Case Studies

Coil Embolization through Collateral Pathway for Ruptured Vertebral Artery Dissecting Aneurysm with Bilateral Vertebral Artery Occlusion

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Introduction

Intracranial vertebral artery dissecting aneurysm (VADA) is a well-known cause of subarachnoid hemorrhage (SAH). Endovascular treatment is now well established as an effective method for treating ruptured VADA, especially in the acute phase of SAH.[1,2] Although stent technology has introduced a new strategy in the treatment of VADA, internal trapping of both the affected vertebral artery (VA) and the VADA using detachable coils is still the standard endovascular treatment for the acute phase of ruptured VADAs to prevent re-rupture.[3,4] Here we report a case of a ruptured VADA associated with bilateral VA occlusion at the points of origin. We successfully performed internal trapping through the muscular branches of the neck, which were functioning as a collateral pathway of the vertebrobasilar system. To our knowledge, there have been no previous reports of such a case.

Case Report

A 69-year-old woman with a history of hypertension suffered from a sudden headache. She spent a week resting at home, but her headache continued. She was admitted to our institute because of aggravating headache. Neurological examination revealed no abnormalities, but computed tomography scanning demonstrated evidence of SAH (Fig 1, A). Computed tomography angiography disclosed the right VADA, which was thought to be the bleeding point, and the contralateral normal VA (Fig 1, B). A diagnosis of a ruptured right VADA was made on day 9 of SAH. Endovascular treatment with internal trapping was planned for the same day.

Under general anesthesia, a diagnostic angiography was performed, and bilateral VA occlusion at the origins of the VAs was revealed. The intracranial VAs were supplied through the muscular branches of the neck, such as the ascending cervical artery and the deep cervical artery. These arteries were functioning as a collateral pathway, and anterograde vertebral arterial flow was preserved on both sides (Fig 2, A,B). The carotid angiography showed the fetal type of posterior communicating arteries on both sides, but both P1 segments of the posterior cerebral arteries and basilar artery were not seen (Fig 2, C,D). We decided to treat the patient through the right collateral pathway, which was on the same side as the ruptured VADA and appeared to be easier to access (Fig 3, A,B). A 4-Fr Optiflush diagnostic catheter (Terumo Corporation, Tokyo, Japan) was placed at the right thyrocervical trunk. An Excelsior SL-10 microcatheter (Stryker Neurovascular, Fremont, CA) and a Transend-14 EX microguidewire (Boston Scientific, Natick, MA) system were coaxially introduced into the ascending cervical artery. The initial attempt to reach into the VADA failed because of the steep angulation of the collateral vessel at the anastomotic portion in the VA. Several attempts resulted in retrograde insertion of the microcatheter into the VA. The Transend-14 EX was then replaced with a CHIKAI-14 microguidewire (ASAHI INTECC CO., LTD., Aichi, Japan). As a result of the superior trackability of the microguidewire, the microcatheter was anterogradely advanced into the affected VADA (Fig 3, C,D). After successful insertion of the microcatheter, internal trapping with detachable coils was performed with good results (Fig 4, A-C). Postprocedure angiography demonstrated

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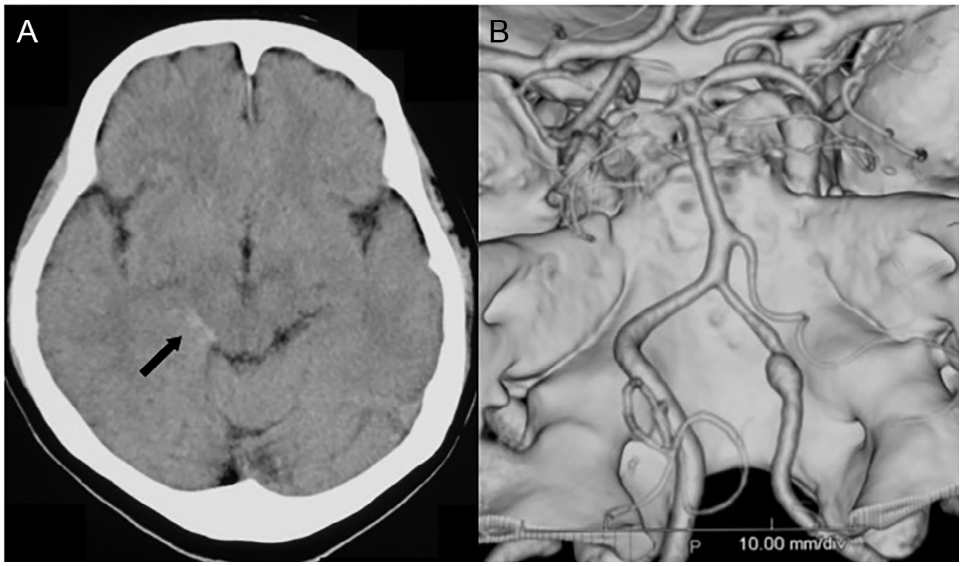

