Venous thromboembolism related to cytomegalovirus infection
A case report and literature review

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Abstract

Rationale: Herein, we present a case of seemingly unprovoked portal vein thrombosis (PVT) occurring in the context of an acute cytomegalovirus (CMV) infection and prolonged debilitating fatigue.

Patient concerns: A 46-year-old male airline pilot presented with a 2 week history of abdominal pain, nausea, vomiting, watery diarrhea, and daily recurrent fevers. This was in the context of progressive, debilitating fatigue for 3 months forcing the patient to leave his job.

Diagnoses: Computed tomography of the abdomen revealed PVT, which was managed initially by heparin infusion. Cefepime was ordered for broad-spectrum antibiotic management of sepsis and possible septic thrombosis. Further workup exposed elevated transaminases consistent with mild hepatitis without synthetic dysfunction and colonoscopy revealed colitis. A comprehensive evaluation for liver disease was notable for a markedly elevated ferritin level. Spiking fevers and neutrophilia persisted for several days despite empiric antimicrobial treatment, but eventually resolved. The remainder of the workup was negative except for positive CMV IgM titer and viral load. This raised suspicion for a hypercoagulable state caused by CMV hepatitis with CMV-induced PVT. Heparin was transitioned to warfarin at the time of discharge.

Interventions: Given the patient's immunocompetent state and resolution of fevers, antiviral therapy for CMV infection was not initiated.

Outcomes: The patient continued to improve with a normalization of the serum ferritin level and anticoagulation therapy was stopped after 6 months.

Lessons: There is mounting support for infectious causes of venous thromboembolism (VTE) based on existing molecular biology and clinical research. Meta-analysis of existing data showed that between 1.9% and 9.1% of patients hospitalized with VTE had concurrent acute CMV infection. Theoretical mechanisms for this association include transient formation of antiphospholipid antibodies, transient formation of antibodies targeting CMV capsule phospholipids with procoagulant properties, and direct infection of the endothelial cells. We hope this case will serve as a reminder to consider CMV as a transient cause of PVT and VTE, particularly in light of 2016 guidelines for unprovoked VTE recommending lifelong anticoagulation. We also plan to prospectively study the association of unprovoked VTE and acute CMV infection in our own hospital system.

Abbreviations: β2GPI = beta-2-glycoprotein I, APS = antiphospholipid syndrome, CMV = cytomegalovirus, PVT = portal vein thrombosis, VTE = venous thromboembolism.

Keywords: CMV, coagulopathy, cytomegalovirus, portal vein thrombosis, PVT, venous thromboembolism, VTE

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1. Introduction

Unprovoked venous thromboembolism (VTE) is a common diagnosis, resulting in thousands of patients being placed on anticoagulation without a clear understanding of the underlying cause of coagulopathy. In such cases, cytomegalovirus (CMV) is rarely considered as a possible provoking agent; however, there is emerging data supporting its role as a cause of a transient hypercoagulable state. Herein, we present a case of CMV-induced portal vein thrombosis (PVT) along with a literature review of similar cases.

2. Case history

A 46-year-old male airline pilot presented as a regional transfer to our facility with progressive abdominal pain for the prior 2 weeks. This was further characterized as a stabbing periumbilical pain associated with nausea, vomiting, watery diarrhea, and recurrent daily fevers over the same period of time. Further

history revealed that the patient had been out of work for 3 months due to progressive, debilitating fatigue. Watery diarrhea was occurring approximately twice daily without any associated weight loss. Earlier in the week, the patient had been treated empirically by his primary care physician with a course of azithromycin without any improvement. Social history was not significant, as the patient did not smoke cigarettes, use other tobacco products, or use illicit drugs. In addition, he had avoided alcohol for most of his life due to his profession as a pilot. The patient was unmarried and had not been sexually active in several years. Past medical history was similarly noncontributory, as the patient denied having any known chronic conditions or prolonged hospitalizations and denied taking any medications or supplements. His family history was only significant for Hashimoto disease in his mother, sister, and maternal aunt.

