Original Article

Ruptured Distal Posterior Cerebral Artery Aneurysm Presenting with Massive Intraventricular Hemorrhage—Case Report—

Kenji KIKUCHI, M.D., Kazuo WATANABE, M.D.,*
and Masayoshi KOWADA, M.D.

脳室内出血を伴った破裂後大脳動脈末梢部動脈瘤の1例

菊地 顕次, 渡辺 一夫,* 古和田 正悦

秋田大学 脳神経外科, *南東北病院 脳神経外科

要 旨: 後大脳動脈末梢部, とりわけ P₃ portion 以降の動脈瘤はまれで, 動脈瘤全体の 0.3% を占めるにすぎない. 手術方法は動脈瘤の部位や大きさによって異なるが, 大別すると pterional, subtemporal, temporooccipital および occipital approach などが報告されている. 最近経験した後大脳動脈末梢部動脈瘤の急性期手術例を報告し, 手術アプローチおよび合併する脳室内出血について若干の文献的考察を行った.

症例は突然の頭痛, 嘔吐および意識障害で発症した 62 歳の女性で, CT でシルヴィウス溝や脳底槽のクモ膜下出血の所見のほかに, 左側脳室後角近傍の脳実質内出血に連続し脳室内出血が描出された. 脳血管撮影では左後大脳動脈末梢の parieto-occipital artery から外上方に突出する, 最大径 8 mm の嚢状動脈瘤が造影された. 手術は腹臥位で脳室ドレナージ後に左後頭開頭を行った. 後頭極をテントより圧排・挙上して四丘体槽に到達し, 最初に後大脳動脈近位部を確保して脳内血腫を除去したのち, 後大脳動脈を順行性に辿って動脈瘤を確認してクリップした. この occipital supratentorial approach は P₃ 以降の後大脳動脈末梢部動脈瘤に対して十分な視野が得られ有用であった.

Summary: The authors report a rare case of distal posterior cerebral artery (PCA) aneurysm in a 62-year-old woman presenting with both subarachnoid and intraventricular hemorrhages. The saccular aneurysm arose from the parieto-occipital artery of the PCA projecting laterally. With the patient placed in a prone position the aneurysm was approached by a supratentorial route through an occipital craniotomy, and successfully obliterated with a Sugita's clip. The patient's postoperative course was uneventful without neurological deficits. The literature concerning aneurysms originating from the distal portion of the PCA is reviewed in the literature and the surgical approaches to the aneurysm are also discussed.

Key words:

- aneurysm
- posterior cerebral artery
- intraventricular hemorrhage

Introduction

Aneurysms of the posterior cerebral artery (PCA) are rare and estimated to comprise approximately 0.7-2.2%⁶⁾¹¹⁾¹³⁾ of all intracranial aneurysms. The

majority of these PCA aneurysms arise near the junction between the trunk of PCA and the posterior communicating artery¹¹⁾¹⁴⁾. By contrast, those originating from the distal or peripheral segment of the PCA are exceedingly uncommon^{1)4)8)~12)15)} and

Yasargil¹⁴⁾ described only 3 patients whose aneurysms arose from the quadrigeminal of P₃ segment of the PCA in his series of 97 patients with vertebrobasilar aneurysms.

We describe an unusual case of ruptured saccular aneurysm of the distal PCA presenting with both extensive subarachnoid and intraventricular hemorrhages, which was successfully managed by an occipital supratentorial approach.

Case Report

A 62-year-old woman was transferred to the hospital after she suddenly developed severe occipital headaches and vomitings, followed by loss of consciousness.

On admission the patient was lethargic, though easily arousable, with stiffness of her neck. There were no obvious motor or sensory abnormalities and her reflexes were equal bilaterally in both upper and lower extremities. The neurological status was then evaluated as Hunt and Kosnik's grade 3. Physical examination, the hemogram, urinalysis and other chemical studies were found to be normal. Roentgenogram of the chest and electrocardiogram were interpreted as within normal limits.

A computed tomographic (CT) scan demonstrated a significant amount of blood clots present predominantly in the left lateral and the third ventricles as well as in the cerebral parenchyma adjacent to the left occipital horn. CT also revealed areas of high density within the subarachnoid cisterns prominently in the perimesencephalic cistern, consistent with the finding of subarachnoid hemorrhage (Fig. 1). Right retrograde brachial angiography showed a saccular aneurysm approximately 5 × 8 mm in size arising from the parieto-occipital artery of the left PCA and projecting laterally and superiorly. There was no evidence of vasospasm on the adjacent blood vessels (Fig. 2).

