92524-Manuscript File-revision.docx

Name of Journal: *World Journal of Clinical Cases*
Manuscript NO: 92524
Manuscript Type: CASE REPORT

Simultaneous portal vein thrombosis and splenic vein thrombosis in a COVID-19 patient: A case report

Abramowitz BR *et al*. Simultaneous PVT and splenic artery thrombosis

Binyamin R Abramowitz, Michael Coles, Ayse Aytaman, Bani Chander-Roland, Daniel A DiLeo

Abstract

BACKGROUND

It is well described that Coronavirus 2019 (COVID-19) infection is associated with an increased risk of thrombotic complications. While there have been many cases of pulmonary emboli and deep vein thrombosis in these patients, reports of COVID-19 associated portal vein thrombosis (PVT) have been uncommon. We present a unique case of concomitant PVT and splenic artery thrombosis in a COVID-19 patient.

CASE SUMMARY

A 77-year-old-male with no history of liver disease presented with three days of left-sided abdominal pain. One week earlier, the patient was diagnosed with mildly symptomatic COVID-19 and was treated with nirmatrelvir/ritonavir. Physical exam revealed mild right and left lower quadrant tenderness, but was otherwise unremarkable. Significant laboratory findings included WBC 12.5 K/uL, total bilirubin 1.6 mg/dL, AST 40 U/L, and ALT 61 U/L. Computed tomography of the abdomen and pelvis revealed acute PVT with thrombus

extending from the distal portion of the main portal vein (PV) into the right and left branches. Also noted was a thrombus within the distal portion of the splenic artery with resulting splenic infarct. Hypercoagulable workup including prothrombin gene analysis, Factor V Leiden, Cardiolipin antibody, and JAK2 mutation were all negative. Anticoagulation with enoxaparin was initiated, and the patient's pain improved. He was discharged on apixaban.

CONCLUSION

It is quite uncommon for PVT to present simultaneously with an arterial thrombotic occlusion, as in the case of our patient. Unusual thrombotic manifestations are classically linked to hypercoagulable states including malignancy and hereditary and autoimmune disorders. Viral infections such as Epstein-Barr virus, cytomegalovirus, viral hepatitis, and COVID-19 have all been found to increase the risk of splanchnic venous occlusions, including PVT. In our patient, prompt abdominal imaging led to early detection of thrombus, early treatment, and an excellent outcome. This case is unique in that it is the second known case within the literature of simultaneous PVT and splenic artery thrombosis in a COVID-19 patient.

Keywords: COVID-19; Thromboembolism; Portal vein thrombosis; Splenic artery thrombosis; Anticoagulation; Lovenox; Thrombotic complication; Case report

Abramowitz BR, Coles M, Aytaman A, Chander-Roland B, DiLeo DA. Simultaneous portal vein thrombosis and splenic vein thrombosis in a COVID-19 patient: A case report. *World J Clin Cases* 2024; In press

Core Tip: Thromboembolism is a severe but clinically common complication of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. Thrombotic events classically occur in infected patients who are critically ill, and

typically present as deep vein thrombosis (DVT) or pulmonary embolism (PE). We report a rare case of a patient with SARS-CoV-2 infection complicated by simultaneous portal vein thrombosis and splenic artery thrombosis. A presentation of moderate to severe abdominal pain in SARS-CoV-2 patients should trigger prompt abdominal imaging, as early diagnosis and treatment of splanchnic thrombosis with anticoagulation leads to favorable outcomes.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) infection is associated with a hypercoagulable state and increased risk of thrombotic complications[1]. Although thrombosis in COVID-19 patients can affect any blood vessel, the incidence of venous thromboembolism within these patients is far greater than that of arterial thromboembolism[2,3]. Up to 30% of critically ill COVID-19 patients have been reported to experience either DVT or PE[4]. In contrast, ischemic strokes, acute coronary syndrome, acute limb ischemia, and mesenteric ischemia have only been reported in up to 3.7% of patients[5].

