Case Studies

A Case of Ruptured Vertebrobasilar Junction Aneurysm Associated with Subclavian Steal Phenomenon

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A 77-year-old woman with arteriovenous shunt for hemodialysis in the left forearm suffered from subarachnoid hemorrhage due to the rupture of a saccular aneurysm located on the left lateral wall of vertebrobasilar junction. Her left subclavian artery was severely stenosed and subclavian steal phenomenon was demonstrated on the digital subtraction angiography. Embolization of the parent artery including the aneurysm using detachable coils resulted in the successful obliteration of the aneurysm through the revascularized left subclavian artery. This is the first case in which the vertebrobasilar junction aneurysm would be caused by the hemodynamic stress due to the subclavian steal phenomenon combined with the shunt for hemodialysis in the left forearm. **Key Words:** Endovascular surgery—dialysis shunt—hemodynamic stress—subclavian steal phenomenon—vertebrobasilar junction aneurysm.

Introduction

Hemodynamic stress has a pivotal effect on the formation of cerebral aneurysms. And in the daily clinical practice, as the representative ones, de novo aneurysm on the feeding arteries of cerebral arteriovenous malformation and that on the vertebrobasilar arteries in moyamoya disease or internal carotid artery occlusion has been encountered.[1-3]

On the other hand, although subclavian steal phenomenon due to ipsilateral subclavian artery stenosis or occlusion has been well known, the incidence of this pathology is not so high as the popularity of the name. Because subclavian steal phenomenon induces hemodynamic stress on the vertebrobasilar arteries, it can lead to cerebral aneurysm formation. However, only 7 cerebral aneurysm cases associated with hemodynamic stress induced by subclavian steal phenomenon have been reported including present case; therefore, this clinical entity has been considered as quite rare.[4,5] In addition, in the present case, hemodialysis shunt has been placed in her left arm that is supposed to increase the hemodynamic stress of the subclavian steal phenomenon.

In this report, we demonstrate this rare case of the aneurysm at the vertebrobasilar junction (VBJ) due to the hemodynamic stress of the subclavian steal phenomenon and ipsilateral hemodialysis and discuss the

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prophylactic strategy for subarachnoid hemorrhage (SAH) in this patient.

Case Report

A 77-year-old woman presenting with sudden onset of severe headache was transferred to our hospital. On admission, she was alert and had no neurological deficits (World Federation of Neurosurgical Surgeons Scale I). Her medical history included chronic renal failure, and she had received dialysis through a shunt in the left forearm created 10 years ago. Computed tomography (CT) revealed diffuse SAH predominantly in the left posterior cranial fossa (Fig 1, A,B). On CT angiography, there was a saccular aneurysm located on the left wall of the VBJ (Fig 1, C). Furthermore, the left subclavian arteriography showed approximately 90% stenosis of the proximal subclavian artery (Fig 2, A). The right vertebral arteriography demonstrated a wide-necked saccular aneurysm with a maximum diameter of 6.1 mm at the VBJ (Fig 2, B), and the retrograde flow from the right vertebral artery (VA) to the left subclavian artery was observed (Fig 2, C).

The patient was diagnosed with SAH due to the ruptured VBJ aneurysm probably by hemodynamic stress due to subclavian steal phenomenon, which was further enhanced by the increased blood flow due to the arteriovenous shunt on the left forearm. Because intraaneurysmal coil embolization was judged at high risk of incomplete occlusion because of the wide neck morphology and the augmented hemodynamic stress, we intended to trap the parent artery including the aneurysm. The patient was informed regarding all surgical details, and informed consent was obtained before surgery.

Preceding the embolization, percutaneous transluminal angioplasty for the severe stenosed left subclavian artery was performed to place the access route to the aneurysm, and to restore the blood flow through the subclavian artery to the left forearm.

A 7 French guiding catheter (Launcher; Medtronic, Minneapolis, MN) was advanced to the origin of the left subclavian artery via a transfemoral approach. The stenosis of the left subclavian artery was dilated using percutaneous transluminal angioplasty balloons, Sterling 3.0 mm × 20 mm (Stryker, Kalamazoo, MI), and Cutting Balloon 4.0 mm × 15 mm (Boston Scientific, Natick, MA). Successful dilatation was achieved (Fig 3, A,B), and the retrograde flow from the right VA to the left subclavian artery was disappeared. Then, the guiding catheter was

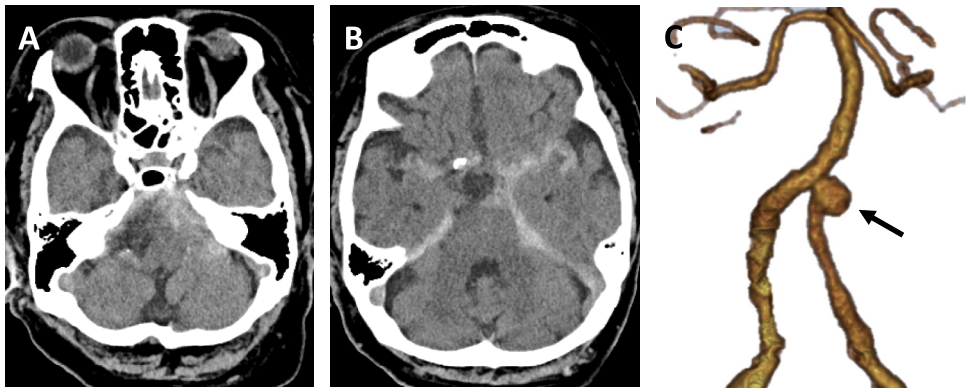

Figure 1. *(A and B) CT images on admission showed diffuse subarachnoid hemorrhage predominantly in the left cerebellopontine angle cistern. (C) CT angiography demonstrated a saccular aneurysm located at the vertebrobasilar junction (arrow). Abbreviation: CT, computed tomography.*

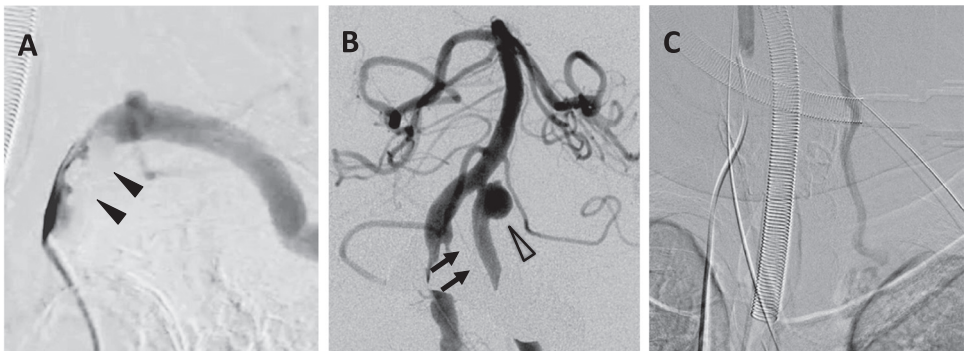

Figure 2. *(A) Left subclavian angiography (A-P view) revealed a severe stenosis at the proximal portion of the left subclavian artery (arrowheads). (B) Right vertebral angiography (A-P view) showed a wide-necked aneurysm (arrow). (C) Right vertebral angiography (A-P view) demonstrated subclavian steal phenomenon from the right vertebral artery to left subclavian artery. Abbreviation: A-P, anterior-posterior.*