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# COVID-19 and Hepatic Artery Thrombosis: A Case Report

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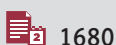
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**Patient:** Female, 45-year-old  
**Final Diagnosis:** COVID-19 • hepatic artery thrombosis  
**Symptoms:** Abdominal pain • anosmia • asthenia • cough • dysgeusia • headache • myalgia • sore throat  
**Medication:** —  
**Clinical Procedure:** Anticoagulant  
**Specialty:** Gastroenterology and Hepatology • Infectious Diseases

**Objective:** Unusual clinical course**Background:** Hypercoagulable states, including venous and arterial thromboses, manifesting as pulmonary thromboembolism or stroke have been observed in COVID-19; recently, gastrointestinal thrombotic events have also been reported. This case report describes a patient with COVID-19 and abdominal pain, who developed coagulopathy and a rare association of hepatic artery thrombosis. Common hepatic artery thrombosis is usually observed among liver transplantation patients and has not been described in infectious disease.**Case Report:** A 45-year-old woman presented in the Emergency Department with a nonproductive cough, sore throat, asthenia, headache, myalgia, anosmia, and dysgeusia. On the 5<sup>th</sup> day after the onset of these symptoms, she tested positive for SARS-COV-2 and was managed with symptomatic drugs. Although her initial symptoms of COVID-19 improved progressively, on the 14<sup>th</sup> day she experienced acute abdominal pain. On the 16<sup>th</sup> day, she was hospitalized and administered intravenous analgesia. Abdominal computed tomography angiography revealed partial thrombosis in the common hepatic artery, which was confirmed by liver Doppler ultrasonography. Protein C and D-dimer levels peaked during this period. Serum tests for thrombophilia were negative. Subcutaneous enoxaparin (60 mg twice daily) was administered during hospitalization, and her abdominal pain improved significantly. She was discharged after 3 days and prescribed an oral anticoagulant for the next 30 days.**Conclusions:** Thrombotic events are well-recognized complications of COVID-19 and recent reports show gastrointestinal involvement. This report of a rare association of hepatic artery thrombosis highlights the importance of investigating the thrombotic events in patients with abdominal pain and coagulopathy during COVID-19.**Keywords:** Abdominal Pain • Case Reports • COVID-19 • ThrombosisFull-text PDF: <https://www.amjcaserep.com/abstract/index/idArt/932531>

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## Background

Since the first report of COVID-19 in December 2019, the disease has spread worldwide, with approximately 120 million confirmed cases and more than 2.5 million deaths (as of March 16, 2021) [1]. The respiratory tract is the main target of the SARS-CoV-2 infection. The virus induces an inflammatory response that injures other organs, including the heart, kidneys, and liver [2]. This can lead to complications related to hypercoagulability [2-5]. Venous thromboembolic events, mainly deep vein thrombosis and pulmonary embolism, have been described in patients with COVID-19 [3]. Arterial thromboses in the aorta, coronary arteries, upper limbs, renal arteries, and cerebral microvasculopathy have also been reported [3-5]. In some cases, gastrointestinal tract involvement and thrombotic events occurred in the portal vein and mesenteric artery [5,6]. Hepatic artery thrombosis, which is frequently seen after liver transplantation, has not been described in patients with COVID-19 [7]. Rare cases of hepatic artery thrombosis have occurred in patients with hematological diseases or those who underwent surgical procedures (not COVID-19 related) [8]. We present the case report of a woman who had COVID-19 and abdominal pain and developed coagulopathy with the rare association of hepatic artery thrombosis.

## Case Report

A 45-year-old woman presented at the Emergency Department with a nonproductive cough, sore throat, asthenia, headache, myalgia, anosmia, and dysgeusia for the past 5 days. On the 5<sup>th</sup> day after the onset of these symptoms, her reverse transcriptase-polymerase chain reaction test (RT-PCR) for SARS-Cov-2 infection was positive (RT-PCR test, Abbott, Maine, USA). She had a medical history of hypertension and diabetes, which has been controlled by atenolol (50 mg once daily) and metformin (500 mg twice daily), respectively, for the last 3 years.

