Vertebrobasilar Junction Fenestration
Associated With Dissecting Aneurysm of
Intracranial Vertebral Artery

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Background
Vertebrobasilar junction fenestration is considered to be a subtype of fenestration of the proximal basilar artery, which has been described only in autopsy cases. The fenestration associated with a dissecting vertebral aneurysm is extremely rare.

Case Description
A 47-year-old man presented with subarachnoid hemorrhage. The four-vessel angiogram showed a fusiform dilatation with an intimal flap of the left vertebral artery distal to the origin of the posterior inferior cerebellar artery and a fenestration at the vertebrobasilar junction, in which a small limb of the fenestration arising from the distal portion of the left vertebral artery bridged the proximal basilar trunk, while another limb had a large diameter showing the same diameter as the basilar artery. The dissecting aneurysm was treated with body clipping by directly clipping the ruptured portion of the aneurysm via a suboccipital approach in an early operation 48 hours after the ictus. The patient had a good recovery and returned to his work. He is well at a 5-year follow-up.

Conclusions
The relevant angiographic features of the vertebrobasilar junction fenestration and the surgical treatment of such associated aneurysms are discussed. (Stroke. 1994;25:1273-1275.)

Key Words
• aneurysm, dissecting • verteobasilar circulation • surgery

Basilar artery fenestration is an uncommon developmental anomaly occurring in 1% to 5% of autopsy specimens. The fenestration typically involves the vertebrobasilar bifurcation or proximal basilar trunk, but it may be more distal. Association of a saccular cerebral aneurysm at the fenestration has been well documented. However, the fenestration associated with a dissecting vertebral aneurysm is much less common. In this report, we describe a rare case of dissecting aneurysm of the left intracranial vertebral artery in conjunction with a vertebrobasilar junction fenestration.

Case Report
A 47-year-old man had a sudden onset of severe headache and recurrent vomiting while washing his face one morning. He was seen at the Department of Surgery in our University Hospital because he had previously undergone gastrectomy. He was suspected of having subarachnoid hemorrhage (SAH) and was referred to our service. Neurological examination on admission disclosed that he was drowsy, with nuchal rigidity. A computed tomographic scan revealed diffuse SAH, particularly dense in the left cerebellopontine angle. The emergency four-vessel angiograms showed a fusiform dilatation with an intimal flap of the left vertebral artery (VA) distal to the origin of the posterior inferior cerebellar artery (PICA) and a fenestration at the vertebrobasilar junction (Fig 1). The diameter of the left VA was slightly larger than that of the right; a smaller limb of the fenestration was bridging the distal portion of the left VA and the proximal basilar trunk, but it was not seen by injection through the right VA (Fig 2). With the preoperative diagnosis of a ruptured dissecting aneurysm, the operation was performed 2 days after his admission.

The aneurysm was approached via a left retromastoid suboccipital craniectomy with the patient in the lateral position. After removal of bloody cerebrospinal fluid from the cisterna magna and dissection of the proximal VA, a fusiform dilatation of the VA was found just behind the largest bundle of the tenth cranial nerve. The dilatation segment was bluish, suggesting a dissecting aneurysm. The aneurysm was exposed from the pons, and the distal segment of the parent artery was confirmed. A small limb of the fenestration was partially observed, from which the left anterior inferior cerebellar artery (AICA) was arising. The ruptured portion of the aneurysm appeared to be the dome opposite to the parent artery, around which some fresh clots were seen. Direct clipping of the ruptured portion with a long straight clip (Sugita clip, No. 19) was successfully carried out to form the vertebral trunk under temporary trapping. A thin strip of Bemsheet cotton (Kawamoto Hotai Zairy Co) with fibrin glue was placed over the aneurysm to reinforce its wall. The postoperative course was uneventful. The parent artery was confirmed to be patent on the angiogram taken 7 days after the operation, with slight aneurysmal dilatation remaining (Fig 3). Five years later, the patient is doing well, with no neurological deficit.

