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Distal Posterior Cerebral Artery Ruptured Aneurysm: A Rare Case Report and Review of Literature

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Abstract

Distal posterior cerebral artery aneurysms consist of a rare vascular entity whose treatment approach remains challenging. Few studies exist scarcely in the literature reporting cases of P4 ruptured aneurysms. In this study, we present the case of a 49-year-old female patient who was admitted to our Neurosurgery Department with the World Federation of Neurological Surgeons grade IV, Fischer grade IV subarachnoid hemorrhage due to a right distal posterior cerebral artery aneurysm. She successfully underwent surgery via a posterior occipital interhemispheric approach. The patient recovered well from surgery, and the following days, she was successfully extubated and had a significant neurological improvement. However, she died during her rehabilitation due to sepsis and severe acute respiratory distress syndrome.

Keywords

- posterior cerebral artery
- ruptured distal PCA aneurysm
- clipping
- subarachnoid hemorrhage

Introduction

Aneurysms of the posterior cerebral artery (PCA) account for 1 to 2% of all intracranial aneurysms and 15% of all aneurysms of the vertebrobasilar circulation.[1,2] These aneurysms are usually located on the P1 and P2 segments and rarely on the P3 and P4 segments (only 5% of PCA aneurysms are located distally).[3]

Surgical approaches and careful anatomic dissection of the PCA are technically demanding due to the complexity of its perforating branches and its close relationship with the cranial nerves and the brainstem. Endovascular techniques for aneurysms arising from PCA segments offer a reliable alternative to the surgical approaches when they are not feasible.

Herein, we present a case of a 49-year-old woman who presented with intracerebral and subarachnoid hemorrhage due to a ruptured distal PCA aneurysm.

Case Report

A 49-year-old woman was admitted to the emergency department with Glasgow Coma Scale 7/15 (E:1, V:1, M:5) and right-sided anisocoria with pupils reactive to light. She was immediately intubated. Patient's symptoms before emergency admission were a thunderclap headache along with neck pain and subsequent loss of consciousness.

The initial diagnostic workup included a computed tomography (CT) of the brain that revealed a right occipital intracerebral hematoma and subarachnoid hemorrhage Fischer Grade scale IV. Further evaluation with a brain computed tomography angiography revealed a right 6-mm distal PCA saccular aneurysm, namely at the junction of the parieto-occipital artery (PoA) and the splenial artery (►**Figs. 1** and **2**). The patient was emergently operated via a right posterior occipital interhemispheric approach

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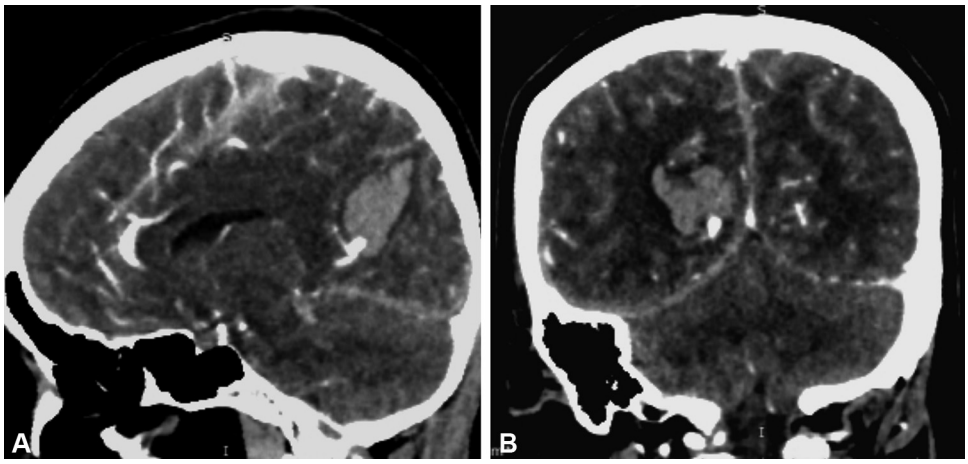

Fig. 1 Preoperative CT angiography of the brain: **(A** and **B)** sagittal and coronal view, respectively, showing the right P4 aneurysm with the occipital hematoma.

for the hematoma evacuation and aneurysm clipping (►**Figs. 3** and **4**). Postoperatively, she was transferred to the intensive care unit, and the following days she was extubated successfully and had a significant neurological recovery. However, a few days later the patient died due to acute respiratory distress syndrome and septic shock.