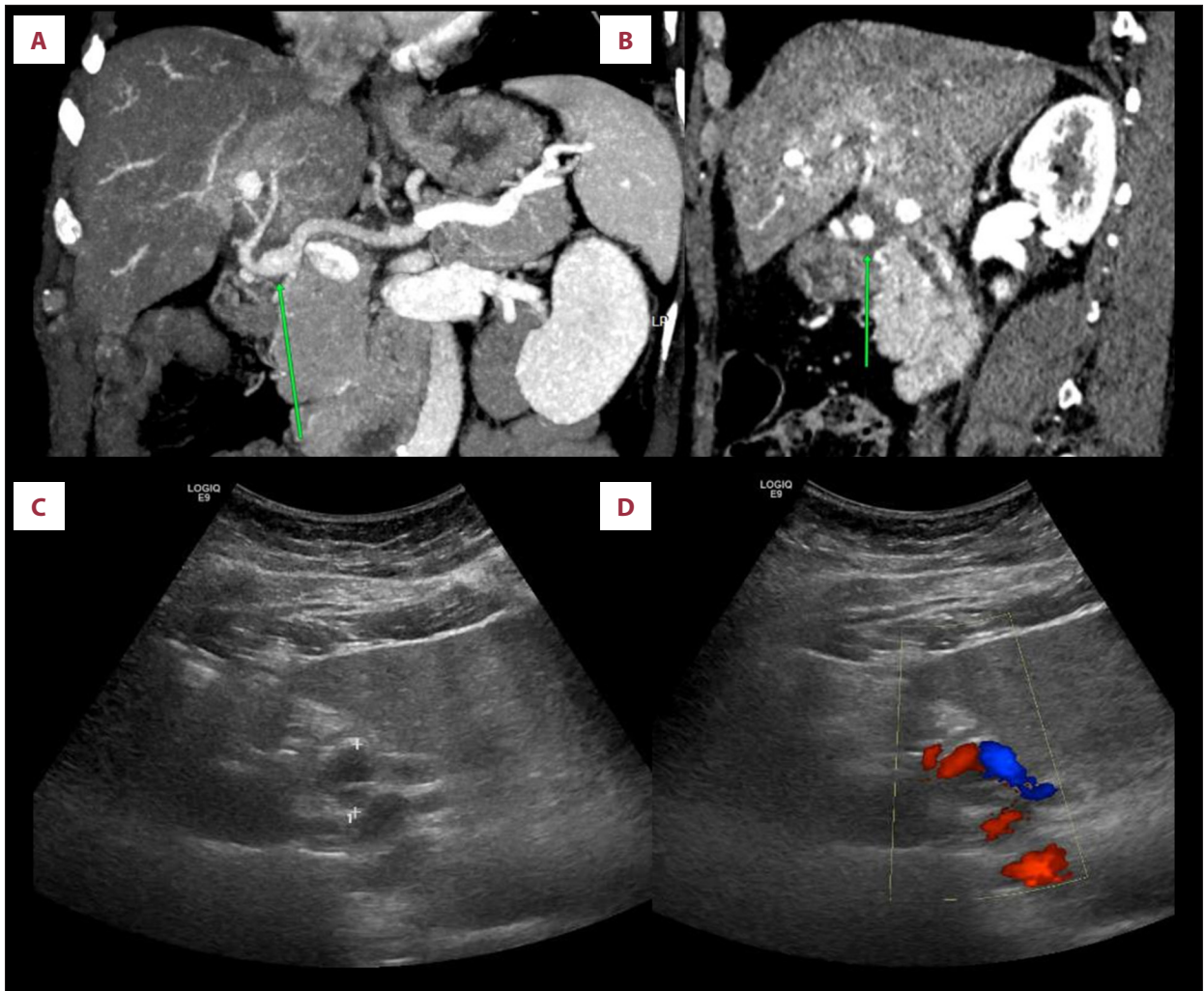
She remained stable, and her initial symptoms of COVID-19 decreased progressively with an improvement in the cough and sore throat; however, the asthenia, mild headache, anosmia, and dysgeusia persisted. On the 14<sup>th</sup> day, she reported pain in the upper abdomen, particularly in the epigastric area. The abdominal pain worsened after 48 h; however, she did not have any vomiting or diarrhea. On the 16<sup>th</sup> day, she was hospitalized and administered intravenous analgesia (dipyrone 1000 mg 3 times daily and tramadol 100 mg 4 times daily).

Her serum gamma-glutamyl transferase (GGT) levels were 2.5 times the upper limit of normal (ULN) levels, and the other liver function test results were below the normal limits. The highest levels of protein C (1.80 mg/dL, ULN 0.48 mg/dL) and D-dimer (2.154 ng/mL, ULN 500 ng/mL) were observed after the onset of abdominal pain. The D-dimer level progressively decreased

