

# Spontaneous Dissection of the Vertebral Artery: Report of Three Cases

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## Abstract-

**Purpose:** Vertebral artery dissection (VAD), although uncommon, is an important cause of ischemic stroke in young adults. Without prompt diagnosis and treatment, it may cause mortality and morbidity. Spontaneous VAD related to abrupt neck position change, sudden sneezing, or severe cough and vomiting after fish bone choking are rarely reported. This report describes three cases of spontaneous VAD due to seemingly harmless events.

**Casp Report:** The first patient developed vertebro-basilar ischemic symptoms after suddenly turning his head to the left during an argument with a colleague. The second suffered from right lateral medullary infarction after sudden sneezing. The third developed left lateral medullary syndrome after she tried to extract a fish bone in her throat, which induced severe cough and vomiting. The three cases all presented with acute severe neck pain with posterior circulation ischemic symptoms and signs. Magnetic resonance imaging (MRI), magnetic resonance angiogram (MRA), and conventional angiography confirmed the diagnosis. The first patient was treated with warfarin and recovered well. The other two cases received heparinization and then oral anticoagulant therapy, and recovered without residual neurologic deficits.

**Conclusion:** In conclusion, VAD should be among the differentials considered when encountering young patients presentation with such clinical symptoms.

**Key Words:** vertebral artery dissection, magnetic resonance angiogram, magnetic resonance imaging, neck position change, young stroke

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## INTRODUCTION

Dissection of vertebral arteries is an important but relatively uncommon cause of stroke. In recent years, this clinical entity has drawn much attention among

clinical neurologists, thereby providing better diagnostic facilities and more alertness on its symptomatology<sup>(1,2)</sup>. Spontaneous vertebral artery dissection (VAD) is even rarer, with an annual incidence of approximately 1-1.5 per 100,000 people<sup>(3)</sup>. Although it accounts for only 2%

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of ischemic stroke in the general population, it is responsible for nearly 20% of stroke in young adults (<45 years)<sup>(3)</sup>.

Although outcome is favorable in previous studies, morbidity and mortality can be encountered<sup>(1)</sup>. Possible precipitating factors and relevant events like trivial trauma or spinal manipulative therapy have been identified in some patients. However, there are few studies examining whether common neck movements pose an independent risk for VAD<sup>(4)</sup>. We present three cases of spontaneous VAD after violent turning head, sneezing and severe cough.

## CASE REPORT

### Case 1

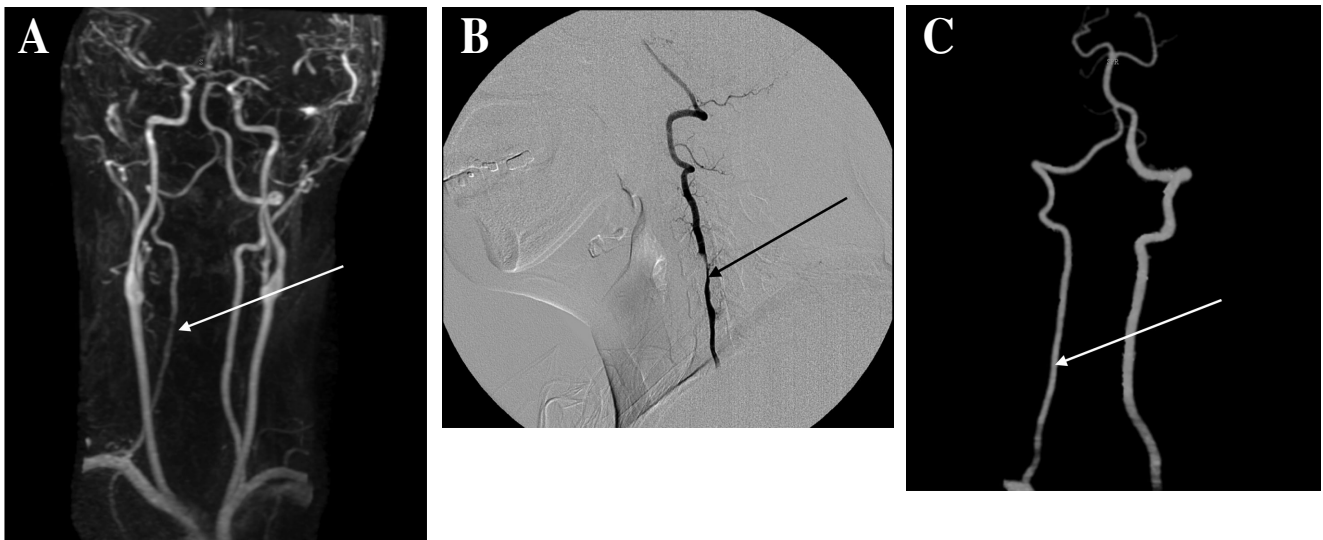
A 40-year-old healthy man presented with acute severe right neck pain and transient consciousness loss for a few seconds after suddenly and violently turning his head to the left during an argument with a colleague. His past medical history was normal and there was no neck trauma or neck massage before symptom onset. He also experienced vertigo, imbalance of gait and a tendency to fall to his right side.