Splanchnic vein thrombosis is an uncommon thrombotic complication of COVID-19[6]. As thrombosis within the portal system can rapidly expand, the clot may progress into the mesenteric venous system, leading to intestinal ischemia[7]. Although splanchnic venous thrombosis is rare, it has been reported in patients with mild COVID-19 infection, including patients without respiratory symptoms[8,9]. We present an exceptionally unique case of simultaneous portal vein thrombosis and splenic artery thrombosis in a COVID-19 patient with mild upper respiratory symptoms.

CASE PRESENTATION

Chief Complaints

A 77-year-old Caucasian male presented to the emergency room with three days of left-sided abdominal pain

History of present illness

The patient described his pain as continuous and crampy in character, most severe in the left lower quadrant, and associated with constipation. He denied flank pain, melena, hematochezia, nausea, or vomiting.

History of past illness

The patient had no history of liver disease. One week earlier he tested positive for COVID-19 after experiencing a mild cough and sore throat. He was treated with nirmatrelvir/ritonavir. His upper respiratory symptoms resolved three days after nirmatrelvir/ritonavir initiation.

Physical Examination

On presentation, the patient was hemodynamically stable. Physical exam revealed mild right and left lower quadrant tenderness, and was otherwise unremarkable.

Laboratory Examinations

Laboratory findings showed a white blood cell count of 12.5 K/uL, hemoglobin of 16.8 g/dL , total bilirubin of 1.6 mg/dL, aspartate transferase (AST) of 40 U/L, alanine transaminase (ALT) of 61 U/L, and alkaline phosphatase of 80 U/L. Partial thromboplastin time (PTT) and international normalized ratio (INR) were within normal limits.

Imaging Examinations

Computed tomography of the abdomen and pelvis (CTAP) revealed acute portal vein thrombosis with the thrombus extending from the distal portion of the main portal vein into the right and left portal branches. Thrombus was also present within the distal portion of the splenic artery with resultant developing splenic infarct. Finally, ill-defined soft tissue was noted in the region of the splenic hilum measuring approximately 2.5cm, likely reflecting inflammatory changes, though an exophytic pancreatic lesion could not be ruled out.

Further Diagnostic Workup

Hypercoaguable workup including prothrombin gene analysis, Factor V Leiden, cardiolipin antibody, and JAK2 mutation were obtained and later all resulted negative.

FINAL DIAGNOSIS

Based on the imaging findings, the patient was diagnosed with both portal vein thrombosis and splenic artery thrombosis.

TREATMENT

Anticoagulation was initiated promptly with full dose enoxaparin. After three days, the patient reported complete resolution of his abdominal pain. He was discharged on a six-month course of apixaban.

OUTCOME AND FOLLOW UP

The patient returned for magnetic resonance imaging (MRI) of his abdomen eight weeks after discharge. He denied any recurrence of abdominal pain since his hospitalization. MRI revealed reperfusion of the portal vein and the previously visualized soft tissue density noted in the CTAP was no longer seen, ruling out an exophytic pancreatic lesion.

DISCUSSION

Thrombosis is a serious complication of COVID-19, which has significantly contributed to its morbidity and mortality throughout the pandemic[10]. Several retrospective studies have shown the incidence of thromboembolism in patients admitted to intensive care units (ICU) to be quite high, with one study revealing an incidence rate of 69%[11]. Deep vein thrombosis and pulmonary embolism comprise the main bulk of cases of thromboembolism in COVID-19 patients, but the virus does increase the general risk of thromboembolism within all vasculature, including the splanchnic circulation, as in the case of our patient.

Delineating the pathophysiology behind thrombosis in COVID-19 infection is key to understanding the increased thrombotic risk in these patients. The SARS-CoV-2 virus primarily infects and enters endothelial cells through membrane-bound angiotensin converting enzyme-2 (ACE2) receptors[12,13]. Once inside the cell, the virus is able to hijack its host cell machinery in order to replicate viral RNA, perform particle assembly, and release an even greater viral load back into the extracellular environment. The infected endothelial cells accrue damage that leads to cell dysfunction, pyroptosis, and apoptosis, which leads to increased vascular permeability[14,15]. Recognition of viral RNA by the innate immune system results in the production of pro-inflammatory cytokines[16]. Massive cytokine build-up allows for the pouring of both innate and adaptive immune cells into the vasculature in the setting of acutely increased permeability, which is subsequently followed by widespread platelet activation[17]. Additionally, damaged endothelial cells lose their physiological capability of blocking the coagulation cascade, while immune cells and cytokines act to promote activation of coagulation factors[18]. This all creates the pathophysiologic context for COVID-19 patients in which their risk of thromboembolism formation is significantly elevated.