The patient was operated upon the following day by the occipital supratentorial approach. The patient was placed in a prone position with the neck slightly anteflexed. After a ventriculostomy was done through a separate burr hole into the occipital horn of the right lateral ventricle, a generous left occipital craniotomy was performed. It extended medially to the sagittal sinus and inferiorly to the transverse sinus. The dural flap was hinged medially. The occipital lobe was then gently retracted superiorly from the tentorium, and by the occipital supratentorial approach the PCA

Fig. 1 Plain CT scans obtained before the operation, revealing subarachnoid and intraventricular hemorrhages. Intracerebral hematoma is also seen adjacent to the occipital horn of the left lateral ventricle.

proximal to the aneurysm was identified in the quadrigeminal cistern. When the PCA was followed distally with caution and adjacent intracerebral hematoma was removed, a saccular aneurysm was found pointing laterally. A small Sugita's straight clip was placed on the neck of the aneurysm. The postoperative course was uneventful and successful obliteration of the aneurysm was confirmed on the postoperative angiography done 10 days after the operation (Fig. 3). No vasospasm was observed on adjacent vessels. The patient was discharged without definite neurological deficits.

Discussion

Aneurysms of the vertebro-basilar system constitute 4%¹³⁾ to 10%¹⁴⁾ of all intracranial saccular aneurysms. The majority of these posterior circulation aneurysms arise at or near the basilar bifurcation, followed in order by those along the basilar trunk and on the vertebral artery at the posterior inferior cerebellar artery (PICA)¹¹⁾¹⁴⁾. Aneurysms of the PCA, on the other hand, are infrequent and estimated to comprise approximately 0.7% to 2.2%⁶⁾¹¹⁾¹³⁾ of all intracranial aneurysms, and approximately 15%

Fig. 2 Preoperative right retrograde brachial angiograms with anteroposterior (*left*) and lateral (*right*) views, demonstrating a saccular aneurysm (*arrow*) at the quadrigeminal segment of the left posterior cerebral artery.

Fig. 3 Postoperative right retrograde brachial angiograms with anteroposterior (*left*) and lateral (*right*) views, showing the aneurysm completely obliterated with a Sugita's straight clip.

⁶⁾¹¹⁾¹⁴⁾ of the posterior circulation aneurysms. These PCA aneurysms tend to become giant and fusiform aneurysms¹⁾³⁾⁵⁾⁷⁾⁹⁾¹¹⁾, which may be treated by trapping¹⁴⁾¹⁵⁾ or proximal clip occlusion²⁾ as alternative methods to neck clipping. According to the extensive review of the literature by Zeal and Rhoton¹⁶⁾, only 13% of all PCA aneurysms arise distal to the junction of the posterior temporal artery. In addition in his series of 97 cases with vertebro-basilar

aneurysms, Yasargil¹⁴⁾ had only 3 (3.1%) of distal PCA aneurysms which arose from the P₃ segment of the PCA. Simpson and Parker¹²⁾ documented that as of 1986 there were only 21 cases of distal PCA aneurysms.

The aneurysm presented in this report can be classified as type F or P₄ aneurysm according to Pia's¹¹⁾ or Yasargil's¹⁴⁾ classification, respectively, on PCA aneurysm that arises on either the calcarine or

Table 1 Clinical features in patients with distal PCA aneurysms

Case	Author	(year)	Age/sex	Aneurysm		Clinical presentation	CT	Surgery			Results
				site	type			timing	approach	procedure	
1.	Obrador	(1967)	20/F	P3	giant	blindness			lobectomy	resection	
2.	Ishikawa	(1974)	40/M	P3	saccular bacterial	SAH hemianopsia		delayed		resection	good
3.	Pia	(1977)	43/F	P4	saccular	SAH hemianopsia			lobectomy	clipping	
4.	Yasargil	(1984)	45/M	P3	saccular large	SAH hemianopsia		delayed	OI	clipping	good
5.	Yasargil	(1984)	46/M	P3	saccular	SAH		delayed	OI	clipping	good
6.	Yasargil	(1984)	44/M	P3	saccular large	somnolence hemiparesis ataxia			OI	clipping	good
7.	Simpson	(1986)	14/F	P3	saccular	SAH	SAH, ICH IVH	early	ST	clipping	good
8.	Chang	(1986)	43/F	P3	saccular	SAH		delayed	ST	clipping	fair
9.	Chang	(1986)	63/F	P3	saccular	SAH		delayed	ST	clipping	good
10.	Nakao	(1988)	57/F	P3	saccular	SAH	isodense spot		OI	clipping	
11.	Yoshinaga	(1989)	35/M	P3	saccular	SAH anisocoria hemiparesis	SAH, ICH	delayed	ST	trapping	fair
12.	Ogane	(1991)	75/F	P3	saccular	SAH	SAH	delayed	ST	clipping	fair
13.	Kikuchi	(1992)	62/F	P4	saccular	SAH	SAH, ICH IVH	early	OST	clipping	good