Neurologic examination (NE) revealed mild dysmetria of right side extremities and gait imbalance. Laboratory studies were normal. Brain magnetic resonance imaging (MRI) done two weeks after the initial event showed no high signal intensity on diffusion-weighted imaging (DWI) (image not shown). However, there was luminal stenosis of the right vertebral artery at the level of the 4th cervical vertebra by magnetic resonance angiogram (MRA) (Fig. 1A). Catheter angiography (Fig. 1B) confirmed the right extra-cranial vertebral artery dissection (VAD).

The patient was treated with warfarin for prevention of thrombo-embolism. There were no recurrent neurologic symptoms on follow-up. Four months later, computed tomography angiography (CTA) showed total recovery of the right VAD (Fig. 1C).

### Case 2

A 36-year-old man had chronic hypertension with adequate medical treatment. He had acute vertigo, vomiting, and right facial numbness after a bout of sneezing. On neurological examination, right-sided Horner's syndrome, hiccup, ataxia, right side dysmetria and right facial hemi-anesthesia were found.



**Figure 1.** (A) Luminal stenosis of the right vertebral artery from the 4th cervical vertebra by magnetic resonance angiogram (MRA) study (white arrow). (B) Conventional angiography reveals focal segmental stenosis of the right extra-cranial vertebral artery around the 4th cervical vertebra level (black arrow), and right VAD with luminal narrowing. (C) After four months, computed tomography angiography (CTA) shows total resolution of the right VAD (white arrow).

Transcranial duplex revealed focal stenotic blood flow in right vertebral artery. Brain MRI showed high signal intensity in the right lateral medulla on DWI (Fig. 2A), and T2-weighted imaging (T2WI) revealed intramural hematoma in the right vertebral artery (Fig. 2B). MRA showed narrow and occlusive right vertebral artery, although the signals disappeared beyond the C2 vertebrae (Fig. 2C). Conventional angiography confirmed a steno-occlusion of the right vertebral artery (Fig. 2D).