Figure 1. *Computed tomography (CT) scanning (A) demonstrates evidence of subarachnoid hemorrhage (arrow). CT angiography (B) shows right vertebral artery dissecting aneurysm (VADA) and the left vertebral artery (VA) are normal.*

complete occlusion of the right VADA (Fig 4, D,E), and there was no evidence of brainstem infarction. The patient remained stable and was discharged 1 week after the procedure. Follow-up magnetic resonance imaging showed no abnormal signs (Fig 4, F).

Discussion

Proximal VA occlusion at the neck is usually compensated for by anastomotic flow to the upper part of the artery via the thyrocervical, deep cervical, occipital, and ascending pharyngeal arteries or reflux from the circle of Willis.[5] The ascending pharyngeal artery and ascending cervical artery are usually anastomosed in the C3–C4 cervical space, and the occipital artery and deep cervical artery are anastomosed in the C2–C3 and C3–C4 cervical space. In our case, the intracranial VAs were mainly supplied by the ascending cervical arteries and deep cervical arteries. These muscular branches could therefore be used as the approach routes for endovascular treatment.

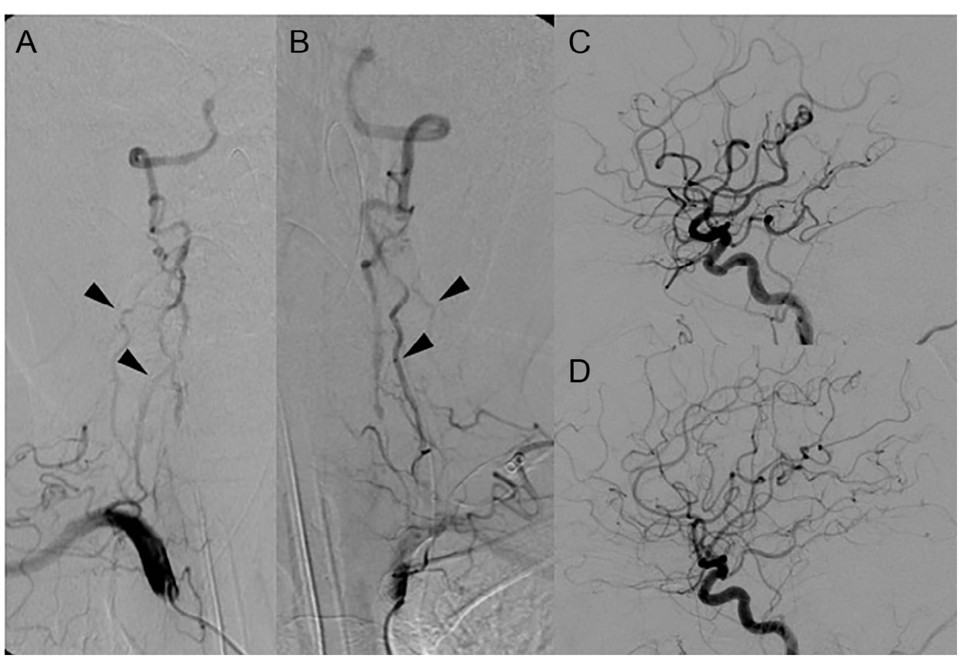

Figure 2. *Right (A) and left (B) subclavian artery angiography shows bilateral vertebral artery (VA) occlusion. Anterograde flow is preserved through muscular branches (arrowhead). Right (C) and left (D) internal carotid artery angiography shows the fetal type of posterior communicating artery in both sides, but the P1 segment of the posterior cerebral artery is not shown.*