JNN

CASE REPORT

pISSN 2635-425X eISSN 2635-4357
https://doi.org/10.31728/jnn.2025.00176

Multiple Cervical Artery Dissections Following COVID-19 Infection: A Case Report

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Cervical artery dissection is an uncommon but important cause of ischemic stroke in young adults. Severe cough or infection may precipitate arterial injury through mechanical stress or inflammation. We report the case of a 35-year-old man who presented with sudden severe posterior neck pain and headache after severe coughing during COVID-19. Brain magnetic resonance imaging (MRI) and angiography revealed infarction of the left middle cerebral artery and stenosis of the left carotid and vertebral arteries with aneurysmal dilatation. Vessel wall MRI revealed intramural hematomas in the left internal carotid artery and both vertebral arteries, confirming the diagnosis of multiple arterial dissections. The patient was treated with dual antiplatelet therapy, and his clinical condition subsequently improved. This case highlights that a cough associated with COVID-19 may trigger cervical artery dissection and that vessel wall MRI helps detect intramural hematomas in the subacute phase.
J Neurosonol Neuroimag 2025;17(2):47-50

Key Words: dissection; cough; COVID-19; magnetic resonance imaging

Received: October 30, 2025
Revised: November 26, 2025
Accepted: December 1, 2025

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Cervical artery dissection (CAD) accounts for approximately 25% of ischemic strokes in individuals younger than 50 years, although it accounts for a small proportion of all ischemic stroke cases.[1] CAD is a multifactorial disease associated with predisposing factors such as connective tissue disorders (e.g., Marfan syndrome, Ehlers–Danlos syndrome, and fibromuscular dysplasia), vasculitis, mechanical stress, and infection.[2,3] Infections, particularly respiratory tract infections such as pertussis, have been reported to contribute to dissection through severe coughing or inflammatory vascular injury.[4-6] Since the onset of the COVID-19 pandemic, several cases of CAD following COVID-19 have also been reported.[7]

The initial symptoms of CAD are often nonspecific and may include neck pain, headache, or facial pain, followed by focal neurological deficits. Various imaging modalities, including magnetic resonance imaging (MRI), magnetic resonance angiography (MRA), computed tomography angiography (CTA), and digital subtraction angiography (DSA), can facilitate the diagnosis of CAD. Characteristic imaging hallmarks include an intimal flap, intramural hematoma, and double lumen.[1] Although CAD is an important cause of ischemic stroke in young individuals, its diagnosis is often delayed because early symptoms are nonspecific, mimicking benign conditions such as tension headache or musculoskeletal pain. Even imaging findings may be subtle, making the diagnosis of CAD more challenging.

We herein report the case of a patient who presented with left middle cerebral artery (MCA) infarction following left internal carotid artery (ICA) and bilateral vertebral artery dissections after severe coughing associated with COVID-19.

CASE

A 35-year-old man was diagnosed with COVID-19 and

experienced severe coughing. Five days later, he experienced the sudden onset of a severe headache (numerical rating scale score 8–9) radiating from the posterior neck to the vertex; the pain began during sleep. The headache was so severe that it awakened him from sleep, and he visited a local clinic the following day, where analgesics were prescribed. Following medication administration, the right-sided pain improved, but the left-sided pain remained. Ten days later, he developed numbness of the right upper limb while driving and persistent left-sided headache.

He revisited the local clinic, and brain MRI was performed 13 days after the initial onset of headache. The MRI and MRA revealed an infarction in the left MCA territory (Fig. 1A), stenosis of the left ICA and left vertebral artery, and aneurysmal dilatation at the V3–V4 junction (Fig. 1B). For further evaluation and management, he was then referred to a university hospital. Upon further history taking, the patient denied any strenuous exercise, chiropractic manipulation, or history of trauma. He did not have cerebrovascular risk factors.

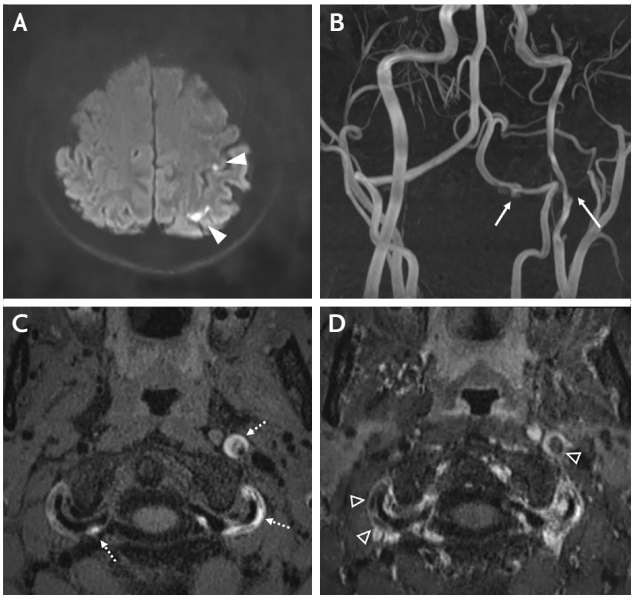

Fig. 1. (A) DWI demonstrates multiple acute infarcts in the Lt. frontoparietal region, including the precentral gyrus (white arrowheads). (B) TOF-MRA shows multiple stenoses and dilatation of the Lt. cervical ICA and Lt. distal VA (white arrows). (C) High-resolution vessel wall MRI demonstrates multiple intramural hematomas (white dashed arrows) with increased T1 signal intensity on pre-contrast T1-weighted fat-suppressed image. (D) A dissecting flap is seen on post-contrast black-blood T1-weighted image (empty white arrowheads). DWI, diffusion-weighted imaging; TOF-MRA, time-of-flight magnetic resonance angiography; MRI, magnetic resonance imaging; MRA, magnetic resonance angiography; ICA, internal carotid artery; VA, vertebral artery; Lt., left.

