

Distal posterior cerebral artery aneurysm

Case report

RICHARD K. SIMPSON, JR., M.D., PH.D., AND WARREN D. PARKER, M.D.

Department of Neurosurgery, Baylor College of Medicine, Houston, Texas

✓ A case of an unusual distal posterior cerebral artery (PCA) aneurysm is presented. The saccular aneurysm arose from a fetal PCA distal to the posterior temporal branch of the P₃ segment. The aneurysm was treated by placing a clip on the PCA distal to the anterior temporal branch of the P₂ segment. A ventriculoperitoneal shunt was also placed. The patient's postoperative recovery was unremarkable and without residual neurological deficit. The highly unusual location of this aneurysm is discussed and the neurosurgical literature is reviewed in detail.

KEY WORDS • aneurysm • posterior cerebral artery • subarachnoid hemorrhage

POSTERIOR cerebral artery (PCA) aneurysms are a rather uncommon entity.^{1,17,22} Fox⁸ described approximately 50 PCA aneurysms in his recent review. Zeal and Rhoton²² reviewed approximately 118 aneurysms of this type, although only 55 cases were found to have been reported in sufficient detail to merit comment. Posterior cerebral artery aneurysms represent a very small proportion (0.26% to 1.0%) of the total reported cases of intracranial aneurysms.^{12,17} Distal PCA aneurysms are exceedingly rare. Only 13% of all PCA aneurysms are considered to be distal to the posterior temporal branch or the P₃ segment.²² It is this small percentage of highly unusual aneurysms that we discuss in connection with a case that we have managed.

Case Report

This 14-year-old right-handed girl was admitted to The Methodist Hospital with the chief complaint of severe occipital headache. Earlier that evening, she experienced an abrupt transient loss of consciousness followed by nausea and neck stiffness.

Examination. She was lethargic, although easily arousable and fully oriented, with a rigid neck. Her neurological examination was otherwise normal, as was her general physical condition. Laboratory data, including a complete blood cell count, electrolyte and serum glucose levels, urinalysis, and clotting studies, were normal. Chest x-ray film and electrocardiogram were also normal. The patient's medical history was negative

for trauma, previous neurological disease, collagen vascular disorders, and substance abuse. She was not hypertensive, nor had she a history of congenital malformation or bleeding disorders. Her family history was not contributory.

The suspected subarachnoid hemorrhage was confirmed on computerized tomography (CT) scanning. In addition, a hemorrhage was noted in the pulvinar of the left thalamus along with blood in the atrium of the lateral and third ventricles. An arteriogram revealed a left PCA aneurysm distal to the posterior temporal branch (Fig. 1). There was no evidence of vasospasm. The left PCA was observed to arise from the left internal carotid artery. Immediately following the arteriogram, the patient became unresponsive and demonstrated opisthotonic posturing for approximately 5 minutes. At the conclusion of the event, she was more lethargic than on admission, arousable to painful stimulation and responding to name only. A second CT scan of the head was obtained, revealing an enlargement of the previous hemorrhage.

Operation. The patient was taken to the operating room approximately 18 hours after her initial hemorrhage. A left subtemporal craniotomy was performed. A ventriculostomy was placed through a separate burr hole into the left lateral ventricle and produced bloody cerebrospinal fluid. The temporal lobe was retracted upward and the internal carotid artery was identified. A very large posterior communicating artery was found

