

The Dissecting Aneurysm of the Posterior Inferior Cerebellar Artery with Unusual Clinical Course

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The dissecting aneurysms of the posterior cerebral circulation arise most commonly from the vertebral artery and occasionally extend to the posterior inferior cerebellar artery (PICA). The dissecting aneurysm localized in the PICA without involving the vertebral artery is rare. We present a PICA dissecting aneurysm that had kaleidoscopic clinical course of bleeding, occlusion, and recanalization before the surgery. The patient had serial follow-up angiograms based on significant changes of clinical status. The patient successfully underwent microsurgical trapping with clips for the dissecting aneurysm and showed neurological improvement.

KEY WORDS : Dissecting aneurysm · Subarachnoid hemorrhage · Posterior inferior cerebellar artery.

Introduction

The posterior inferior cerebellar artery (PICA) aneurysms are rare and accounting for 0.5~3.0% of all intracranial aneurysms^{5,8)}. They typically occur at the origin of the PICA. Dissecting PICA aneurysms isolated from the origin from the vertebral artery (VA) are extremely rare^{10,15)}. We present a PICA dissecting aneurysm without involving the origin of the PICA. The patient had complex clinical course of initial subarachnoid hemorrhage, subsequent infarctions, and eventually neurological improvement along with serial changes of angiographic findings, such as stenosis, occlusion, and final recanalization. We review the literature PICA dissecting aneurysms and discuss treatment strategy based on the natural course of PICA dissecting aneurysms.

Case Report

A 45-year-old, non-hypertensive woman had suddenly developed occipital headache, vertigo and vomiting followed by loss of consciousness. The patient was brought to ER with neurological status of a Hunt and Hess Grade IV. Subarachnoid hemorrhage was noted in the prepontine and perimesencephalic cisterns on CT scan (Fig. 1A). Any history of head or

neck trauma was denied. Initial vertebral arteriography showed sclerotic narrowing at the lateral medullary segment of right PICA. There was not any bleeding focus like aneurysmal dilatation in both carotid and vertebrobasilar systems (Fig. 1B). Conservative treatment started and she recovered her consciousness at a late hour of the day.

On the hospital day 11, her mental status changed to deeply drowsy. Brain CT was checked and there was no evidence of rebleeding. She underwent bilateral vertebral arteriography

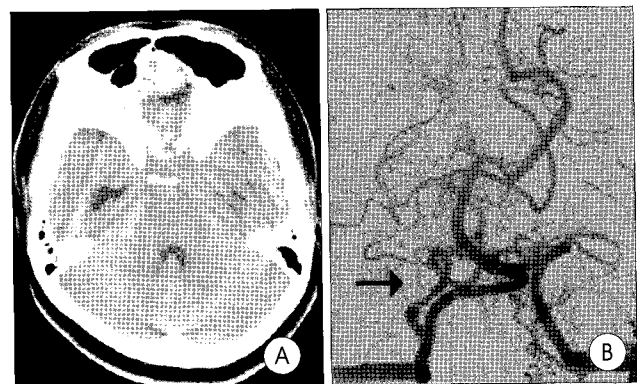


Fig. 1. A : Brain computed tomography shows thick subarachnoid hemorrhage in prepontine cistern. B : The initial vertebral arteriography reveals sclerotic narrowing at the second segment of right posterior inferior cerebellar artery (arrow).

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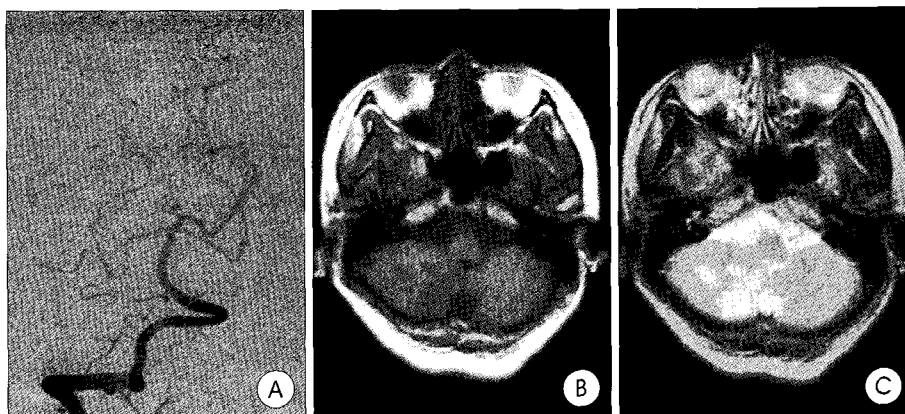


Fig. 2. A : Posterior inferior cerebellar artery is not seen on the follow-up vertebral angiography B : T1-weighted image demonstrates multiple decreased signals in right posterior inferior cerebellum. C : T2-weighted image shows high signals at corresponding areas.

