

Acute Ischemic Multicentric Stroke Associated With COVID-19 Infection in An Adult with Known Vascular Risk Factors

(Running title: Vascular risk factor for stroke and COVID-19)

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Abstract

We report a case of an adult with known vascular risk factors who presented with an acute ischemic multicentric stroke that was associated with COVID-19 infection. Health care professionals who care for patients who have COVID-19 infection should be aware of the associated increased risk of acute ischemic stroke, especially in those individuals with comorbid cardiovascular risk factors. Interventions that may decrease such risk should be considered.

Keywords: case report, ischemic stroke, COVID-19, vascular.

Introduction

Acute viral infections of the respiratory tract are known to increase the risk of ischemic stroke with an age- and season-adjusted incidence ratio of up to 7.82 [1,2]. In individuals infected with COVID-19, concurrent acute ischemic stroke has been described but it is relatively uncommon (1.3%) [3]. In those with acute viral infection as well as comorbid cardiovascular risk factors such as small vessel disease, large vessel atherosclerosis, and cardio-emboli, acute ischemic stroke may occur more often and may increase associated mortality[3].

Methods

Patient consent was obtained for submission of this report. The electronic medical record of the Duke University Health System was retrospectively reviewed to collect medical information related to the care of this individual. This report followed the tenets of the Helsinki Declaration of 1975, as revised in 2000. Data from the hospital stay including the comprehensive neurological evaluation and neuroimaging was reviewed.

Report of a Case

A 67-year-old female with hypertension, pre-diabetes, hyperlipidemia, and concurrent tobacco use who had no pre-infection history of stroke, no prior neuroimaging, and no known neurocognitive or psychiatric diagnoses was transported to the emergency room with altered mental status 2 weeks after receiving her second vaccination for SARS-CoV-2. Workup revealed a positive SARS-CoV-2 test by polymerase chain reaction (PCR). She had a computed tomography (CT) scan of thorax, which demonstrated bi-apical peripheral ground-glass opacities that were nonspecific but attributed to COVID-19 pneumonia (Figure 1A). A standard non-contrast CT scan demonstrated a left middle cerebral artery (MCA) territory infarct with no evidence of intracranial hemorrhage. A contrast-enhanced head and neck CT arteriogram highlighted acute thrombosis of the basilar artery with complete occlusion of the right vertebral artery starting at approximately the V3 segment with opacification of the bilateral posterior cerebral arteries via collateral flow from the anterior circulation.