Physical examination was notable for a fever of 38.6°C, tachycardia averaging 105 beats per minute, and abdominal tenderness to deep palpation of the periumbilical area and the right upper quadrant. The liver span was 13 cm at the midclavicular line by percussion, suggestive of mild hepatomegaly. He did not have any notable rash, lymphadenopathy, palpable splenomegaly, or any other stigmata of liver disease. There were also no warm, swollen, tender, or immobile joints upon musculoskeletal examination.

Initial laboratory findings were consistent with mild hepatitis with elevated transaminases, mild hyperbilirubinemia, and mild hypoalbuminemia without coagulopathy or hyperammonemia (Table 1). The patient also had mild hyponatremia, elevated C-reactive protein, and elevated lactate dehydrogenase levels. The initial blood counts showed mild neutrophilia, atypical lymphocytes, and rare smudge cells. Prior to transfer, computed tomography of the abdomen with contrast revealed PVT

(Fig. 1A, B). This was confirmed by abdominal ultrasound with portal vein duplex showing retrograde flow and a visible thrombus with normal echogenicity of the liver. With persistent fevers and concern for septic thromboembolism, continuous heparin infusion and intravenous cefepime antibiotic therapy (2 g every 8 hours) were initiated on arrival. Further evaluation for liver disease revealed a ferritin level of 6248 ng/mL (Table 2), which was not accompanied by any other clinical or laboratory evidence of hemochromatosis. Additional workup for liver disease revealed moderately low alpha-1-antitrypsin levels, though the patient did not display other classic signs of the disease.

As the workup progressed, the patient continued to have daily fever spikes and neutrophilia, despite empiric antimicrobial treatment and negative blood and stool cultures (Table 3). Testing for human immunodeficiency virus was negative; however, the remainder of the evaluations for both fever and hepatitis revealed a positive CMV IgM titer and abnormal hepatitis B and C findings. Viral loads for both hepatitis viruses were negative, but CMV viral titers were markedly elevated, supporting the diagnosis of an active CMV infection. On hospital day 5, fevers ceased and did not recur. The patient was transitioned from heparin to warfarin for discharge.

The diffuse nature of our patient's disease processes with objective findings of pathology in both the liver and colon, in addition to the PVT, strongly suggested CMV was the underlying etiologic agent. This fit with the history of a viral prodrome along with the finding of atypical lymphocytes in the peripheral smear. However, due to his immunocompetent state and resolution of fevers, we did not favor antiviral therapy for the CMV infection at the time of discharge.

3. Differential diagnosis

As part of the initial evaluation, the differential diagnosis for the fever was considered in the context of watery diarrhea and thrombosis. Prior to admission, workup for his fevers had included complete blood counts, a metabolic panel, chest X-ray, urinalysis, and urine cultures. He also received empiric therapy with azithromycin. Without a proven infectious source on those studies, we first focused on infectious diarrhea and bacteremia; however, all cultures resulted negative. Other causes such as pharyngitis, cholecystitis, and intraabdominal abscess were ruled out by physical examination and imaging studies. Septic thrombus was also considered unlikely due to the lack of positive blood cultures. As these findings returned negative, and he approached the 3-week mark of fevers, fever of unknown origin was more strongly considered. Drug-induced fever was considered unlikely due to the lack of any medications or supplements being taken prior to the onset of fevers. Before the consideration of rarer causes, such as tuberculosis or parasitic infections, several viral infections were tested.