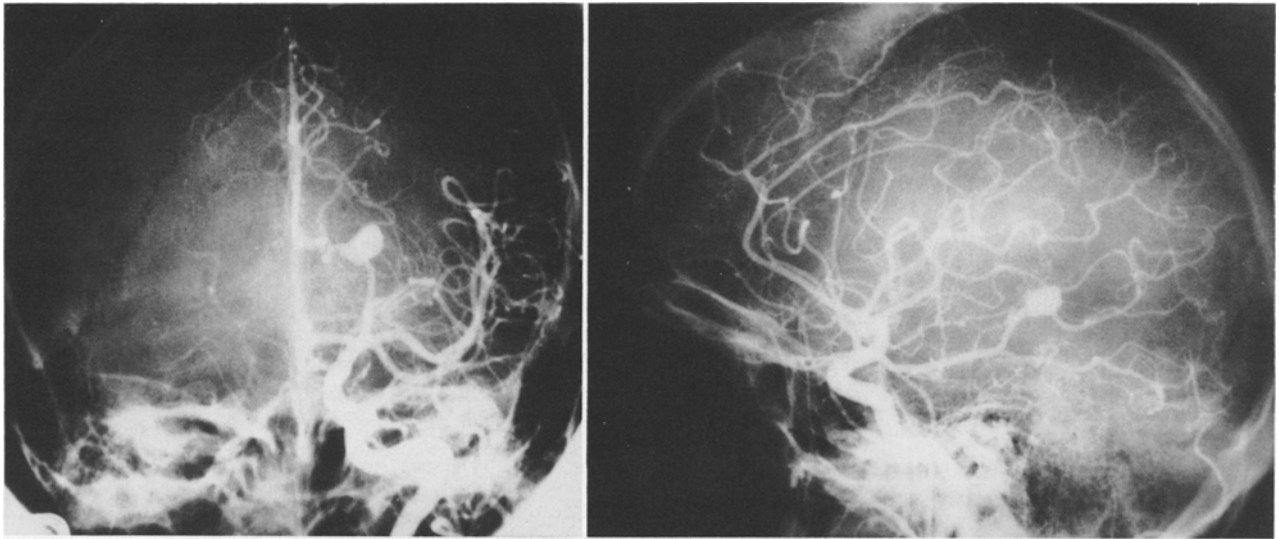


FIG. 1. Preoperative left internal carotid arteriograms, anteroposterior (*left*) and lateral (*right*) views, demonstrating an aneurysm at the P₃ segment of the posterior cerebral artery. These films also illustrate a fetal posterior cerebral artery arising directly from the internal carotid artery.

and traced in an occipital direction to the anterior temporal branch of the fetal PCA. A medium-sized curved Yasargil aneurysm clip was placed on the PCA just distal to this junction. Branches of the medial and lateral posterior choroidal arteries were identified and spared. After closure, the patient was taken to the neurosurgical intensive care unit with the ventriculostomy left in place.

Postoperative Course. The patient was awake, alert, oriented except to date, and was otherwise neurologically normal. Arteriography performed on the 3rd postoperative day demonstrated that the clip was in the proper position. There was no evidence of vasospasm,

and no retrograde filling of the aneurysm could be observed (Fig. 2). There was, however, a small degree of retrograde filling of the left PCA distal to the aneurysm site. On the 4th postoperative day, a CT scan showed no evidence of infarct or encephalomalacia. Mildly dilated lateral ventricles and a resolving hematoma were also observed. Because of the patient's persistently high intracranial pressure, her ventricular drain was replaced with a ventriculoperitoneal shunt on the 5th postoperative day.

Because distal PCA aneurysms are so unusual, several diagnostic studies were performed to rule out other causes of such a lesion. Multiple cultures of blood and cerebrospinal fluid samples were obtained, including