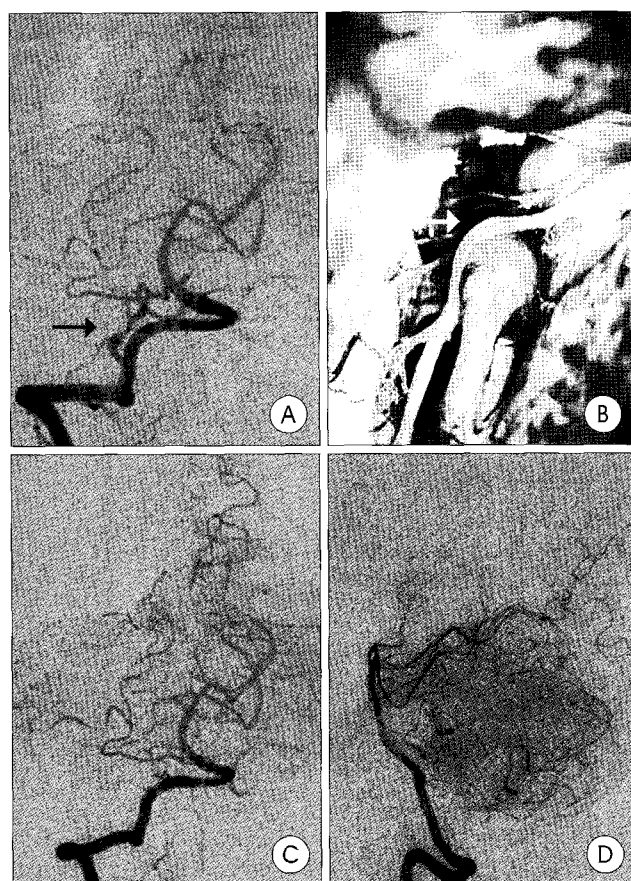


Fig. 3. A : Contrast dye fills the posterior inferior cerebellar artery again one week after second angiography (arrow). B : Subadventitial hemorrhage and fusiform dilatation of proximal posterior inferior cerebellar artery are noted intraoperatively (arrow). C-D : The postoperative angiogram obtained 2 weeks after the surgery demonstrates completely trapped dissecting aneurysm of the PICA and collateral supply from ipsilateral anterior inferior cerebellar artery.

and right PICA was totally invisible (Fig. 2A). She had partial Wallenberg's syndrome including vertigo, vomiting and ataxia. MRI was obtained and the T1-weighted image demonstrated low signal areas in the right cerebellum (Fig. 2B). T2-weighted

images revealed increased signal intensities at corresponding areas (Fig. 2C).

The third vertebral angiography was performed one week after clinical improvement. The whole PICA emerged again and irregular stenosis at the second segment of PICA was noted (Fig. 3A). Neither a double lumen nor the retention of the contrast medium was observed. Although significant aneurysmal dilatation was not identified yet, clinical course and follow-up radiologic findings suggested risk

of rebleeding that we decided to perform surgical exploration.

A right suboccipital craniotomy with far lateral extension was performed 1 months after the onset. A subadventitial hemorrhage with black discoloration was noted in the wall of the aneurysmal protuberance about 1cm in length at the second segment of PICA (Fig. 3B). Two branches of the PICA were observed; the first branch, originating from the aneurysm, coursed caudally, and the second, originating from the portion proximal to the end of subadventitial hemorrhage, coursed medially toward the brain stem. The dissecting aneurysm included the origin of the first perforating branch and was entrapped with two aneurysm clips; one was applied at the origin of the PICA, and the other was placed between the distal end of the subadventitial hemorrhage and perforators to brain stem.

The postoperative course was uneventful. The patient recovered to neurological status with mild dizziness and ataxia. The postoperative angiogram obtained 2 weeks after the surgery demonstrated completely trapped dissecting aneurysm of the PICA and collateral supply from ipsilateral anterior inferior cerebellar artery (Fig. 3C, D).