This paired well with a similar ongoing work-up for hepatitis. The patient had mild, but new and persistent transaminitis and hyperbilirubinemia without evidence of synthetic liver dysfunction. In the context of PVT, our gastroenterology consultant recommended evaluation for underlying liver disease and they proceeded with a colonoscopy to evaluate for colitis due to the persistent diarrhea. Hyperferritinemia was notable, but was an isolated feature. This ruled out hemochromatosis and many autoimmune conditions, such as adult Still disease due to the lack of arthralgias, rash, or pharyngitis. As mentioned above, the alpha-1-antitrypsin level was also noted to be low, so

Table 1

Initial laboratory studies.

| Study	Value	Normal range
Sodium	134 mmol/L	136–145 mmol/L
Potassium	4.0 mmol/	3.5–5.1 mmol/L
CO$_2$, venous	23 mmol/L	22–30 mmol/L
Creatinine, blood	0.76 mg/dL	0.70–1.30 mg/dL
Lactic acid	1.6 mmol/L	0.7–2.1 mmol/L
Total bilirubin	1.6 mg/dL	0.2–1.2 mg/dL
Direct bilirubin	0.7 mg/dL	0.0–0.5 mg/dL
Alkaline phosphatase	150 U/L	40–150 U/L
Aspartate aminotransferase	90 U/L	5–34 U/L
Alanine aminotransferase	148 U/L	0–55 U/L
Gamma glutamyl transferase	117 U/L	12–64 U/L
Total protein	6.1 g/dL	6.3–8.2 g/dL
Albumin	3.1 g/dL	3.5–5.0 g/dL
Ammonia	30 μmol/L	18–72 μmol/L
International normalized ratio	1.1	0.9–1.2
Partial thromboplastin time	35 sec	24–36 sec
Fibrinogen	236 mg/dL	185–475 mg/dL
White blood cell	11.79 cells per microliter	4.00–12.00 cells per microliter
Absolute neutrophil count	8.25 cells per microliter	1.40–5.30 cells per microliter
Hemoglobin	15.6 g/dL	13.0–16.5 g/dL
Platelet	144 platelets per microliter	140–440 platelets per microliter
CRP	7.05 mg/dL	<0.50 mg/dL
Erythrocyte sedimentation rate	2 mm/h	0–15 mm/h
Lactate dehydrogenase	577 U/L	125–220 U/L
Ethanol	<10 mg/dL	<10 mg/dL
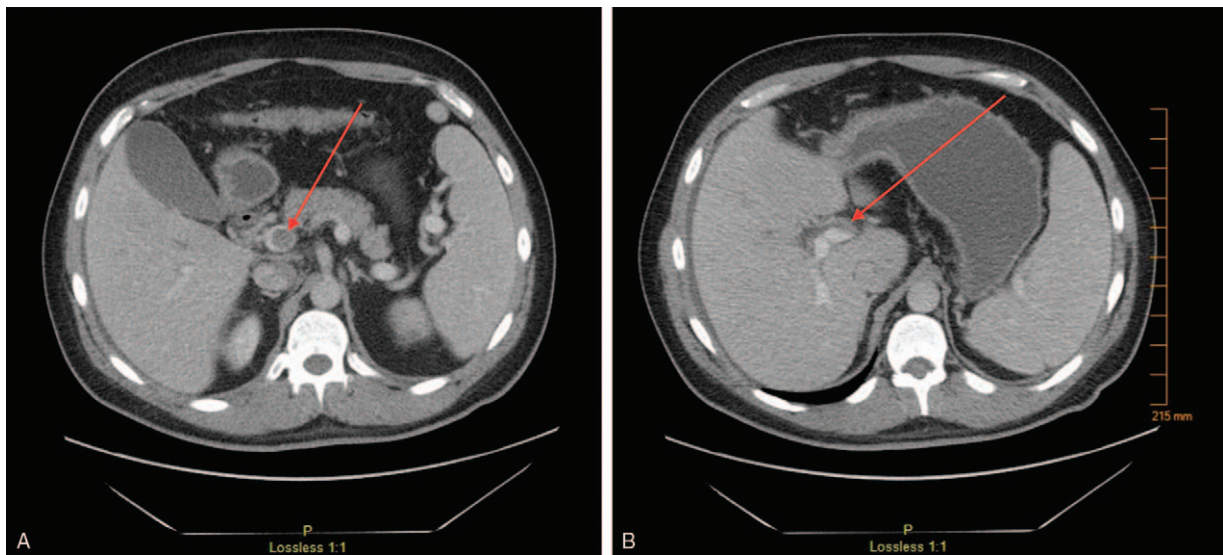
Figure 1. The arrows point to hypoattenuated areas that represents parts of the thrombus: (A) this image depicts the portal vein thombus in the extra-hepatic portal vein; (B) this image depicts the portal vein thrombus at branchpoint to the anterior right main portal vein. These images were generated by computed tomography of the abdomen and pelvis, performed with intravenous contrast dye.

phenotyping was sent, revealing an SZ phenotype. This is associated with a low alpha-1-antitrypsin level without always carrying the classic disease presentation of the ZZ phenotype.