**Table 1.** Laboratory test results for the patient when the hepatic artery thrombosis was diagnosed.

Variable (normal values)	16 <sup>th</sup> day of illness	Variable (normal values)	16 <sup>th</sup> day of illness
White blood cells 10 <sup>3</sup> /mm <sup>3</sup> (4-10)	8.760	Fibrinogen mg/dl (200-400)	454
Neutrophils 10 <sup>3</sup> /mm <sup>3</sup> (1.6-7)	5957	Prothombin time ratio (0.80-1.2)	1.0
Lymphocytes 10 <sup>3</sup> /mm <sup>3</sup> (1.5-4.5)	1927	Fator V de Leiden mutation R506Q	Absent
Hemoglobin g/dl (11.5-15)	13,3	Prothrombin G20210A mutation	Absent
Platelets 10 <sup>3</sup> /mm <sup>3</sup> (150-450)	212	Anti-beta2 glycoprotein I (IgG) U/ml (negative <7)	2,9
C-reactive protein mg/dl (<0.5)	1,8	Anti-beta2 glycoprotein I (IgM)U/ml (negative <7)	<2,9
AST U/L (10-37)	32	Rheumatoid factor	Neg
ALT U/L (5-45)	25	Antinuclear antibody	Neg
Bilirubin mg/dl (0.3-1.2)	0,8	Anticardiolipin IgG (GPL <10)	0,8
Alkaline phosphatase U/L (46-116)	75	Homocysteine mcmol/L (4.4-13.56)	13
Gamma GT U/L (1-24)	56	Protein C% (70-140)	130
LDH U/L (120-246)	226	Protein S% (72-112)	110
Lipase U/L (12-53)	52	Antithrombin (82-112%)	89
D-Dimer ng/ml (<500)	2541		

ALT – alanine transaminase; gamma-GT – gamma-glutamyltransferase; LDH – lactate-dehydrogenase.



**Figure 1.** (A) Abdominal computed tomography angiography on maximum intensity projection in the coronal plane. (B) Multi-planar sagittal reconstruction depicting the segment of the common hepatic artery in the hepatic hilum with circumferential partial thrombosis and aneurysmatic dilation (green arrows). (C) Ultrasonography of the common hepatic artery depicting the dilated segment with partial thrombosis in B-mode. (D) Normal blood flow without hemodynamic changes on the color Doppler ultrasonography.

after initiation of the anticoagulant therapy. The serum tests for thrombophilia were negative (**Table 1**).

The upper digestive tract endoscopy results were normal. Abdominal computed tomography angiography (CTA) showed partial thrombosis of the common hepatic artery with aneurysmal dilation (**Figure 1A, 1B**) and the Doppler ultrasonography of the liver confirmed this finding (**Figure 1C, 1D**). The chest CTA, which assessed the pulmonary involvement and thromboembolism, was normal. A Doppler deep venous ultrasonography of the lower limbs was normal.

Subcutaneous enoxaparin (60 mg twice daily) was administered during hospitalization. Three days later, there was significant improvement of the abdominal pain. She was discharged

from the hospital and prescribed oral rivaroxaban for 30 days. Thirty days after hospital discharge, her abdominal pain and the other COVID-19-related symptoms completely resolved. Doppler ultrasonography performed 30 days after the thrombotic event revealed a persistent thrombus, which was managed by continuing the prescribed anticoagulant for a further 90 days. Currently, she remains asymptomatic and has a follow-up every 4 months as an outpatient, with no evidence of recurrence of the thrombotic events. She is due for the next Doppler ultrasonography in July 2021. The patient gave informed consent for the publication of this case report.

## Discussion

This case report describes a patient who presented with the clinical manifestations of COVID-19, which was confirmed by an RT-PCR test. Then, she developed acute abdominal pain and a rare thrombotic event.

In patients with COVID-19, thrombosis can be induced by several mechanisms, including a cytokine storm, coagulation activation (especially interleukin 6), and excessive complement activation [3]. Microthrombogenic responses to the endothelial insults induced by COVID-19 can also occur [3]. Binding of the viral spike protein (protein S) to the angiotensin-converting enzyme 2 (ACE2) necessary for viral internalization can reduce the availability of cellular ACE2, which has an important biological function of converting angiotensin II to angiotensin 1-7. Consequently, this can increase the levels of angiotensin II (Ang II), which has pro-inflammatory and thrombotic effects [9].

Venous thrombotic events are more common than arterial events [3-5,10]. In a recent meta-analysis of 39 articles about venous thrombotic events, the occurrences of pulmonary thromboembolism and venous thrombosis were 17% and 42%, respectively, in patients with severe COVID-19 [10]. Although less frequent, arterial thrombosis is significant because of its ability to cause severe complications in myocardial conditions, lower limbs, kidneys, and cerebral ischemic conditions [4,5]. In a study involving 531 patients, 5.6% of the patients developed arterial thrombosis, and 40% of them were hospitalized due to these thrombotic events. Myocardial infarction occurred in 30% of the cases, stroke in 26.7%, and acute or subacute ischemia of the lower limbs was seen in 20% of cases. The thrombotic events occurred more frequently in these 3 zones [5].