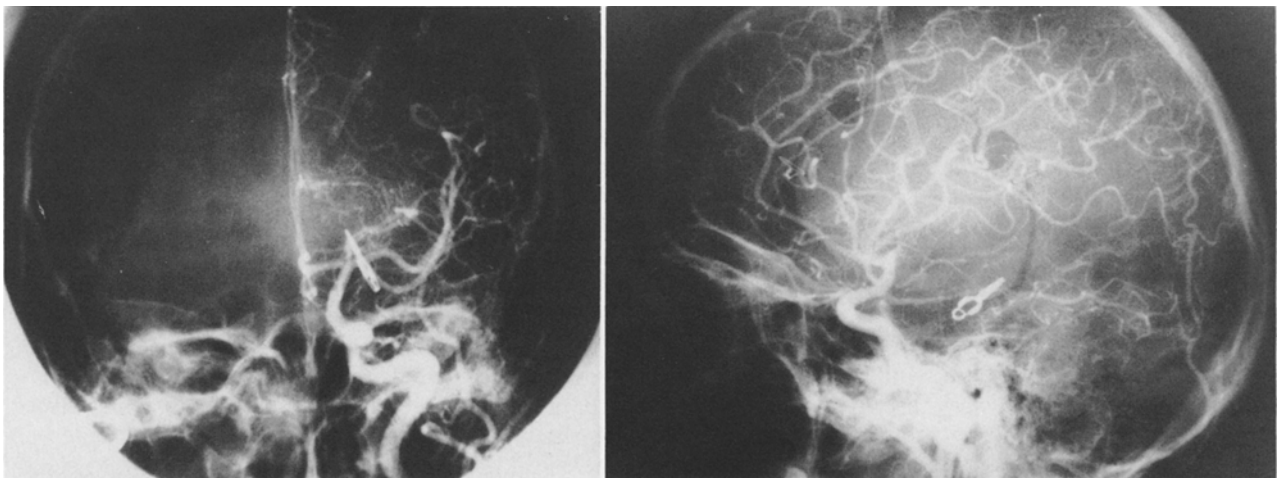


FIG. 2. Postoperative left internal carotid arteriograms, anteroposterior (*left*) and lateral (*right*) views, showing a clip placed on the posterior cerebral artery just distal to the anterior temporal branch. Distal filling of the aneurysm is not evident. A ventriculostomy catheter is also visible.

Distal posterior cerebral artery aneurysm

intraoperative specimens; all cultures were negative. A serum protein electrophoresis, rheumatoid factor, lupus erythematosus cell preparation, antinuclear antibody, and complement (C3) titers were normal. Erythrocyte sedimentation rate was 25 mm/hr and white blood cell count and differential were unremarkable. An echocardiogram was likewise normal. Careful review of all the patient's arteriograms and CT scans revealed no pathology other than the aneurysm. Prior to discharge, formal visual field testing was performed and was normal. She was discharged neurologically intact on the 19th postoperative day.

Discussion

The present case illustrates a rare variety of intracranial aneurysm in an adolescent female. Posterior cerebral artery aneurysms represent approximately 1.0% of all aneurysms.¹⁷ Review of the neurosurgical literature reveals only 21 cases of distal PCA aneurysms.^{2,4,5,7,9-19,21} Aneurysms in children are very uncommon, accounting for only 1.3% of all intracranial aneurysms.¹⁴ Only 23 cases of PCA aneurysms have been documented in individuals 20 years of age or younger.^{1,4,6,7,9,14,15,18,21} Ten of these cases are considered to be distal to the posterior temporal branch or the P₃ segment, as described by Zeal and Rhoton.²² The most common site of origin for PCA aneurysms is the first major branching point beyond the intersection of the posterior communicating artery, as described by Drake and Amacher.⁶ Historically, the first reported case of a distal PCA aneurysm was in 1856.² In his review of the European neurological literature, Bertrams² states that this early case study described a patient presenting with a "meningoencephalic syndrome," although it was not well documented.

Congenital saccular aneurysms are probably the most common form of distal PCA aneurysm in adults; however, a variety of origins have been ascribed to such aneurysms in children.⁸ Mycotic, traumatic, and aberrant vestigial anastomoses have been reported etiologies.^{4,7,15} Sturge-Weber syndrome and moyamoya phenomenon have also been described as potential etiologies contributing to aneurysm formation.^{18,20} Of the distal PCA aneurysms in children, one-half have been found to be the giant (> 2.5-cm) type.^{1,9,16} The present case is most unusual, however, because it illustrates an aneurysm arising from the distal portion of a fetal PCA. These vessels are thought to occur in approximately 30% of the normal population.³ Schaeffer¹⁹ described a similar aneurysm arising from a fetal-type PCA. In that case, a large posterior communicating artery was clipped despite the fact that preoperative arteriograms showed filling of the aneurysm via a hypoplastic PCA. No postoperative arteriograms were obtained.

Presenting signs and symptoms for distal PCA aneurysms are difficult to characterize due to the rarity of

the lesion. These patients have presented with occipital headaches, signs of increased intracranial pressure (nausea and vomiting), and neck stiffness.^{2,11,17} They have demonstrated a homonymous hemianopsia, hemiparesis, and cranial nerve palsies.^{10,13,17} They have also presented with astereognosis, body image disturbances, and, rarely, the Déjérine-Roussy syndrome.^{6,8,12,16,17}

Several surgical methods for treating these aneurysms have been described, including trapping, ligation and excision, clipping, and cauterization.^{5,7,9} Several approaches have also been used, including the pterional, subtemporal, temporo-occipital, and occipital routes.^{6,9,16,19} Clipping the proximal segment of the PCA, particularly the P₂ segment, via the subtemporal approach has been reported to result in good to excellent outcomes.^{1,5,6}