For a number of reasons, including a viral pattern of the transaminases, viral hepatitis was the favored etiology. Both hepatitis B and C had somewhat abnormal antibody testing, but proved negative on polymerase chain reaction testing (Table 2). Ultimately, what confirmed the diagnosis of CMV was the positive IgM titer and a high viral load by polymerase chain reaction. This was supported by the finding of approximately 10% atypical lymphocytes noted on the peripheral smear after admission. We suspect that the CMV infection was responsible for viral hepatitis, which caused PVT, and colitis, which caused watery diarrhea. When considering the elevated CMV IgG titer in the setting of detectable CMV viremia, these findings are consistent with a chronic active infection that would account for the chronic fatigue-like syndrome exhibited by our patient.

Table 2

Portal vein thrombosis and hepatitis laboratory studies.

Study	Value	Normal range
Ferritin	6248 ng/mL	22–274 ng/mL
Iron	28 μg/dL	31–144 μg/dL
Transferrin	126 mg/dL	174–364 mg/dL
Iron saturation	18%	15%–62%
PNH flow cytometry	Normal phenotyping results No PNH clone is detected	Normal phenotyping results No PNH clone is detected
Antihepatitis A IgM	Not detected	Not detected
Antihepatitis B Core IgM	Intermediate	Not detected
Hepatitis B surface antigen	Not detected	Not detected
Hepatitis C antibody	1.09 Signal cutoff ratio	<1.0 signal cutoff ratio
Hepatitis B viral load	0 international units per milliliter	0 international units per milliliter
Hepatitis C viral load	Not detected	Not detected
Carcinoembryonic antigen	0.8 ng/mL	0.0–3.0 ng/mL
Antismooth muscle antibody	<1:10 titer	<1:10 titer
Antimitochondrial antibody	<1:10 titer	<1:10 titer
Ceruloplasmin	32 mg/dL	20–60 mg/dL
Alpha-1-antitrypsin	61 mg/dL	100–190 mg/dL
Alpha-1-antitrypsin phenotype	SZ phenotype	MM phenotype
Human immunodeficiency virus antibody and antigen	Not detected	Not detected
Epstein–Barr virus antigen IgG	>3.50 IgG phospholipid units	<0.90 IgG phospholipid units
Epstein–Barr virus antigen IgM	0.22 IgM phospholipid units	<0.90 IgM phospholipid units
CMV virus IgG	>3.50 IgG phospholipid units	<0.90 IgG phospholipid units
CMV virus IgM	5.23 IgM phospholipid units	<0.90 IgM phospholipid units
CMV quantitative PCR	3220 international units per milliliter	0 international units per milliliter

CMV = cytomegalovirus, PCR = polymerase chain reaction, PNH = paroxysmal nocturnal hematuria.

Table 3

Additional laboratory studies.

Study	Value	Normal range
Peripheral blood smear	~10% atypical lymphocytes, rare smudge cells present, and largely normal RBC morphology	Normal
Blood cultures	No growth to date after 5 d	No growth to date after 5 d
Urinalysis	Normal	Negative/normal
Stool culture	Negative	Negative
Clostridium difficile PCR	Negative	Negative
Colonic biopsy, random	Colonic mucosa with prominent intramucosal lymphoid aggregates. Negative for microscopic colitis. Trichrome stain demonstrates normal subepithelial collagen thickness.	Normal mucosa
Thyroid stimulating hormone	1.237 milli-international units per liter	0.300–5.000 milli-international units per liter
Lyme antibody	0.44 immune status ratio	<0.90 immune status ratio
Antinuclear antibody	Negative	Negative
Extracted nuclear antigen panel	Negative	Negative
Anticyclic citrullinated peptide antibody	19 units	<20 units

PCR = polymerase chain reaction, RBC = red blood cell.

