

CASE REPORT

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COVID-associated free-floating thrombus presenting with acute stroke

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ABSTRACT

Introduction: Recent trials have identified an association between COVID-19 and ischemic stroke, particularly through the formation of free-floating thrombus (FFT). This report highlights cases of acute ischemic stroke caused by FFT in COVID-19 patients, usually asymptomatic. An FFT is a thrombus attached to an arterial wall but with a free-floating distal end, leading to embolic events and high mortality. It can be present as recurrent transient ischemic attacks, characterized by episodic neurological ischemia.

Case Report: Case 1 involves an elderly diabetic woman, presenting with sudden bilateral vision loss, unsteady gait, and drowsiness. Neuroimaging revealed a left occipital infarct and FFT in the right vertebral artery. Case 2 involves a woman, with COVID-19 infection, who presented with right-sided hemiparesis and slurred speech. Imaging confirmed FFT in the left internal carotid artery and a left parietal infarct. Both patients were treated with thrombolysis (tenecteplase), anticoagulation, and antiplatelet therapy. Follow-up imaging at two weeks showed complete resolution, and both patients showed neurological improvement with rehabilitation.

Conclusion: Both the cases highlight the importance of awareness of FFT as a potential complication in post-COVID-19 patients, especially those who were present with unexplained neurological deficits. Early diagnosis and prompt treatment, including anticoagulation and thrombolysis, leads to favorable outcome.

Keywords: COVID-19, Free-floating thrombus, Ischemic stroke, Thrombolysis

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INTRODUCTION

Several recent studies have established the association between COVID-19 and stroke [1, 2]. We documented two occurrences of acute ischemic stroke due to free-floating thrombus (FFT) in COVID-19 patients without symptoms of active COVID-19 infection. An FFT of the carotid artery is attached to the arterial wall proximally; however, it does not completely occlude the vessel, and its distal end floats freely with blood flowing around it [3]. An extremely high mortality rate is linked with it due to distal embolic shower, making this a clinical emergency [4]. A crescendo transient ischemic attack (cTIA), common clinical presentation of an FFT, is characterized by recurrent and episodic transient neurological ischemia (TIA) [5]. The incidence ranges from 0.05% to 0.7% [6].

CASE REPORT

A diabetic patient in their late fifties with a history of asymptomatic COVID-19 infection one week ago presented with a sudden painless loss of vision in both eyes (point +3), an unsteady gait (point +2), and drowsiness for the last 6 hours associated with a moderate headache which was different from her usual headache. Although, the patient was diabetic, she had no past history of vascular complications and her blood glucose was under control. Shortly after she was infected by COVID-19, an FFT was identified, irrespective of no atherosclerotic changes. Additionally, studies have reported evidence of thrombus formation, including, FFT, as a consequence of COVID-19 infection. At the time of the presentation, she was conscious, her vitals were stable, and she obeyed minimum commands (point +1). The total National Institutes of Health Stroke Scale (NIHSS) score was 6. There was no history of loss of consciousness, impairment of ocular movements, facial deviation, sensory loss, or slurring of speech. Our differential diagnosis included stroke due to small vessel disease, embolic stroke, stroke from an atherosclerotic plaque. Magnetic resonance imaging (MRI) brain showed a left occipital lobe non-hemorrhagic infarct and incomplete occlusion of the right vertebral artery further characterized as an FFT on computed tomography angiography (CTA) (Figure 1, non-contrast computed tomography (CT) of the patient shows the left occipital non-hemorrhagic infarct (A). Image B is axial CT angiography (CTA) image showing the FFT in the right vertebral artery (red arrow). Images C and D show sagittal CTA images of the right vertebral FFT (red arrows)).

A second patient in their early fifties with no previous medical illness presented with sudden onset right-sided hemiparesis (+2 points), slurring speech (+1 point), and arousal to minor stimulation (+1 point). Their total NIHSS score was 4. The strength in the right limbs was four out of five. The history of transient slowing of speech was also present 2–3 days ago and lasted for a few minutes. There was no facial weakness, aphasia, inattention, sensory loss or impairment of ocular movements, and visual fields were intact. The patient had mild COVID-19 and reverse transcription-polymerase chain reaction (RT-PCR) test was positive, despite the absence of respiratory symptoms. There was a non-occlusive acute FFT in the proximal left internal carotid artery (ICA), and the left external carotid artery was patent (Figure 2, MRI and CTA of the patient. Image A shows diffusion-weighted image showing the left parietal infarct. Image B is axial CTA image showing the FFT in the left proximal internal carotid artery (red arrow)). Neuro-imaging on serial intervals showed acute parietal nonhemorrhagic infarct. Follow-up neuro-images showed small reperfusion hemorrhage and resolution of the old infarct. She also had COVID-induced subacute thyroiditis [thyroid-stimulating hormone (TSH) 0.19, erythrocyte sedimentation rate (ESR) 37, and

procalcitonin was negative) as evidenced by decreased Tc99m uptake on the nuclear scan. Carotid doppler showed normal laminar flow with 10–15% occlusion by plaque on both sides.