Discussion

The PCA is divided into four anatomic segments.[4] The P1 or precommunicating segment extends from the basilar bifurcation to the posterior communicating artery, the P2 or postcommunicating segment extends from the posterior communicating artery to the posterior edge of midbrain within the crural cistern (P2A) and the ambient cistern (P2P), the P3 or quadrigeminal segment extends from the posterior edge of midbrain to the anterior edge of the calcarine sulcus, and, finally, the P4 segment consists of the terminal cortical branches of the PCA. From these segments arise multiple branches that supply distinct anatomic areas, namely brain stem, thalamus, third ventricle, and temporal and occipital lobes.

The terminal trunk of the PCA consists of the PoA and the calcarine artery (CA), and this terminal division usually occurs at the P3 segment.[4,5] The artery with the largest diameter is considered the terminal branch, and Zeal and Rhoton reported the terminal branch as the PoA in 56.0% and the CA in 44.0%.[4]

PoA is present in almost all hemispheres, and it is consistently arising as a single branch and runs in the parieto-occipital fissure to mainly supply the posterior parasagittal region, cuneus, and precuneus.[5] CA is also present in almost all hemispheres as a single branch and travels through the calcarine fissure to supply an area of the primary visual cortex bordered by the cuneus at the top of the fissure and the lingual gyrus at the bottom of the fissure.

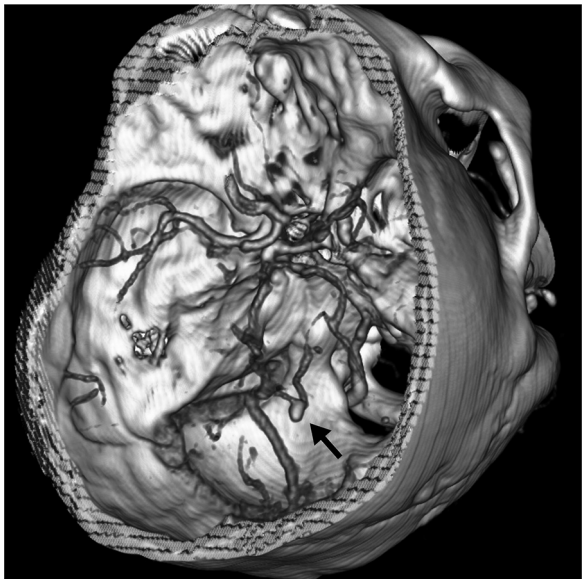

Fig. 2 Three-dimensional reconstruction of the vessels revealing the P4 aneurysm (*straight black arrow*).

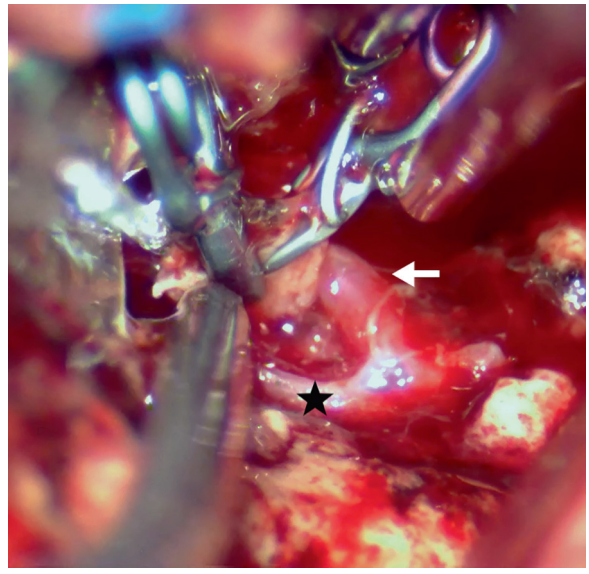

Fig. 3 Intraoperative view aneurysm is located on the junction of parietooccipital artery and calcarine artery, *white arrow* indicates the parieto-occipital artery, while the *black asterisk* indicates the calcarine artery.

Fig. 4 Patient positioning and skin incision.