4. Outcomes and follow-up

The patient continued to improve after discharge with only anticoagulation. Ferritin and C-reactive protein trended down and have since normalized. Anticoagulation was stopped after 6 months of therapy. Additional workup following discharge for autoimmune disease, hypercoagulability including antiphospholipid syndrome (APS) and genetic mutations, and lyme disease have been negative thus far (Tables 3 and 4). The resolution of his fevers, diarrhea, hepatitis, and chronic fatigue is suggestive of full viral clearance and completed seroconversion from IgM to IgG, though this could not be confirmed as the patient did not follow-up with the infectious disease specialist.

5. Discussion

When assessing the etiology of VTE, infectious causes such as CMV are rarely considered. However, there is mounting evidence to the contrary. At the time of preparing this case report, a literature review of accessible sources revealed 28 cases documented in several case reports and case series describing immunocompetent patients presenting with CMV-induced VTE (Tables 5 and 6). Common features included fever and abdominal pain. However, chronic fatigue was very uncommon and none of the cases described a prolonged prodrome of symptoms.[1–22] A recent meta-analysis showed that between 1.9% and 9.1% of patients hospitalized with VTE had concurrent acute CMV infection.[23]

Currently, the most plausible mechanism of CMV-induced VTE involves formation of APS antibodies in response to CMV infection with resulting transient hypercoagulable state. Several case studies have described the formation of anticardiolipin antibodies in acute CMV in humans.[24] In mice models, the immunological pathways have been studied in greater detail. Through this process, one CMV-derived peptide of particular interest, TIFI, was found to be an analog of human beta-2-glycoprotein I (β2GPI). Mice injected with TIFI developed APS antibodies and measurable lupus anticoagulant activity, resulting in more thrombotic events than controls.[25] Translation to humans was postulated by formation of anti-β2GPI antibodies against TIFI which would bind endogenous human β2GPI on the surface of endothelial cells leading to activation of the coagulation cascade.[26] This model was taken 1 step further when it was demonstrated that injection of TIFI along with APS antibodies had a protective effect from VTE in mice.[27] The development of APS antibodies in patients with acute CMV infection has not been consistently demonstrated in case studies, but this appears to be a most promising avenue for further study.

Another possible mechanism involves the immune response to accessible CMV envelope procoagulant phospholipids, such as

Table 4

Follow-up hypercoagulability studies.

Study	Value	Normal range
Factor II (prothrombin) Mutation	Normal	Normal (homozygous wild-type)
Factor V (leiden) mutation	Normal	Normal (homozygous wild-type)
MTHFR DNA mutation	Negative	Negative
Protein C activity	141%	79%–175%
Protein S activity	72%	65%–129%
Antithrombin III activity	90%	82%–139%
Anticardiolipin IgG	3.8 IgG phospholipid antigen units per millilitre	0–11.9 IgG phospholipid antigen units per milliliter
Anticardiolipin IgM	6.5 IgM phospholipid antigen units per millilitre	0–11.9 IgM phospholipid antigen units per milliliter
Anticardiolipin IgA	1.8 IgA phospholipid antigen units per millilitre	0–9.9 IgA phospholipid antigen units per milliliter
Beta-2-glycoprotein IgG	11.1 IgG phospholipid antigen units per millilitre	<20.0 IgG phospholipid antigen units per milliliter
Beta-2-glycoprotein IgM	8.1 IgM phospholipid antigen units per millilitre	<20.0 IgM phospholipid antigen units per milliliter
Beta-2-glycoprotein IgA	2.8 IgA phospholipid antigen units per millilitre	<20.0 IgA phospholipid antigen units per milliliter
Lupus anticoagulant	Negative	Negative

Table 5

Literature review (demographic and pertinent clinical characteristics of reported cases of venous thromboembolism occurring in the context of acute cytomegalovirus infection in an immunocompetent host).

