after temporary clip placement. Postoperative contrast-enhanced axial T1-weighted magnetic resonance imaging demonstrates a shrunken residual aneurysm (D) without evidence of cerebral infarction on diffusion-weighted sequences (E).

fissure approach.⁷⁾ Anterior temporal and zygomatic approaches to P2 aneurysms have also been reported.^{8,9)} In 1969, Drake et al. reported the subtemporal approach in a series of eight patients with PTA bifurcation aneurysms and emphasized the satisfactory orientation of the operative field and ease of securing parent blood vessels.¹⁰⁾ This approach is widely used today for PCA aneurysms located from the P1 to the P3 segment.^{9,11–14)}

Of the PCA aneurysms, 20%–50% are giant and thrombosed.^{2,3,10,11,15–21)} To the best of our knowledge, 10 cases of direct surgery for a giant P2 aneurysm have been reported since 1980, including this case (Table 1). Most operations consisted of aneurysm trapping and proximal occlusion of the parent artery. However, if brainstem compression is present, as in this case, aneurysm thrombectomy is required.¹³⁾ The results of surgery were relatively good, which is because of the presence of good

collateral circulation in the PCA territory.^{10,12,17)} In cases of large PCA aneurysms, the subtemporal approach may be inadequate: the PCA is displaced superiorly, and considerable temporal lobe retraction is required; moreover, visualization of the distal PCA and P3 aneurysms is difficult.^{1,4,13)} Similarly, it is difficult to access the distal PCA via the zygomatic approach.⁸⁾

The transpetrosal approach can be observed from the posterior petrosectomy from the retrolabyrinth presigmoid window in the shallower operative field from the posterior-inferior to the anterior-superior part without brain retraction (Fig. 3). The proximal PCA is also easily identifiable above the oculomotor nerve.²²⁾ Craniotomy, although time-consuming, is a very useful approach through which hearing loss and cerebrospinal fluid leakage complications can be avoided. This approach should be considered for P2 segment aneurysms.

Table 1 Reported cases of open surgical treatment for giant (>25 mm) P2 aneurysms since 1980

No.	Authors (year)	Age/sex	Clinical features	Thrombus	Treatment approach	Result
1	Fukamachi ¹⁵⁾ 1982	48/F	SAH	N/A	Pterional trapping	Fair
2	Ohwaki ¹⁷⁾ 1986	31/F	Headache	N/A	Subtemporal proximal clipping	Good
3	Mochimatsu ⁸⁾ 1987	36/F	SAH	Partially thrombosed	Zygomatic clipping, thrombectomy	Fair
4	Seoane ³⁾ 1997	41/M	SAH	N/A	Subtemporal proximal clipping	Fair
5	Seoane ³⁾ 1997	54/F	SAH	N/A	Subtemporal trapping	Good
6	Terasaka ¹³⁾ 2000	47/F	Headache	no	Pterional + subtemporal clipping, thrombectomy + STA–PCA bypass	Good
7	Shimizu ⁴⁾ 2001	42/M	Incidental	Partially thrombosed	Subtemporal proximal clipping	Fair
8	Ture ²¹⁾ 2003	37/M	Hemiparesis	Totally thrombosed	Pterional trapping, total excision of the aneurysm	Fair
9	Shindo ¹⁹⁾ 2004	40/F	SAH	Partially thrombosed	Subtemporal (using circulatory arrest and profound hypothermia) clipping	Fair
10	Present case	62/F	Hemiparesis	Totally thrombosed	Transpetrosal trapping, thrombectomy	Good

PCA: posterior cerebral artery.

Fig. 3 Schematic drawing of the surgical approach in the right side. (A) subtemporal approach; (B) posterior transpetrosal approach (black arrow: approach route; asterisk: aneurysm; white arrow: oculomotor nerve; black arrowhead: proximal PCA; white arrowhead: distal PCA). B: brainstem, C: cerebellum, PCA: posterior cerebral artery, T: temporal lobe.

Conflicts of Interest Disclosure

All the authors have no conflicts of interest.

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