On examination, he was alert and oriented. Blood pressure was 162/108 mmHg. Heart rate was 79 beats per minute with a regular rhythm. Neurological examination of the upper and lower limbs showed hypoesthesia of the right upper limb without weakness, whereas other findings, including muscle tone and deep tendon reflexes, were normal. Cardiovascular examination was unremarkable.

Total cholesterol was 192 mg/dL, triglycerides were 101 mg/dL, and LDL cholesterol was 136 mg/dL. D-dimer was below 0.2 μg/mL. Inflammatory markers and fasting blood glucose tests were normal. As the patient had no cerebrovascular risk factors but a history of infection-related cough, arterial dissection was suspected, and brain vessel wall MRI was performed 15 days after headache onset. T1 fat-suppressed (FS) sequences revealed stenosis of the left ICA and left vertebral artery, and aneurysmal dilatation at the V3–V4 junction; further, intramural hematomas were observed within the vessel walls (Fig. 1C, 1D). Accordingly, the patient was diagnosed with dissections involving vertebral arteries and the left cervical ICA.

The patient was administered aspirin and clopidogrel. On the fourth day of hospitalization, he was discharged with a mild residual headache, while neurological deficits had improved.

DISCUSSION

CAD is etiologically classified into traumatic and spontaneous dissection. The latter is associated with various risk factors such as underlying diseases, minor mechanical stress, and infection. Infection can contribute through severe cough or inflammatory injury to the vessel wall. Recently, arterial dissection cases following COVID-19 have been reported, suggesting that COVID-19 itself may be a risk factor.[7,8] However, this association remains to be established because of the small number of reported cases.

Diagnosing CAD remains difficult clinically and radiologically. Initially, patients frequently present with nonspecific symptoms such as facial pain, headache, or neck pain; dizziness or tinnitus may occur less commonly. Focal neuro-

logical deficits can develop later or may be absent, thereby delaying diagnosis. In our case, the patient experienced only a persistent headache for 10 days before developing right upper-limb numbness, for which he took analgesics until the imaging evaluation.

Imaging findings are variable, and characteristic hallmarks—such as intimal flaps, intramural hematomas, and double lumens—are not always present. Although DSA remains the reference standard for evaluating the vascular lumen, it is invasive and limited in assessing the arterial wall.

CTA provides rapid, noninvasive evaluation and high spatial resolution, although it may yield false-negative results due to artifacts or non–flow-limiting lesions. MRI, particularly FS T1-weighted sequences, enables the identification of intramural hematomas, allowing for a more accurate dissection diagnosis. It is especially useful in the subacute phase, when hematoma signal changes become more distinct, as seen in this case. Indeed, in this patient, the right V3 segment dissection could not be identified on the initial time-of-flight MRI or CTA but was visualized on vessel wall MRI, emphasizing the diagnostic value of this modality in subacute lesions. However, intramural hematomas cannot be detected in the hyperacute phase, and the sensitivity of MRI for vertebral artery dissection is lower than that of CTA.[1] Therefore, combining CTA and MRI—including FS T1-weighted sequences—can improve diagnostic accuracy.

In this case, the patient developed a severe cough during acute COVID-19, followed by the abrupt onset of intense headache before the appearance of right upper-limb numbness. MRI revealed multiple cervical artery dissections involving the vertebral and internal carotid arteries. As he had no history of trauma, strenuous exercise, or chiropractic manipulation, it is suggested that cough and inflammation associated with COVID-19 contributed to the dissections.

In conclusion, imaging evaluation should be performed in young patients with a recent history of infection and severe headache. Furthermore, arterial dissection should be considered when internal carotid or vertebral artery stenosis is identified. Careful history taking and multimodal imaging—particularly MRI with FS T1-weighted sequences in the subacute phase—are essential for accurate diagnosis and appropriate management of cervical artery dissection.

Ethics Statement

Written informed consent was obtained from the patient to report demographic data, medical conditions, neuroimaging, and treatment.

Availability of Data and Material

The imaging data obtained or edited in this study are available from the corresponding author on reasonable request.

Author Contributions

Kilim Lee wrote the first draft; Kilim Lee, Minsoo Sung, Sung Jun Ahn, Kyung-Yul Lee analyzed the data; Kilim Lee and Sung Jun Ahn interpreted the data; Minsoo Sung and Kyung-Yul Lee critically reviewed the manuscript; Kyung-Yul Lee supervised the project; All authors read and approved the final manuscript.

Acknowledgments

None.

Sources of Funding

None.

Conflicts of Interest

All authors certify that they have no affiliations with or involvement in any organization or entity with direct financial interest in the subject matter or materials discussed in this manuscript. All the authors have approved the final version of the manuscript and have no potential conflicts of interest to declare.

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