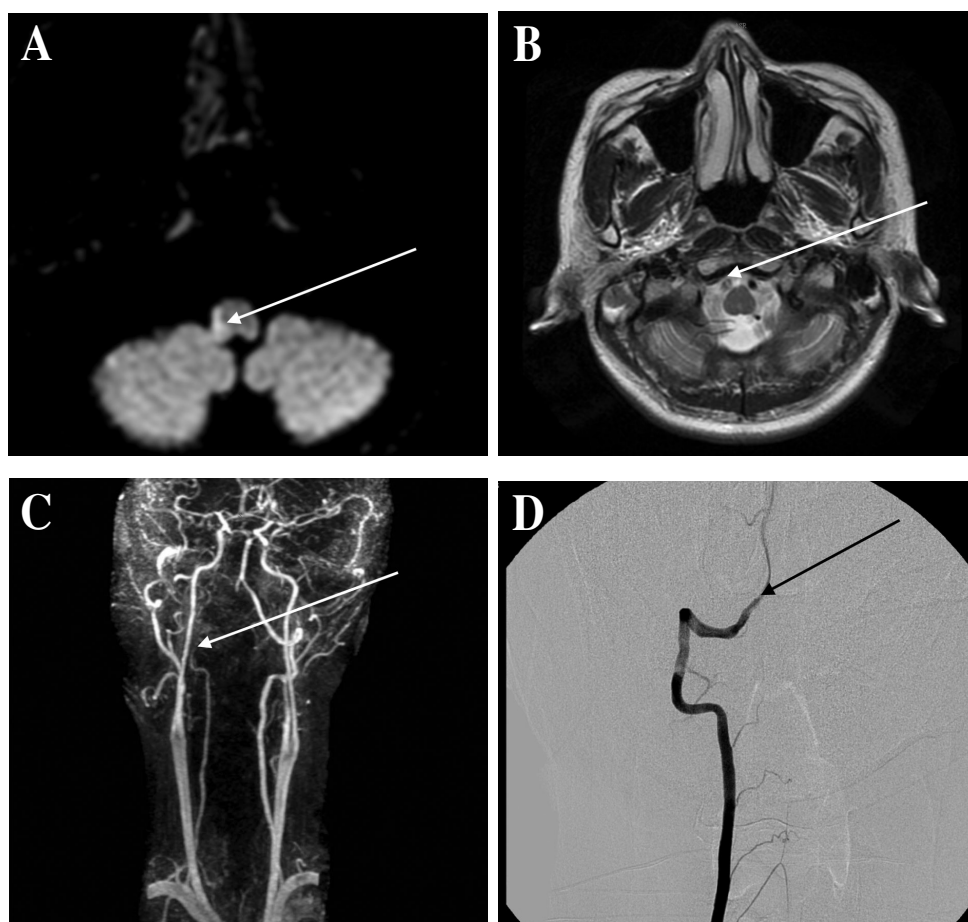
The patient received heparin infusion, followed by oral warfarin and rehabilitation program during hospitalization. The focal neurologic deficit was improved on discharge and warfarin was replaced with aspirin six months later.