Discussion
Basilar artery fenestration has received increasing attention over the last 15 years, as the lesion may be
associated with an aneurysm at its location.\textsuperscript{5,7} Although the occurrence of aneurysms in the fenestration is a subject of controversy, there is evidence to suggest that existence of defects in the tunica media of the vessel at each end of the fenestration and local hemodynamic forces at the proximal site may precipitate aneurysm formation.\textsuperscript{9} The reported incidence of aneurysms of the basilar artery fenestration varied from 7\% to 35.5\%.\textsuperscript{10,7} In 37 cases collected by San-Galli et al\textsuperscript{10} up to 1992, all were saccular aneurysms and were located mostly at the proximal end of the fenestration. The present case was quite exceptional in that it was a spontaneous dissecting aneurysm of the intracranial VA, distal to the PICA origin, but not at the fenestration. We encountered another similar case that was described elsewhere by Hara et al\textsuperscript{8} in 1991. In that case, the cerebral angiography demonstrated aneurysmal dilatation with segmental narrowing of the left VA in a middle-aged man suffering SAH. Right vertebral angiography was not performed because of his poor condition and respiratory distress. Repeated vertebral angiograms, taken 4 months after conservative treatment of the ruptured dissecting aneurysm, revealed complete occlusion of the left VA just distal to the origin of the PICA, indicating spontaneous entrapment of the lesion. The right vertebral angiogram showed retrograde filling of the distal portion of the left VA and a basilar artery fenestration. Reviewing the angiograms of that case, we observed that the right limb in a small diameter of the fenestration arising from the distal portion of the right VA connected with the proximal basilar trunk, while the left limb had a large diameter, the same as that of the basilar artery. This
Finding was fundamentally the same as that of our case in this report. There seems to be no doubt from these data that the fenestrations of the two cases possess features of the verteobasilar junction fenestration. As described by De Caro et al.,11 the verteobasilar junction fenestration refers to one small limb of the fenestration bridging the lateral surface of the rostral end of the ipsilateral VA and the proximal basilar trunk and another larger limb representing the same diameter as that of the remaining part of the basilar artery. Such a fenestration was considered to be a subtype of fenestration at the proximal basilar artery, and it may be caused by the persistence of the cranial part of a primitive lateral verteobasilar anastomosis, unlike other common fenestrations of the proximal basilar artery caused by the incomplete fusion of the primitive paired basilar arteries. Perhaps it is the different embryological origin of the verteobasilar junction fenestration that results in occurrence of the aneurysm at sites rather than the fenestration, similar to the VA fenestration associated with aneurysms in variable locations.1,12,13 However, the relation of dissecting aneurysms to the verteobasilar junction fenestration cannot be elucidated until a larger number of cases are accumulated. It should be emphasized that bilateral vertebral angiography with different projections is most useful to identify the verteobasilar junction fenestration, because one small limb of the fenestration could arise from the distal segment of its parent VA, and it could not be observed by the injection through the contralateral VA if the vertebral axial blood flow did not mix in the region of the proximal basilar artery.

In regard to the surgical treatment of a vertebral dissecting aneurysm associated with a verteobasilar junction fenestration, care should be taken to avoid injury to perforating arteries of the distal segment of the intracranial VA and important branches, such as the AICA, of the fenestration. Although clip occlusion of the proximal VA is most commonly used, we made a body clipping or direct clipping of the ruptured portion of the aneurysm; in addition, we reinforced the remaining aneurysm with Bemsheets because the affected artery was larger than the contralateral VA and the left AICA arising from the proximal part of the small limb of the artery. The result of our case was encouraging, suggesting that body clipping may be a useful technique for ruptured dissecting aneurysms operated on in the early stage to maintain patency of the parent artery and prevent rebleeding. On the other hand, it must be pointed out that this technique may fail to control further dissection; follow-up cerebral angiographies are necessary.14

References

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