OI=occipital interhemispheric; ST=subtemporal; OST=occipital supratentorial; SAH=subarachnoid hemorrhage; ICH=intracerebral hemorrhage; IVH=intraventricular hemorrhage

parieto-occipital artery. Thirteen cases, including our own, of such aneurysms that arose distal to the junction of the posterior temporal artery or the quadrigeminal segment of the PCA were found to have been reported in sufficient detail as to clinical presentation, neuroradiology, surgical procedure and results (Table 1). There were 5 men and 8 women, ranging in age from 14 to 75 years. Eleven cases had episodes of subarachnoid hemorrhage, and the remaining two cases had progressive neurological deterioration presumably due to mass effect of a large aneurysm. CT findings previously described in 4 patients⁸⁾¹⁰⁾¹²⁾¹⁵⁾ are characterized by subarachnoid blood clots present in the ambient and/or quadrigeminal cisterns occasionally associated with intracerebral hematomas involving the adjacent temporo-occipital region¹⁰⁾¹⁵⁾. In addition in another patient intraventricular hemorrhage involving the lateral and third ventricles was demonstrated¹²⁾. These characteristic features are all well illustrated in the present case and clearly distinct from CT appear-

ances by rupture of anterior circulation aneurysms. In rare instances the aneurysm itself was delineated as an isodense or hyperdense round lesion localized in the ambient cistern⁷⁾⁸⁾. As for surgical treatment the aneurysms were approached mostly in delayed operation through either subtemporal (5 cases) or occipital interhemispheric route (4 cases), and the majority of them underwent successful neck-clipping. The operative results were generally satisfactory in most cases. However, cerebral infarction occurred in two cases due to occlusion of the parent or adjacent artery after trapping or clipping procedures¹⁾¹⁰⁾.

Surgical approaches to this particular aneurysm of the PCA deserve special mention. Yasargil¹⁴⁾ subdivided these PCA aneurysms into four groups according to the location of the aneurysm; P₁, P₁/P₂ junction, P₂ and P₃ aneurysms, and reviewed his surgical approaches based upon anatomical relationships. The surgical approach to aneurysms located in the proximal part of the PCA may be the pterional approach, or possibly subtemporal

approach. Pterional transsylvian approach may be best employed if the origin of the aneurysm is within 1 cm of the bifurcation of the basilar artery (P_1 and P_1/P_2 segments). By contrast for PCA aneurysms located distal to the junction of the posterior communicating artery (P_2 segment), a subtemporal approach may be utilized to allow easy access to the neck of the aneurysm. However, excessive retraction of the temporal lobe may result in intracerebral hematoma or cerebral edema²⁾. In particular the presence of the well-developed vein of Labbé would eventually provide only a limited operative field to access to the PCA. For the more distal aneurysms (P_3 and P_4 segments) such as the one in the present case, the approach of choice is either subtemporal or occipital approach. Yasargil¹⁴⁾ used occipital interhemispheric approach for P_3 aneurysms in a sitting position with spinal drainage. Nakao *et al.*⁸⁾ also approached P_3 aneurysm via occipital interhemispheric route with the patient placed in a lateral recumbent position, by which the occipital lobe of the affected side spontaneously sunk by its own weight and retraction of the occipital lobe could be kept minimal. However such surgical sequelae as visual field defect may ensue in this approach due to direct compression of the visual cortex or area striata on the medial surface of the occipital lobe⁸⁾. In the presented case the interhemispheric approach was abandoned because of the presence of multiple “bridging” veins between the superior sagittal sinus and the occipital lobe, and more distal location of the aneurysm than those documented by Yasargil¹⁴⁾ and Nakao⁸⁾. After ventricular drainage in a prone position, we took the occipital supratentorial approach, retracted the occipital pole, identified with ease the proximal portion of the PCA in the quadrigeminal cistern, and successfully clipped while retracting the occipital lobe superiorly from the tentorium. This approach combined with ventricular drainage was safe and feasible, especially for peripheral aneurysms of PCA as described in this report, offering excellent visualization for handling both the aneurysm and the associated intracerebral hematoma. This approach may also be designated as a “trans-occipital pole supratentorial approach”. It should be emphasized again that surgical approach to the PCA aneurysms varies depending upon their anatomical locations.

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