Thrombolysis with intravenous TNK (0.25 mg/kg tenecteplase) was utilized to manage both cases. Tenecteplase was preferred due to its single dose administration, hence being an effective tool in acute settings. Endovascular thrombectomy was considered, but owing to the location of FFT, i.e., proximal ICA and vertebral artery, tenecteplase was prioritized. Lab markers and imaging modalities were used to monitor the risk of bleeding or embolization. After that, we decided to start subcutaneous injections of low molecular weight heparin 0.6 mL twice daily for five days in case 1 and 0.4 mL once daily in case 2 for five days to prevent further reperfusion bleeding. In addition, 80 mg of atorvastatin and 150 mg of aspirin were administered daily in both cases. In all instances, repeated imaging after two weeks revealed a complete resolution of the FFT. Both the patient's limb weaknesses showed improvements with regular physical therapy, which were renewed for the next six months.

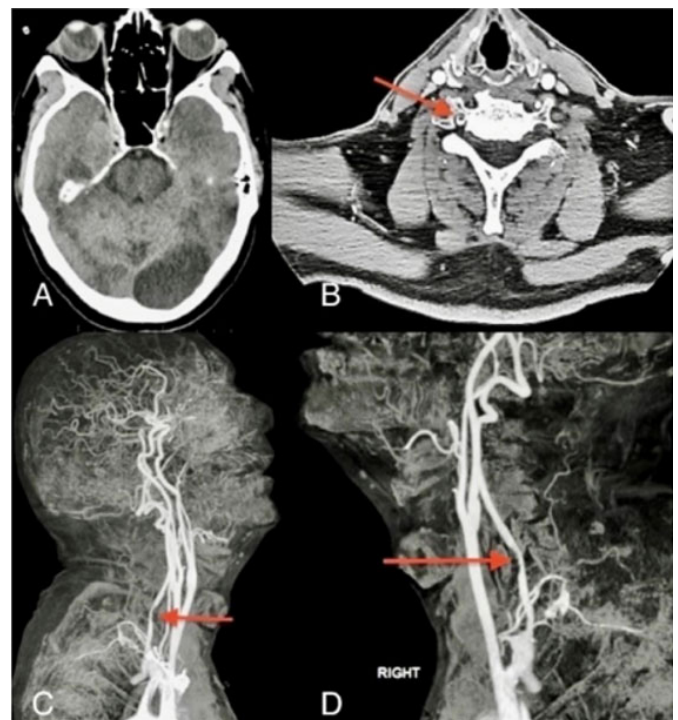


Figure 1: Non-contrast computed tomography (CT) of the patient shows the left occipital nonhemorrhagic infarct (A). Image B is axial CT angiography (CTA) image showing the free-floating thrombus in the right vertebral artery (red arrow). Images C and D show sagittal CTA images of the right vertebral FFT (red arrows).

DISCUSSION

In a study conducted in 2020 on stroke rates in the pre- versus post-COVID-19 era, 76.5% of the 238 stroke

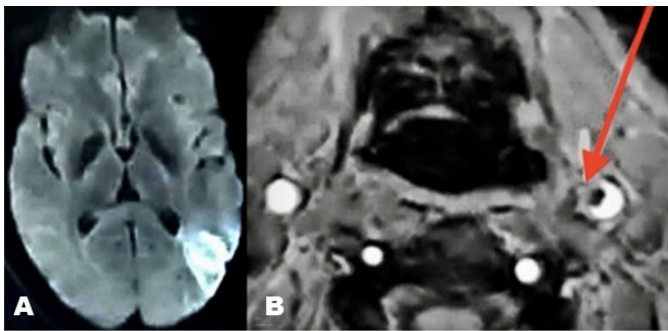


Figure 2: MRI and CTA of the patient. Image A shows diffusion weighted image showing the left parietal infarct. Image B is axial CT angiography image showing the FFT in the left proximal internal carotid artery (red arrow).

