Portal Vein Thrombosis in a Patient With COVID-19

Andrew Ofose, MD, MPH\(^1\), Daryl Ramai, MD, MScBR\(^2\), Anastasios Novikov, MD\(^3\) and Venugopal Sushma, MD\(^4\)

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INTRODUCTION

In December 2019, a novel coronavirus, now designated severe acute respiratory syndrome coronavirus 2 or coronavirus disease 2019 (COVID-19), was identified as the cause of an outbreak of acute respiratory illness in Wuhan, Hubei Province, China (1). COVID-19 has become a global pandemic affecting people around the world and causing mortality in 0.5%–3% of infected individuals (2). The most common symptoms of COVID-19 include cough, fever, shortness of breath, diarrhea, and radiographic evidence of viral pneumonia (2). In addition, COVID-19 has been associated with a hypercoagulable milieu leading to thrombosis, particularly pulmonary embolism (3). These thrombotic events have been reported in patients without any known risk factors (4). We report our first case of COVID-19 associated with portal vein thrombosis.

CASE PRESENTATION

A 55-year-old man with a history of hyperlipidemia was brought to the emergency department on account of a history of fever for the past 3 days, shortness of breath, and altered mental status. His vital signs on presentation showed a blood pressure of 128/90, pulse of 118 bpm, temperature of 99.4 °F, and oxygen saturation of 86% on room air. He was immediately placed on 3 L of oxygen via nasal cannula with saturation levels reaching 94%. Physical examination was unremarkable. Blood work showed elevated D-dimer levels; additional laboratory values can be seen in Table 1.

Computer tomography angiography (CTA) of the chest was negative for pulmonary embolism but showed midzone ground glass opacities. A thrombus was seen in the main right anterior and posterior divisions of the right portal vein. A triple phase abdominal CTA was performed, which showed thrombi in the main right anterior and posterior divisions of the right portal vein associated with a wedge-shaped peripheral defect suggestive of ischemia, seen in Figure 1. No signs of portal hypertension were noted, and no collaterals or cavernous formation were noted. Cirrhotic features were not identified.

The patient was tested and found to be positive for COVID-19. He was started on a five-day course of azithromycin 500 mg daily and hydroxychloroquine 200 mg BID and placed on therapeutic doses of apixaban (5 mg BID). Anticoagulation panel including antithrombin III, lupus anticoagulant, protein C, and protein S were found to be normal. After 5 days of medical therapy, he was discharged home with baseline mental status and did not require supplemental oxygen therapy.

The patient had a follow-up televisit 2 weeks after being discharged, which noted significant improvement in respiratory and neurologic symptoms. He remained asymptomatic while on apixaban and was scheduled for repeat CTA in 6-month to assess resolution of portal vein thrombus.

DISCUSSION

The clinical presentation of severe acute respiratory syndrome coronavirus 2 infection seems to be variable, including asymptomatic infection, mild upper respiratory infection, and severe viral pneumonia with respiratory failure (2). Several reports have documented a tendency of COVID-19 to induce a hypercoagulable state including the formation of pulmonary embolism. We report the first case of COVID-19 infection associated with portal vein thrombosis.

Recent case series have shown endothelial cells dysfunction induced by COVID-19 infection resulting in excess thrombin generation leading to a hypercoagulable state which results in venous thrombosis (5). To this end, a majority of cases have been associated with acute pulmonary embolisms. However, no known cases of portal vein thrombosis have been documented.

Current therapies for treating COVID-19 are continuously evolving as clinical data become available. Clinical management of COVID-19 infection includes infection control and preventative measures, and supportive care, including the use of supplemental oxygen and mechanical ventilatory support as needed (6). Medications including remdesivir, hydroxychloroquine, azithromycin, steroids, and convalescent plasma are being used with varying results.

There are currently no official guidelines for the prevention of COVID-19-induced thrombosis. Anecdotal reports from our institution among other institutions include the use of Lovenox at prophylactic dosages (i.e., 40 mg daily). Anticoagulant therapy mainly with low molecular weight heparin seems to be associated with better prognosis in patients with COVID-19 meeting sepsis induced coagulopathy criteria or with markedly elevated D-dimer levels (5). We treated our patient with therapeutic doses of apixaban with favorable results.

To the best of our knowledge, our case represents the first reported case of portal vein thrombosis in a patient with COVID-19 infection. Further studies are needed to

### Table 1. Laboratory results

| Laboratory markers | Value |
|--------------------|-------|
| Hemoglobin         | 14.0 g/dL |
| White blood count  | 9.5 uL |
| Platelets          | 518 x 10^3 uL |
| ALT/AST            | 36/50 U/L |
| Total bilirubin    | 0.8 mg/dL |
| Direct bilirubin   | 0.2 mg/dL |
| Alkaline phosphatase | 64 U/L |
| INR                | 1.2 |
| D-dimer            | >4.4 ug/dL |
| CRP                | 3.0 mg/L |

ALT, alanine transaminase; AST, alanine transaminase; CRP, C-reactive protein; INR, international normalized ratio.
determine the incidence of portal vein thrombosis in patients with COVID-19 infection and optimal treatment strategies.

CONFLICTS OF INTEREST
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Figure 1. Computer tomography angiography of the chest.