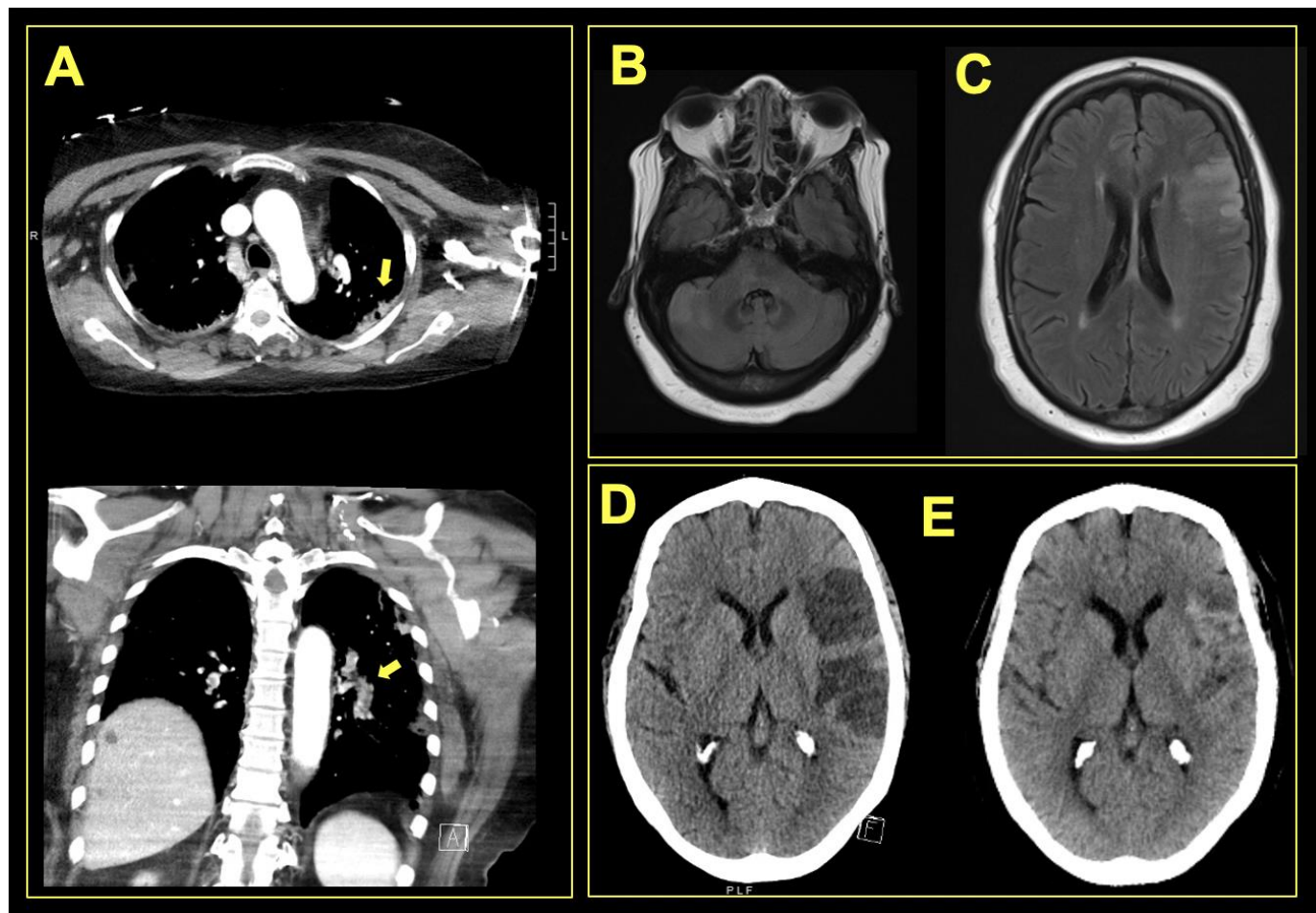


Figure 1 (A-E): Axial and coronal thoracic CT at the time of COVID-19 diagnosis demonstrated pulmonary ground-glass opacities (A). Axial T2 fluid-attenuated inversion recovery (FLAIR) images demonstrated spotty restrictive diffusion in the right pons (B) and right cerebellar hemisphere (C). Left hemisphere stroke is evidenced (D), but likely unrelated to COVID diagnosis. Repeat head CT three weeks later demonstrated progression of left infarct (E).

There was also occlusion of the anterior temporal branch of the left MCA with parenchymal findings consistent with an infarct about 24 hours old. A brain MRI scan without contrast showed areas of extensive acute infarct in multiple vascular distributions including the left anterior MCA distribution and posterior fossa, affecting the right greater than left cerebellar hemispheres and pons (Figures 1 B, C). A CT brain perfusion with intravenous contrast demonstrated a completed infarct in the left frontal operculum and a basilar artery thrombosis with a large penumbra with 100% mismatch (and progression three weeks later) (Figures 1 D, E). The diagnosis of acute ischemic multicentric stroke associated with COVID-19 infection in an adult female with known vascular risk factors was made.

Discussion

This case serves as a reminder of the increased risk of stroke during the acute phase of a COVID-19 infection. With no prior history of stroke, this patient experienced concurrent acute infarctions of the left middle cerebral artery, right vertebral artery, and basilar artery that were attributed to coexisting COVID-19 infection.

The combination of acute ischemic stroke due to the SARS-CoV-2 viral illness alone may not be clinically unexpected, especially in those with severe COVID-19 [4,5]. In a study of 125 COVID-19 patients in the UK, 77 (62%) presented with a cerebrovascular event; 57 (74%) of these 77 patients developed a concurrent ischemic stroke [5].

Initially, the virus itself may be thought to be contributing to a thrombotic state but more recent evidence suggests otherwise. A post-mortem study from the National Institute of Neurological Disorders and Stroke (NINDS) of 19 patients who expired soon after the onset of COVID-19 demonstrated multifocal areas of cerebral microvascular damage, manifested as leaky, thinned blood vessels, and attributed these findings to the body's inflammatory response to SARS-CoV-2 and not the virus itself, since no virus particles were detected [6]. Such findings are often associated with cerebrovascular events [7].

The increased risk of ischemic stroke in individuals with COVID-19 is probably multifactorial, with activation of coagulation and inflammatory pathways as reflected in increased fibrin D-dimer levels, erythrocyte sedimentation rate, lactic acid dehydrogenase, and lymphopenia in patients with COVID-19 [8-10].

During the acute phase of the COVID-19 infection, an ischemic stroke occurs more often than it may during other viral illnesses and may specifically increase associated mortality in individuals with coexisting risk factors [3]. Patients with COVID-19 who developed acute ischemic stroke were older, more likely to be Black, and had a higher frequency of hypertension, diabetes, hyperlipidemia, atrial fibrillation, and congestive heart failure than those without COVID-19 infection [3].

Health care professionals caring for individuals who have COVID-19 infection should be aware of the associated increased risk of acute ischemic stroke, especially in those individuals with comorbid cardiovascular risk factors. Interventions that may decrease such risk should be considered.

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