Subarachnoid Hemorrhage Caused by Ruptured Dissecting Aneurysm Arising From the Extracranial Distal Posterior Inferior Cerebellar Artery

—Case Report—

Homare NAKAMURA, Toshihide TANAKA*, Takami HIYAMA, Shinji OKUBO, Tadashi KUDO, Hiroo KOBAYASHI, and Mieko ODANAKA**

Department of Neurosurgery, Ishioka Cardiology and Neurosurgery Hospital, Omitama, Ibaraki;
*Department of Neurosurgery, Jikei University School of Medicine Kashiwa Hospital, Kashiwa, Chiba;
**Department of Pathology, St. Marianna University School of Medicine, Kawasaki, Kanagawa

Abstract

A 50-year-old man presented with a dissecting aneurysm arising from the extracranial portion of the right posterior inferior cerebellar artery (PICA) causing subarachnoid hemorrhage (SAH) and manifesting as sudden onset of disturbed consciousness. Computed tomography showed SAH with ventricular reflux predominantly in the posterior fossa. Angiography revealed a fusiform aneurysm of the right PICA originating extracranially from the right vertebral artery. The aneurysm was isolated and excised. Histological examination showed dissection of the aneurysm wall. Dissecting aneurysm arising from the extracranial portion of the PICA is extremely rare.

Key words: extracranial aneurysm, posterior inferior cerebellar artery, subarachnoid hemorrhage, dissection

Introduction

The posterior inferior cerebellar artery (PICA) is well known for showing anatomic variations. Cadaveric and angiographic studies have shown that the PICA arises from the extracranial portion of the vertebral artery (VA) in 17–18% of cases. Approximately 3% of all intracranial aneurysms arise from the PICA. Two thirds of PICA aneurysms are located at the junction of the VA, whereas distal PICA aneurysms are much less common. Extracranial aneurysms arising from the PICA are rare.

We describe a case of dissecting aneurysm arising from the extracranial portion of the PICA causing subarachnoid hemorrhage (SAH).

Case Report

A 50-year-old man with a history of hypertension suffered sudden onset of severe headache and neck pain, and visited a local hospital in January 2008. Computed tomography (CT) showed SAH predominantly in the posterior fossa. During transfer to our hospital, he fell into a deep coma.

On admission, his neurological score was Hunt and Kosnik grade 5. Bilateral light and corneal reflexes were absent. He had difficulty in spontaneous breathing, so emergency endotracheal intubation was performed to allow controlled ventilation. He had no history of trauma. Routine laboratory examinations were within normal limits. CT showed SAH with acute subdural hematoma predominantly in the cisterna magna and basal cistern, with intraventricular hemorrhage in the third and fourth ventricles (Fig. 1). Right vertebral angiography revealed a fusiform aneurysm of the right PICA originating extracranially from the right VA at the C1 level (Fig. 2). The aneurysm was found in the straight segment of the artery, not at a bend or bifurcation. Three-dimensional CT showed the aneurysm was located at the top of the posterior C1 arch (Fig. 3). His condition did not change during the examination. Three hours after admission, surgery was performed.

The patient was placed in the prone position. Suboccipi-
Fig. 1 Computed tomography scans at onset showing subarachnoid hemorrhage predominantly in the posterior fossa.

Fig. 2 Right vertebral angiograms, anteroposterior view (A) and lateral view (B), showing an extracranial ruptured aneurysm (arrow) arising from the posterior inferior cerebellar artery.

Fig. 3 Three-dimensional computed tomography scan showing the aneurysm (arrow) located at the top of the posterior C1 arch.

Fig. 4 A: Intraoperative photograph showing that the posterior inferior cerebellar artery (PICA) was occluded at the proximal side with clip. B: Indocyanine green videoangiogram showing adequate retrograde flow from the distal PICA (arrowheads).

Fig. 5 Intraoperative photograph showing the aneurysm (arrow) retrieved from the posterior inferior cerebellar artery.

Fig. 6 Photomicrographs of the surgical specimen showing the disrupted internal elastic lamina and the dissection in the tunica media (asterisks). A: Elastica Van Gieson stain, ×20; B: hematoxylin-eosin stain, ×40.

tal craniotomy was performed to prepare the occipital artery for bypass surgery if required, then C1 laminectomy was performed. After the dura was incised in the midline, the thickened subdural and subarachnoid hematomas were evacuated from the posterior cranial fossa. The SAH clot was thicker on the dorsal aspect of the cord. Following removal of the clot along the right distal PICA, a fusiform aneurysm surrounded by a massive clot was located at the straight segment of the PICA at the C1 level. Since the neck of the aneurysm was not identified, the PICA was occluded at the proximal side with a clip, and then adequate retrograde flow from the distal PICA was
confirmed with indocyanine green videoangiography (Fig. 4). In addition, no perforators to the medulla from the PICA were identified in the vicinity of the aneurysm. Therefore, the aneurysm was completely isolated, so no bypass surgery was performed, and the aneurysm was excised (Fig. 5). The wall of the aneurysm was found to be elastic and thick. Histological examination found that the internal elastic lamina was disrupted, and the tunica media was destroyed with cavity formation (Fig. 6A), compatible with dissection of the arterial wall. Numerous fibroblasts were found within the thickened, destroyed tunica media, suggesting chronicity (Fig. 6B).

The postoperative course was uneventful. The patient regained full consciousness. He was discharged with moderate disability due to slight ataxia and mild dysphagia.

### Discussion

Sixteen cases of extracranial aneurysm arising from the distal PICA including the present case have been reported, located in the anterior medullary segment in 1 case, the lateral medullary segment in 4, the tonsillomedullary segment in 5, and the caudal loop in 2 (Table 1).1–9,11–13,15,16 Most aneurysms were saccular. Surgical interventions including endovascular procedures were performed in all cases, but clipping was employed in most cases. Brain stem perforators rarely originate distal to the telovelotonsillar segment, so isolation of the aneurysm may be utilized. In the present case, the aneurysm was excised following isolation so that further histological analysis could be carried out.

The etiology of formation of extracranial aneurysms arising from the PICA may involve the unusual course of the PICA and VA resulting in hemodynamic stress at the bend in the segment and at the top of the loop. In the present case, the shape and location of the aneurysm were different from those reported previously. Vertebral angiography revealed a fusiform aneurysm, which histological examination showed to be a dissecting aneurysm. A ruptured aneurysm in the distal cerebral artery is usually mycotic or traumatic. In the present case, histological examination found no evidence of vasculitis or infection, thus excluding infectious origin. Moreover, the location of the aneurysm was not associated with either the bending or the branching point of the PICA, but coincided with the C1 lamina. Chronic rotation or flexion/extension stress caused by an occipital blow may have caused interaction between the C1 lamina and the PICA, resulting in damage to the arterial wall.

The PICA segments have been classified as the anterior medullary, lateral medullary, tonsillomedullary, telovelotonsillar, and cortical segments.10,14 However, this classification is not appropriate if the PICA arises from the extracranial portion of the VA. We propose the addition of the extracranial straight segment of the PICA to the clas-
sification, as in the present case.

References


Address reprint requests to: Homare Nakamura, M.D., Department of Neurosurgery, St. Marianna University School of Medicine Yokohama City Seibu Hospital, 1197-1 Yasashi-cho, Ashi-ku, Yokohama, Kanagawa 241-0811, Japan.