### Case 3

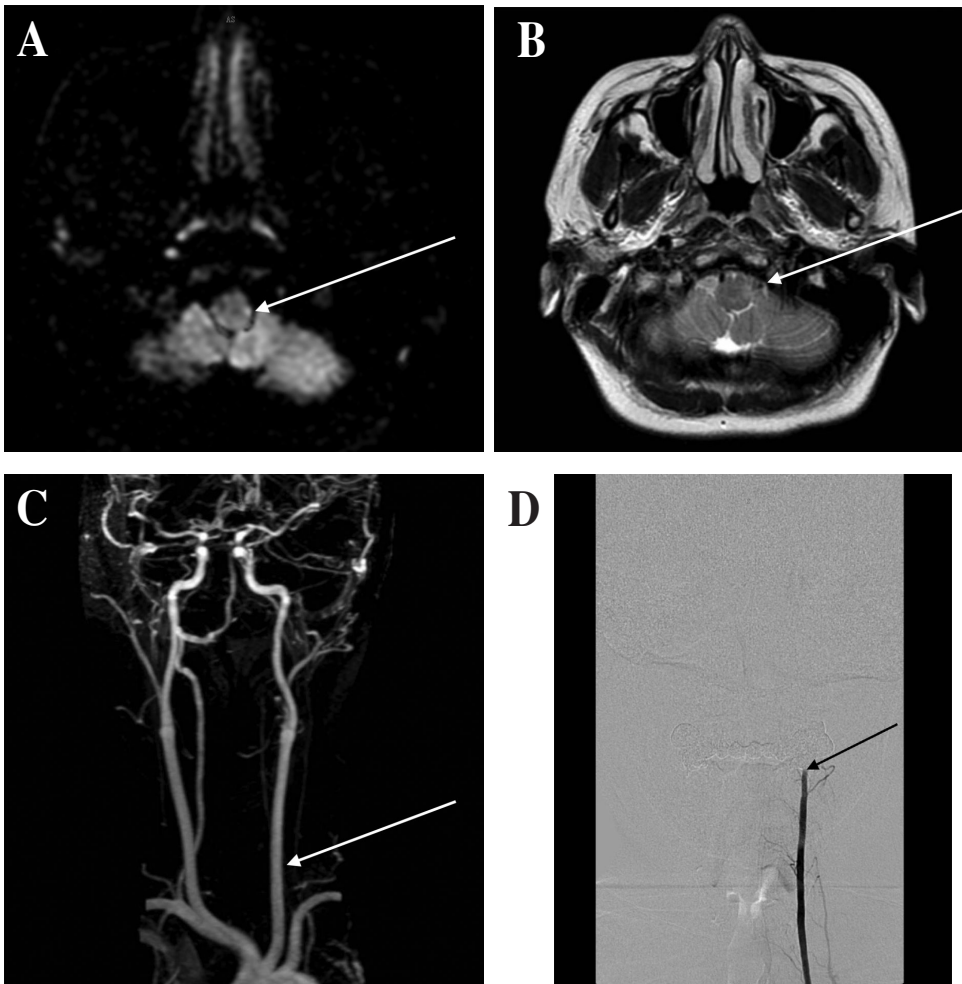
A 40-year-old right-handed healthy female experienced sudden onset vertigo and left side paresthesia after severe vomiting. She got fish bone stuck in her throat while having lunch. Left eyelid drop, blurred vision, hoarseness, and easy choking were accompanied with acute severe left posterior neck pain.

NE revealed partial Horner's sign, left side numbness, dysmetria of the left extremities and ataxic gait. Laboratory studies were within normal limits. Brain MRI showed high signal intensity on the left lateral medulla on DWI (Fig. 3A). T2WI showed intramural hematoma of the left vertebral artery (Fig. 3B), while MRA revealed vessel narrowing and occlusion along the entire left vertebral artery (Fig. 3C). There was no filling of contrast beyond the C2 vertebra by conventional angiography (Fig 3D).

Intravenous heparin infusion was administered, and



**Figure 2.** (A) Diffusion-weighted imaging (DWI) of head MRI on axial view shows high signal intensity of the right lateral medulla, suggestive of acute ischemic infarction (white arrow). (B) T2 weighted imaging (T2WI) reveals a hematoma of the right vertebral artery (white arrow). (C) MRA shows a narrow and occlusive right vertebral artery, but the signals disappear beyond the C2 vertebra (white arrow). (D) Conventional angiography confirms a steno-occlusive right vertebral artery (black arrow).



**Figure 3.** (A) DWI of head MRI shows high signal intensity on the left lateral medulla compatible with acute ischemic stroke (white arrow). (B) Axial T2WI of head MRI shows a hematoma in the left vertebral artery (white arrow). (C) MRA reveals vessel narrowing and occlusion on the entire left vertebral artery (white arrow). (D) There is no filling of contrast beyond the C2 vertebra in conventional angiography, suggesting vessel occlusion (black arrow).

was shifted to oral anticoagulants on discharge. She recovered well and returned to work without neurologic sequelae.

### CONCLUSION

Vertebral artery dissection (VAD) is an important cause of stroke in young and middle-aged adults. With advance in neuroimage facilities and more alertness of its clinical symptomatology have increased the recognition of this disease entity. Reported cases of VAD in the literature show that about half patients have a precipitating factor, with sports activity and chiropractic manipulation as prominent preceding events<sup>(1,7)</sup>.