Clinical descriptions in the literature of the preoperative and postoperative conditions of many of these patients, including neurological grade, are incomplete. Although postoperative neurological deficits in these patients can be serious,^{4,12} many patients (particularly children) have been described as being neurologically intact upon discharge, with no visual field deficit.^{1,14,19} The good collateral circulation in the distribution of the PCA has been proposed as the reason for lack of serious neurological sequelae.^{6,12,22} Collateral anastomoses between the anterior and posterior choroidal arteries were emphasized by Hanafée and Jannetta.¹⁰ Splenic branches of both anterior and posterior cerebral arteries also contribute to the collateral vascular supply.²² Contributions by the anterior and middle cerebral arteries to the cortical branches of the PCA are also thought to be involved in the rich collateral network of the occipital lobe.¹²

References

1. Amacher AL, Drake CG, Ferguson GG: Posterior circulation aneurysms in young people. *Neurosurgery* 8: 315-320, 1981
2. Bertrams J: Das periphere Aneurysma der A. cerebri posterior. *Deutsch Z Nervenheilk* 194:243-251, 1968
3. Bisaria KK: Anomalies of the posterior communicating artery and their potential clinical significance. *J Neurosurg* 60:572-576, 1984
4. Burton C, Velasco F, Dorman J: Traumatic aneurysm of a peripheral cerebral artery. Review and case report. *J Neurosurg* 28:468-474, 1968
5. Chou SN, Ortiz-Suarez HJ: Surgical treatment of arterial aneurysms of the vertebrobasilar circulation. *J Neurosurg* 41:671-680, 1974
6. Drake CG, Amacher AL: Aneurysms of the posterior cerebral artery. *J Neurosurg* 30:468-474, 1969
7. Drennan AM: Aneurysms of the larger cerebral vessels. *NZ Med J* 20:324-349, 1921
8. Fox JL: *Intracranial Aneurysms*. New York: Springer-Verlag, 1983, Vol 1, p 147
9. Fukamachi A, Hirato M, Wakao T, et al: Giant serpentine aneurysm of the posterior cerebral artery. *Neurosurgery* 11:271-276, 1982
10. Hanafée W, Jannetta PJ: Aneurysm as a cause of stroke. *AJR* 98:647-652, 1966

11. Höök O, Norlén G, Guzmán J: Saccular aneurysms of the vertebral-basilar arterial system. A report of 28 cases. *Acta Neurol Scand* 39:271-304, 1963
12. Hunt WE, Hess RM: Aneurysm of the posterior cerebral artery with unexpected postoperative neurological deficit. Case report. *J Neurosurg* 26:633-635, 1967
13. Ishikawa M, Waga S, Moritake K, et al: Cerebral bacterial aneurysms: report of three cases. *Surg Neurol* 2: 257-261, 1974
14. Kaplan PA, Hahn FJ: Aneurysms of the posterior cerebral artery in children. *AJNR* 5:771-774, 1984
15. Lemmen LJ, Schneider RC: Aneurysm in the third ventricle. *Neurology* 3:474-476, 1953
16. Obrador S, Dierssen G, Hernandez JR: Giant aneurysm of the posterior cerebral artery. Case report. *J Neurosurg* 26:413-416, 1967
17. Pia HW, Fontana H: Aneurysms of the posterior cerebral artery. Locations and clinical pictures. *Acta Neurochir* 38:13-35, 1977
18. Pozzati E, Padovani R, Frank F, et al: Leptomeningeal angiomatosis and aplasia congenita of the scalp. Case report. *J Neurosurg* 58:937-940, 1983
19. Schaeffer HR: Aneurysms of the posterior cerebral artery. *Med J Aust* 1:632-633, 1964
20. Tanaka Y, Takeuchi K, Akai K: Intracranial ruptured aneurysm accompanying moyamoya phenomenon. *Acta Neurochir* 52:35-43, 1980
21. Weibel J, Fields WS, Campos RJ: Aneurysms of the posterior cervicocranial circulation: clinical and angiographic considerations. *J Neurosurg* 26:223-234, 1967
22. Zeal AA, Rhoton AL Jr: Microsurgical anatomy of the posterior cerebral artery. *J Neurosurg* 48:534-559, 1978

Manuscript received August 7, 1985.

Address reprint requests to: Richard K. Simpson, Jr., M.D., Department of Neurosurgery, Baylor College of Medicine, One Baylor Plaza, Houston, Texas 77030.