Discussion

Dissecting aneurysms of the PICA without involving the vertebral artery are rare^{3,5,8}. Precipitating factors reported for dissecting aneurysms, such as trauma, giant cell arteritis, migraine, fibromuscular dysplasia, moyamoya disease, Marfan's syndrome, or homocystinuria, were not found in our patient, although these have been reported in the literature^{1,3}. Friedman and Drake reported fourteen cases of subarachnoid hemorrhage from dissecting aneurysms located on the vertebrasilar circulation; one presented with a fusiform dilatation of the right PICA just beyond its origin, the wall of which was found at surgery to be characteristically a purplish-red³. Yamaura and his colleagues reported a case of dissecting aneurysm of the

PICA presenting with Wallenberg's syndrome and showing a pattern of angiographic findings similar to our case¹². According to a report, two of twenty four patients with dissecting aneurysms of the intracranial vertebral artery had aneurysm at the origin of the PICA and underwent clip occlusion of the proximal PICA and entrapment¹³. Hudgins described distal PICA fusiform aneurysm in which report they concluded fusiform aneurysm of the PICA is caused by dissection⁵.

The diagnosis of dissecting aneurysm has been based on angiographic findings such as "string sign", "rosette sign", "pearl reaction", and luminal narrowing^{1,3}. The only definite angiographic diagnostic sign, however, is the demonstration of a "double lumen"¹¹. Since the classical true diagnostic "double lumen sign" was rarely observed in the angiograms, it was not easy to diagnose dissecting aneurysm of the vertebral artery^{2,11}. We think that such findings are hard to be demonstrated in small vessels like distal segment of PICA.

The causes of falsely negative angiographic findings of SAH include intra-aneurysmal thrombosis and intra-aneurysmal blood stagnation⁶. MRI has demonstrated high sensitivity in the detection of an intramural hematoma or the double lumen of dissection aneurysms in the vertebrobasilar system⁴. In our case, the poor resolution of the MRI failed to show the area of high-signal intensity in the wall of the narrowed lumen of the PICA, but we confirmed subadventitial hemorrhage in the arterial wall at surgery. Postangiographic 3D CT scans obtained immediately after cerebral angiography may reveal the angiographically occult thrombosed aneurysmal sac which would be not demonstrated on MR angiography because the large volume of contrast medium induces the late enhancement of the thrombosed aneurysm⁹.

The treatment strategy of dissecting aneurysms remains controversial because the natural course of the disease is not fully understood¹⁴. Yamaura have pointed out that a ruptured dissecting aneurysm enters into a healing stage approximately 1 month after the first attack¹³. In one analysis of serial angiographic findings of unruptured VA dissections presented with ischemic symptoms, only one of seventeen patients was re-analyzed with fusiform dilatation⁷. Yamakawa recently reviewed serial angiographic findings of the PICA dissections in the literature and there was no case of recanalization after initial bleeding with string sign of PICA and subsequent complete occlusion on follow-up angiography¹¹. Dinichert and colleagues reviewed angiographic findings of published PICA dissecting aneurysms and three of twenty four showed spontaneous favorable evolution³. There was no case which showed recanalization along with newly noted fusiform dilation after occlusion on the follow-up angiographies. Understanding the spectrum of clinical courses of PICA dissection is essential to make a therapeutic plan. Our case afforded more clinical know-

wledge about the natural course of PICA dissecting aneurysms.

Rebleeding rate of dissecting aneurysms in the vertebrobasilar complex has been reported to occur in 24% of cases with a very high mortality in the first few weeks after hemorrhage and early surgical treatment has been recommended¹³. To our knowledge, there is no evidence of high rebleeding risk from PICA dissections in contrast to vertebral artery dissecting aneurysms¹⁰. It could be why most reported cases with PICA dissections had good outcome and spontaneous favorable evolution with temporary neurological improvement could be observed^{2,13}. However, the rebleeding rate of isolated PICA dissecting aneurysm is not thoroughly investigated. More sufficient evidence is required to safely assume that the natural history of PICA dissections is more benign than other dissecting aneurysms of posterior circulation. Primary goal of the surgery for PICA dissecting aneurysm should be prevention of rebleeding in spite of no evidence of high risk or mortality in comparison with vertebral artery dissecting aneurysms.

The most common treatment technique used in this condition is proximal occlusion or trapping of the PICA with or without extracranial to intracranial bypass^{10,14}. Endovascular techniques have also afforded safe treatment in selected cases¹⁴. Endovascular approach is minimally invasive and safe, especially when the test occlusion is tolerated and adequate collateral circulation is present.

We performed microsurgical trapping with clips to prevent rebleeding and progression of dissection. In our patient, ischemic symptom had already occurred and she was tolerable to sacrifice of the PICA. Direct inspection of the affected segment during surgery provided the surgeon with advantage for decision to sacrifice or save the parent vessel and perforators going to stem.

Conclusion

The natural history of isolated PICA dissecting aneurysm remains unknown. We described a patient with kaleidoscope of clinical course traced by using serial angiographies and eventually good neurological outcome with microsurgical treatment.

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