Spontaneous VAD is the term used to describe all

cases that do not involve blunt or penetrating trauma as a precipitating factor. However, a history of trivial or minor injury is elicited frequently from patients with so-called spontaneous VAD. Several risk factors have been associated with the development of VAD. These include the following: yoga, ceiling painting, nose blowing, minor neck trauma, intrinsic vascular pathology and fibromuscular dysplasia<sup>(4,6)</sup>.

Fibromuscular dysplasia (FMD) is an arterial disease of unknown etiology typically affecting the medium and large arteries of young to middle-aged women. FMD is classically diagnosed on the basis of a "string of beads" appearance on angiography. This appearance is explained by the presence of luminal stenosis alternating with aneurysmal outpouchings. Angiographic findings in

our patients excluded this etiology.

The role of trivial, unnoticed trauma producing dissection is not clear. It has been suggested that patients with so-called "spontaneous" VAD may have had unrecognized trauma or sudden neck motion that has been forgotten, overlooked, or considered insignificant by the patient and thus not reported to the physician. In a Canadian survey<sup>(6)</sup>, cervical dissections are associated with sudden neck movements ranging from therapeutic neck manipulation to a vigorous volleyball game, although some are during mild exertion, such as lifting a pet dog or during a bout of coughing. Causative potential trauma, including violent coughing, neck turning during a parade, playing basketball, dancing, swimming, and minor falls, have immediately preceded the initial symptoms of dissection<sup>(6,13,14)</sup>.

In this report, causative preceding events are sudden neck position change, acute sneezing, coughing and vomiting. These seemingly harmless movements may suddenly increase pressure to neck vessel wall and induced endothelial injury as well as subsequent neck pain associated with ischemic symptoms<sup>(11)</sup>. Possible explanations for this causation remain ill defined. Authors have suggested the association of vertebral artery anomalies, tortuosity, and atherosclerosis, as well as the duration and force of the neck movement. It is also likely that inherent vessel wall abnormalities predispose to dissection upon subtle trauma<sup>(8)</sup>.

Typical patients with VAD present with posterior neck pain or headache, followed by ischemia of the vertebrobasilar system. Initial manifestations of VAD however, are less distinct than those of carotid artery dissection and usually interpreted as musculoskeletal pain<sup>(9,10)</sup>. Therefore, an accurate neurologic examination and detailed history-taking are mandatory, particularly in young adults, in order to search for symptoms or focal signs of brainstem stroke.

Ischemic symptoms occur in more than 90% of VAD patients and may involve the brain stem, especially the lateral medulla (Wallenberg's syndrome), as well as the thalamus and cerebral or cerebellar hemispheres<sup>(8,12)</sup>.

Catheter angiography is the gold standard for diagnosis of VAD. Characteristic features are vessel irregu-

larity and/or stenosis, string sign, double lumen, pseudo-aneurysm formation, or complete occlusion. Conventional angiography of our patients demonstrate some of these classic findings (See Figure). Magnetic resonance techniques and CTA are replacing standard angiography in the diagnosis and follow-up of VAD in clinical practice<sup>(15,16)</sup>. The resolution of MRA and CTA now approaches that of catheter angiography and they can show the intramural hematoma itself.

The prognosis of VAD is associated with the initial stroke severity and the extent of collateral circulation<sup>(2)</sup>. The reported death rate due to dissections is < 5% and about 75% of patients with an ischemic insult have good recovery<sup>(2,12)</sup>. Although there is no consensus on the standard treatment, anticoagulation with intravenous heparin, followed by oral warfarin, has been suggested for VAD patients to prevent thromboembolic complications. All these three patients reported here received anticoagulants and no recurrent cerebrovascular events occurred during follow-up.

In conclusion, VAD is an important etiology of brain stem stroke in young adults. If patients present with such symptomatology, detailed investigation of precipitating events and associated posterior circulation ischemic symptoms and signs are mandatory. Early diagnosis and prompt treatment can reduce morbidity and mortality.

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