Gastrointestinal manifestations, including diarrhea, nausea, vomiting, and abdominal pain, were described in 15% of patients, although thrombotic events of the gastrointestinal system are rare [6,11-14]. In a study by Hassan and Ramadan that reevaluated 7 cases of hepatic vein thrombosis, abdominal pain was the most frequent manifestation, and all the patients achieved complete recovery [6]. In a review of 31 patients with venous and arterial mesenteric thrombosis with severe ischemic complications, the most common initial presentations were abdominal pain (61.3%), nausea, and vomiting (32.2%); 64.5% of patients underwent a laparotomy and an intestinal resection, and 48% of patients had arterial or macrovascular venous thrombosis detected radiologically [14].

Our patient presented with abdominal pain and arterial thrombosis 14 days after the COVID-19 symptoms. In a study by Fournier et al, the onset of arterial thrombosis ranged from 5 days to 20 days (mean 11 days) after the onset of COVID-19 symptoms [5]. Hepatic artery thrombosis is associated with

liver transplantation surgery, affecting 2% to 12% of transplant recipients, and is the main cause of graft failure and mortality [7]. Rare hepatic artery thrombosis cases were reported in patients (not liver receptors) with hematological disorders or those who underwent surgical procedures [7,8]. Liver transplant patients who develop hepatic artery thrombosis have elevated liver function test results due to ischemia of the bile ducts [7]. In our patient, only the serum GGT levels had increased. This could indicate a compensatory response to arterial perfusion of the hepatic parenchyma by the other small collateral arteries. These small vessels are sectioned during liver transplantation, and severe ischemia occurs due to hepatic arterial obstruction after orthotopic liver transplantation [7].

Our patient developed hepatic artery thrombosis identified by CTA and Doppler ultrasonography. Thrombotic events of the portal and arterial systems can be identified by color Doppler ultrasonography. CT, magnetic resonance imaging, or conventional angiography can be performed to confirm the diagnosis. CTA using an early arterial phase and thin-slice reconstruction has diagnostic accuracy, which is comparable to or better than ultrasonography [7].

Ultrasonography and abdominal CTA revealed aneurysmal dilation in the present case. Arterial aneurysms are rarely diagnosed in young patients, and if they occur, they are related to atherosclerosis, trauma, invasive procedures, infection, vasculitis, or autoimmune diseases [15]. Therefore, the lack of predisposing factors for an aneurysm in our patient suggested the involvement of the SARS-CoV-2 infection.

The abdominal pain decreased after the introduction of anticoagulant therapy during hospitalization and continuing the anticoagulant therapy after hospital discharge. In a study by Hassan and Ramadan, 5 out of 7 cases with portal vein thrombosis presented with abdominal pain. Anticoagulation with subcutaneous or venous heparin is the main therapy, which showed an improvement in all the patients, except for 1 patient, who had thrombosis of the superior mesenteric artery and died [6]. In cases of portal vein thrombosis, the early introduction of anticoagulation therapy in the first week and its maintenance for 6 months promotes recanalization in >60% of patients, and in <20% of patients if this therapy is initiated after the first week [16].

Despite the higher frequency of thrombotic events associated with the SARS-CoV-2 infection, protocols and guidelines do not recommend anticoagulant prophylaxis for outpatients. This prophylaxis is indicated only for hospitalized patients (including non-critically ill patients) [9,17]. However, the guideline of the Global COVID-19 Thrombosis Collaborative Group considers anticoagulant prophylaxis for non-hospitalized patients with limited mobility and a history of venous thromboembolism or



active malignancy [9]. The patient in the present case report was a young woman with no risk factors for thrombotic events.

There have been no reported cases of hepatic artery thrombosis in patients with COVID-19. Although we were uncertain whether COVID-19 induced the hepatic artery thrombosis, no secondary causes, including hereditary or acquired thrombophilia, or autoimmune diseases were identified. Systemic inflammation and hypercoagulability were present, although these were related to COVID-19.

In the present case report, the patient had acute abdominal pain as the main manifestation of the arterial thrombosis. Abdominal pain has been reported in up to 9% of COVID-19 patients with gastrointestinal involvement. This was observed particularly among the patients with severe COVID-19 [13].

## Conclusions

Thrombotic events are well-recognized complications of COVID-19 and recent descriptions involve the gastrointestinal system. This report of a rare association of hepatic artery thrombosis highlights the importance of investigating thrombotic events in patients with abdominal pain and coagulopathy during COVID-19, as it requires prompt treatment with anticoagulants to reduce the risk of serious complications.

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## Conflicts of Interest

None.

## Declaration of Figures Authenticity

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