PCA aneurysms can be treated with different surgical approaches regarding the location of the aneurysm in relation to the PCA segment. P1 and P2 aneurysms are usually treated with the standard pterional approach, and P2 and P3 aneurysms are mainly treated via the subtemporal approach. The occipital interhemispheric approach is mostly used for aneurysms involving P3 and P4 distribution areas. Via this procedure, although the surgeon has adequate control on P3 into the quadrigeminal cistern, aneurysm's dome may be a barrier for temporary occlusion of the parent artery. For this reason, adequate occipital sulcus dissection is essential for complete exposure of the PCA in length. In the occipital interhemispheric approach, the surgeon must be familiar with the area's anatomy. PoA, calcarine artery, parieto-occipital sulcus, cuneus and precuneus, and splenium of the corpus callosum are the main landmarks. PoA is expected to course across the parieto-occipital sulcus at different depths; thus, it is safer to recognize this artery from its origin (usually at P4 segment) and follow that posteriorly

Table 1 Studies reporting cases of ruptured distal posterior artery aneurysms[6–21]

Case	Age	Symptoms	CT findings	Treatment	Surgical approach
Burton et al 1968	14 y	Headache, blurred vision, coma	ICH	Proximal electrocautery	Occipital craniotomy
Ishikawa et al 1974	40 y	Headache, Hemianopia	ICH	Aneurysm resection	Via hematoma cavity
Pia and Fontana 1977	43 y	Blindness, hemiparesis, coma	ICH-IVH	–	Occipital lobectomy
Tanaka et al 1980	40 y	Headache, vomit	SAH-IVH	Aneurysm resection	Temporo-pari-eto-occipital transventricular
Ishibachi-Onuma 1989	69 y	Headache, vomit, hemianopia	ICH-IVH	Clipping	Occipital inter-hemispheric
Statham et al 1990	45 y	Headache, hemianopia, coma	SAH-IVH	Clipping P2 segment	Subtemporal
Barker 1992	42 y	Headache, grand mal seizure, coma	ICH-IVH	Clipping	Via hematoma cavity
Orita et al 1994	63 y	Gait, aphasia coma	ICH	Coated	Occipital inter-hemispheric
Orita et al 1994	73 y	Anisocoria	ICH-IVH	Clipping	Via hematoma cavity
Ito 1998	57 y	Headache, visual impairment	ICH-IVH	Clipping	Occipital inter-hemispheric
Ramakrishnamurthy 1999	50 y	–	SAH-ICH	Clipping	Occipital
Hashimoto et al 2000	73 y	Headache, nausea	ICH	Clipping	–
Ciceri 2001	52 y	–	SAH	Coiled	–
Andreou et al 2007	23 y	Visual field deficit	–	Parent artery occlusion	–
Yamahata et al 2010[8]	75 y	Headache, nuchal rigidity, nausea	SAH	Clipping	Occipital inter-hemispheric
Mulero et al 2016	40 y	Headache, hemianopia	ICH	Coiled	–

(*Continued*)

Table 1 (*Continued*)

Case	Age	Symptoms	CT findings	Treatment	Surgical approach
Kawabata et al 2014	77 y	–	ICH	Parent artery occlusion	–
Our case	49 y	Headache, nuchal rigidity, coma	ICH	Clipping	Occipital interhemispheric

Abbreviations: ICH, intracerebral hemorrhage; IVH, intraventricular hemorrhage; SAH, subarachnoid hemorrhage.

(distally) via the parieto-occipital sulcus. Of course, the surgeon has to be aware of any anatomical variation of PoA (duplication, atypical origin, perforators, and branches). Special attention should be given to PoA anastomoses with the precuneal artery complex and the calcarine artery.[5] Preoperative evaluation of these arteries for surgical planning through a digital subtraction angiography could be very useful.

In this study, we reviewed the current literature for similar cases with ruptured distal PCA aneurysms of the P4 segment treated via various surgical approaches. So far, 19 studies including ours have revealed cases of ruptured P4 aneurysms (►**Table 1**).[6-21] Moreover, 36% of the cases were treated via an occipital surgical corridor, while five out of seven occipital approaches were interhemispheric. Orita et al reported that transventricular and transhematoma approaches should be preferred over the interhemispheric one when extensive cerebral edema exists.[3] Multiple underlying pathologies have been identified while reviewing the bibliography. Barker presented a case of a ruptured P4 aneurysm associated with a grade III astrocytoma, while Tanaka et al reported three cases of distal PCA aneurysms following Moyamoya phenomenon.[9] Furthermore, other causative factors reported in the literature include bacterial infection and trauma and should also be taken into consideration during the diagnostic work-up of such patients.

Conclusion

Distal PCA aneurysms consist of a rare and challenging vascular entity. They require careful diagnostic work-up as they are frequently associated with multiple etiologies and also proper planning to choose the appropriate surgical corridor or endovascular technique.

Conflict of Interest
None declared.

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