admissions occurred during the COVID-19 epidemic. Fifty percent of FFT were seen in COVID-19 suspects with surrogate biomarkers of heightened inflammation present at the time of the stroke [7]. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infects endothelial cells via ACE-2 receptors, hence causing endothelial dysfunction and triggering inflammation. This can eventually lead to prothrombotic condition via IL-6, D-dimer, and fibrinogen. An FFT consists of friable thrombi that are either completely detached from or partially attached to the underlying vessel with one end free. The FFT tends to move in an arc-like pendulous manner with each cardiac cycle while it's one end is attached to the vessel. It is non-flow limiting but is prone to fragmentation. It may be formed due to underlying ulcerated atherosclerotic plaques and other vessel wall pathologies such as dissection, fibromuscular dysplasia, trauma, or other causes of endothelial discontinuity (Virchow's triad) [3]. In addition, thrombophilic states such as malignancy, pregnancy, antiphospholipid syndrome, thrombophilia due to genetic mutations, and sepsis may contribute to thrombosis. Rarely, FFT may arise over an uninvolved, non-aneurysmal vessel wall and occur without a known cause. The true incidence of FFT is undetermined, its clinical presentation is variable, and its management is based on case reports and case series. A crescendo transient ischemic attack (cTIA) is distinguished by recurrent episodes of transient neurological ischemia followed by a recovery. When an ipsilateral carotid artery block causes a TIA, the ideal treatment consists of medical intervention and, if necessary, an emergent carotid endarterectomy [8]. In the past, an FFT was believed to be a filling defect on computer tomography angiography (CTA), distinguishable from atherosclerotic plaque [9].

CONCLUSION

An FFT can be caused by recent COVID-19 infection. During the COVID-19 epidemic, an FFT in the cerebral

vasculature became frequent. In patients with multiple territorial infarcts and no vascular risk factors use of anticoagulation ensures a favorable outcome one to two months after treatment initiation.

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Author Contributions

Pushpendra Nath Renjen – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Priyal Tiwari – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation

of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Dinesh Mohan Chaudhari – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Avinash Goswami – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Nayaab Saeed – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related

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Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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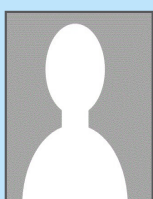
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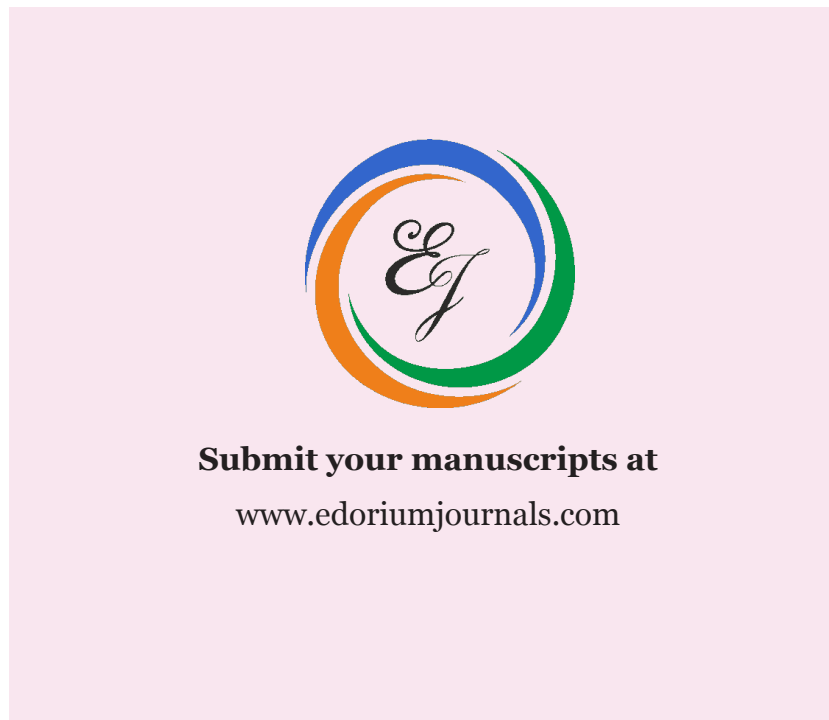
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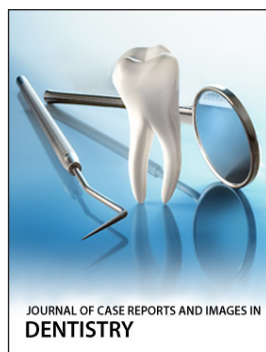
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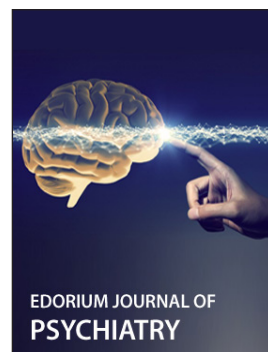
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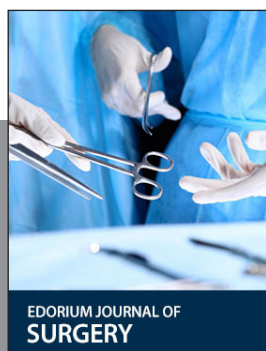
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