Although the risk of splanchnic vein thrombosis is higher in COVID-19 patients than the average population, its incidence within the infected population has been reported to be as low as 0.6%, far below that of DVT or PE[19]. The most common subtype of splanchnic vein thrombosis in COVID-19 patients is portal vein thrombosis, followed by mesenteric vein thrombosis, splenic vein thrombosis, and Budd-Chiari syndrome[20]. Although thrombotic risk is elevated with increased severity of COVID-19 infection, thrombosis can still be diagnosed in mild and even asymptomatic COVID-19 infections[21]. In our case, the patient only experienced mild upper respiratory symptoms that had already resolved before he began to develop thrombotic-related clinical symptoms. Therefore, thrombotic risk still exists in COVID-19 patients whose symptoms may have already resolved.

The incidence of arterial thromboembolism in COVID-19 is significantly lower than that of venous thromboembolism, with the most common subtypes being acute coronary syndrome followed by ischemic stroke, and acute limb ischemia[22]. Splanchnic arterial thromboembolism in COVID-19, such as the splenic artery thrombosis that occurred in our patient, is even rarer. There is only one additional known case within the literature of simultaneous PVT and splenic artery thrombosis in a COVID-19 patient[23].

As PVT in COVID-19 patients has been found to have mortality rates up to 16%, early diagnosis and treatment is imperative[24]. Presenting clinical symptoms typically involve abdominal pain and are otherwise non-specific. Thus, imaging with CT scan, ultrasound, or MRI will facilitate the diagnosis[25,26]. Once the diagnosis is made, treatment with anticoagulation must be prioritized, as early anticoagulation has been associated with positive outcomes[27,28]. Low molecular weight heparin (LMWH) is often utilized as the primary anticoagulant of choice in COVID-19 patients rather than direct oral anticoagulants (DOACs), as LMWH is less likely to have negative drug interactions with antiviral therapies[29,30].

As dozens of cases of COVID-associated PVT have been reported ever since the start of the pandemic with relatively high mortality rates, it is important for clinicians to have PVT within the differential for COVID-19 patients presenting with abdominal pain. In our patient, prompt abdominal imaging led to early detection of thrombus with early treatment and an excellent outcome. This case is quite unique in that it is only the second known imaging confirmed case within the literature of simultaneous PVT and splenic artery thrombosis in a COVID-19 patient.

CONCLUSION

Thromboembolism is a severe potential complication of COVID-19 infection. Thrombosis more commonly affects venous circulation within the extremities or the pulmonary vessels, but it can also affect splanchnic vessels. Although it is relatively rare, splanchnic thrombosis should be on the differential in a patient presenting with abdominal pain in the setting of a COVID-19 infection. Our case was quite unique in that the patient presented with both portal vein and splenic artery thrombosis simultaneously. As previous literature has shown, timely imaging and early treatment with anticoagulation resulted in a positive outcome in our patient.

92524-Manuscript File-revision.docx

ORIGINALITY REPORT

7%

SIMILARITY INDEX

PRIMARY SOURCES

1	www.ncbi.nlm.nih.gov Internet	63 words — 3%
2	jcimcr.org Internet	15 words — 1%
3	pubmed.ncbi.nlm.nih.gov Internet	13 words — 1%
4	repositories.lib.utexas.edu Internet	13 words — 1%
5	www.wjgnet.com Internet	13 words — 1%
6	www.thieme-connect.com Internet	12 words — 1%

EXCLUDE QUOTES	ON	EXCLUDE SOURCES	< 12 WORDS
EXCLUDE BIBLIOGRAPHY	ON	EXCLUDE MATCHES	< 12 WORDS