Article, y	Onset (age)	Gender	Presenting complaint	VTE location	Hypercoagulable state/risk factors	Extra-vascular manifestation	Treatment
Estival et al (2001)[1]	31	F	Fever, lymphadenopathy	PVT	Heavy smoker, OCP	CMV viremia, CMV hepatitis	NR
Ofotokun et al (2001)[2]	50	M	Fever, abdominal pain	PVT	None	CMV viremia, splenomegaly	Gancyclovir
Abgueguen et al (2003)[3]	32	F	Fever, dyspnea, left chest pain	DVT, PE	Factor V leiden (heterozygous)	NR	NR
Abgueguen et al (2003)[3]	38	F	Fever, diarrhea	DVT, PE	None	CMV colitis	NR
Youd et al (2003)[4]	35	M	Fevers, night sweats, weight loss	PE	NR	CMV hepatitis	NR
Rovery et al (2005)[5]	33	M	Fever, epigastric pain, RLE pain	Tibial popliteal DVT	DVT history, factor V leiden (heterozygous), strong family history	CMV viremia	NR
Paran et al (2007)[6]	21	F	LLE pain	Femoral popliteal DVT	Positive anticardiolipin antibodies	NR	NR
Paran et al (2007)[6]	35	M	Fever, chest pain	Tibial popliteal DVT	Factor V leiden (heterozygous), MTHFR mutation (Homozygous)	NR	NR
Paran et al (2007)[6]	29	F	Fever, dyspnea	Bilateral DVT	OCP	NR	NR
Squizzato et al (2007)[7]	34	M	Fever, cough	PVT	None	Splenomegaly	Warfarin
Ergas et al (2008)[8]	28	M	Fever, right flank pain	Mesenteric vein thrombosis, PE	MTHFR (heterozygous), strong family history	NR	NR
Ladd et al (2009)[9]	17	F	Fever, RUQ abdominal pain	PVT, PE	OCP	NR	NR
Poon et al (2011)[10]	30	F	Fever, myalgia, cough	PE	NR	Splenic infarct	Warfarin
Kalaitzis et al (2012)[11]	40	M	Fever, weight loss	Mesenteric vein thrombosis	None	CMV viremia, small bowel necrosis	Enoxaparin
Sherman et al (2012)[12]	70	M	FUO, headache	Sinus vein thrombosis	None	NR	Warfarin

APL = antiphospholipid antibodies, CMV = cytomegalovirus, DVT = deep vein thrombosis, F = female, FUO = fever of unknown origin, LLE = left lower extremity, M = male, NR = not reported, OCP = oral contraceptive pills, PE = pulmonary embolism, PMH = past medical history, PVT = portal vein thrombosis, RLE = right lower extremity, VTE = venous thromboembolism.

phosphatidylserine. This would theoretically allow these compounds to bypass components of the coagulation cascade to active thrombin through inhibition of innate anticoagulants.[28] Alternatively, direct infection of endothelial cells by CMV has long been suggested as the pathophysiology behind this association of CMV with both venous and arterial thromboembolic events. This invokes Virchow triad, focusing on the role of endothelial damage in thrombosis. In this model, infection of the endothelial cells leads to lysis and release of tissue factor-mediated thrombin, inhibition and depletion of natural anticoagulants like antithrombin III, and inhibition of fibrinolysis.[29]

Although one or more of the above mechanisms might be the cause of this theoretical procoagulant state, the effect appears to be transient. This was demonstrated in case studies where there was clearance of anticardiolipin antibodies several months after CMV infection and acute VTE.[23] One prospective study specifically described a window period of approximately 6-month postinfection where there appeared to a higher rate of VTE than the control population.[30] This is especially important in the context of the 2016 update to VTE guidelines published by the American Thoracic Society, which called for consideration of chronic anticoagulation in all patients with new, unprovoked VTE.[31] If there is a subset of patients with transient or reversible causes of hypercoagulability, we need to actively identify them, as lifelong anticoagulation would be unnecessary and potentially harmful.

Table 6

Literature review (demographic and pertinent clinical characteristics of reported cases of venous thromboembolism occurring in the context of acute cytomegalovirus infection in an immunocompetent host).

Article, y	Onset (age)	Gender	Presenting complaint	VTE location	Hypercoagulable state/risk factors	Extra-vascular manifestation	Treatment
Pichenot et al (2013)[13]	39	M	Monosyndrome, abdominal pain	PVT, PE	None	CMV viremia	Warfarin, valgancyclovir
Pichenot et al (2013)[13]	40	F	Diarrhea	PVT	OCP	CMV viremia	Warfarin
Pichenot et al (2013)[13]	43	F	Fever, purpura, arthralgia	Bilateral DVT, PE	Heavy smoking	None	Warfarin, gancyclovir
Galloula et al (2014)[14]	24	F	NR	PVT	OCP	NR	Warfarin
Nakayama et al (2014)[15]	19	M	Fever, hemoptysis, right chest pain	DVT, PE	APL	Alveolar hemorrhage, CMV viremia	Warfarin
Rinaldi et al (2014)[16]	62	F	Fever, abdominal pain	PVT	Smoker	CMV hepatitis	Warfarin, gancyclovir
Rinaldi et al (2014)[16]	20	F	Abdominal pain, headache	PVT	None	CMV hepatitis	Enoxaparin
Vandamme et al (2014)[17]	30	M	Fever, left chest pain, gastroenteritis	Bilateral PE	None	Myopericarditis, pulmonary hemorrhage	NR
Bertoni et al (2015)[18]	39	M	FUO, monosyndrome	Mesenteric vein thrombosis	Factor V leiden	NR	Warfarin
Wang et al (2015)[19]	61	M	Chronic fatigue, dyspnea, night sweats, productive cough	PVT	None	None	Warfarin
Chou et al (2016)[20]	78	M	Fever, diarrhea	PE	NR	CMV colitis	Heparin, gancyclovir
Bountouris et al (2017)[22]	25	M	Fever, cough, chest pain	DVT, PE	None	NR	rivaroxaban
Vael et al (2017)[21]	58	F	Fever, abdominal pain, chronic fatigue	PVT	None	CMV colitis	Thrombolysis, right hemicolectomy, heparin
Kelkar et al (2017)	46	M	FUO, abdominal pain, emesis, diarrhea	PVT	None	CMV viremia, suspected CMV hepatitis, suspected CMV colitis	warfarin

APL = antiphospholipid antibodies, CMV = cytomegalovirus, DVT = deep vein thrombosis, F = female, FUO = fever of unknown origin, LLE = left lower extremity, M = male, NR = not reported, OCP = oral contraceptive pills, PE = pulmonary embolism, PMH = past medical history, PVT = portal vein thrombosis, RLE = right lower extremity, VTE = venous thromboembolism.

Keeping all of the above in mind, the combination of CMV viremia and CMV hepatitis likely contributed to the procoagulant state, leading to PVT.[29,32] These features likely also contributed to the prolonged debilitating fatigue prodrome, which was a unique feature in this case, as it suggested a prolonged failure to clear the virus, despite the patient's immunocompetent status. Although our patient did not require antiviral therapy, further study into the possible benefits of such therapy in cases with immunocompetent patients is warranted.[33] We hope this case will support further study of the mechanisms linking CMV to VTE and provide additional testimony for consideration of acute CMV infection as a procoagulant state by clinicians in practice. We are also planning further study of our own in the form of retrospective analysis of hypercoagulability in CMV patients and prospective testing for CMV seropositivity in new cases of unprovoked VTE.

6. Methods

Informed consent from the patient was requested and obtained from the patient. Ethical approval from our Institutional Review Board was not necessary as this is a case report maintains the anonymity of the patient.

7. Patient perspective

The patient was offered the option to share his written perspective, but he politely refused the request. The authors would like to thank our patient for allowing for his case to be presented.

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