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## Case Report

# Superior mesenteric artery thrombosis and small bowel necrosis: An uncommon thromboembolic manifestation in COVID-19 pneumonia

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## ABSTRACT

Thromboembolism is a recognized complication in patients with COVID-19 infection. It is believed that coagulopathy results secondary to severe inflammatory response syndrome with release of cytokines, viral activation of coagulation cascade or viral related vasculitis. Both arterial and venous thromboembolic complications have been described, however venous thromboembolic complications are much far common. We present an uncommon thromboembolic complication of the superior mesenteric artery in a 49-year-old male with COVID-19 pneumonia. The patient also developed segmental infarct of his renal transplant. Patients with SARS-COV-2 infection should be closely evaluated and monitored for the development of thromboembolic complications. Prompt evaluation with CT angiography of suspected thromboembolism could help early diagnosis and treatment which can reflect better patients' outcomes

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## Introduction

The novel corona virus (COVID-19) is a highly contagious worldwide viral pandemic which has emerged in Wuhan, China, during December 2019 [1]. This viral disease has a wide spectrum of clinical manifestations which range from asymptomatic to critically ill with severe acute respiratory distress syndrome. Many articles evoked the high incidence of coagulation disorders in COVID-19 patients [2]. Venous

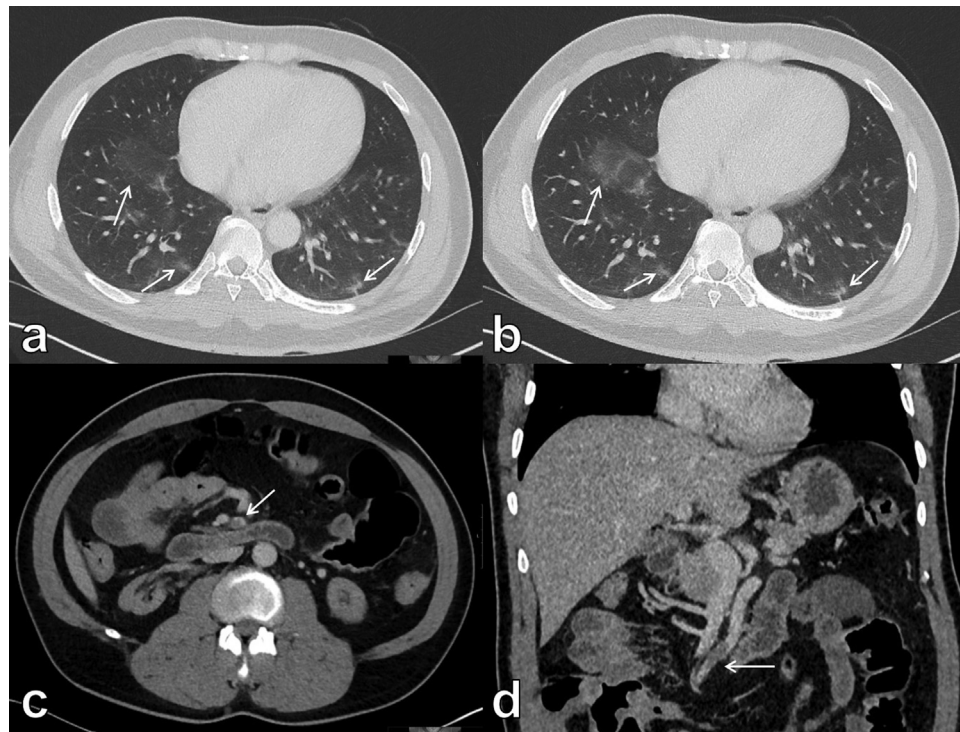
and arterial thromboembolism is an increasingly recognized complication in patients with COVID-19 [3]. Venous thromboembolism is more frequently encountered and typically manifest as deep venous thrombosis and pulmonary embolism (PE) [4,5]. The typical finding of elevated D-dimer, fibrinogen and fibrin degradation products in COVID-19 patients raises concern of underlying venous thromboembolism [6]. Coagulation derangement is believed to be secondary to the cytokine storm related to severe inflammatory response syndrome or a direct effect of the virus itself [3,7]. We present

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**Fig. 1 – Superior mesenteric artery thrombosis in a 49-year-old man with RT-PCR confirmed COVID-19 pneumonia. Axial CT images of lung bases (A and B) demonstrate multi-focal bibasilar subtle patchy areas of ground glass opacification (arrows) with small nodular consolidative patches. Axial contrast-enhanced CT image of the abdomen (C) shows a partially obstructing hypodense intraluminal filling defect within the superior mesenteric artery (arrow). Coronal contrast-enhanced image of the abdomen (D) better visualizes the extent of partially obstructing superior mesenteric artery thrombus (arrow).**

a case of COVID-19 pneumonia complicated with superior mesenteric thrombosis and segmental renal infarct.

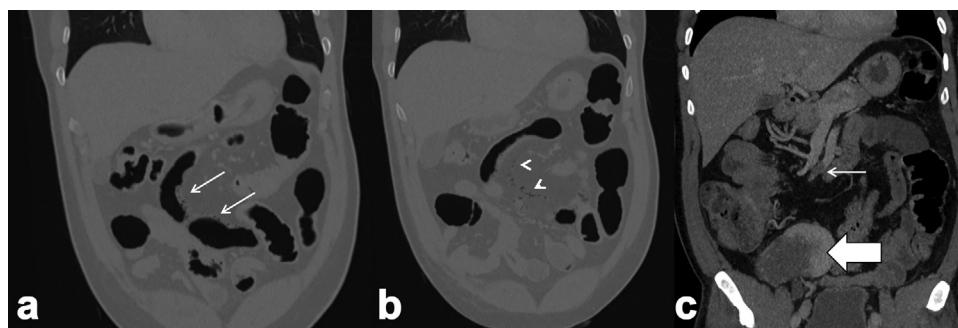
ence of imaging features of bowel necrosis. Therefore, conservative treatment with tinzaparin was initiated. Despite the extensive therapy, the patient succumbed.

## Case presentation

A 49-year-old male presented with acute abdominal pain and postural hypotension. On physical examination, there were features of peritonism, more in the lower quadrants. The patient had low grade fever (38.2°), tachypnea (18 breaths/min) and tachycardia (117 bpm). Laboratory results showed elevated D-dimer 4.21  $\mu\text{g/ml}$  (normal < 500 ng/mL), and CRP 385 mg/L (normal 3–10mg/L). The patient didn't receive COVID-19 vaccination. CT abdomen and pelvis was requested for further evaluation. CT revealed superior mesenteric artery thrombus (Fig. 1) with ischemic small bowel, intramural pneumatosis, and segmental infarction of the right iliac fossa transplanted kidney (Fig. 2), and free intraperitoneal air were observed. Partially visualized lower chest cuts demonstrated mild bibasilar ground glass opacities, concerning for COVID-19 pneumonia (Fig. 1 and 2). Reverse transcriptase polymerase chain reaction testing was positive for COVID-19 infection. Prompt treatment with vigorous fluid resuscitation, inotropic, and broad-spectrum antibiotics for example ceftriaxone and metronidazole were initiated. The patient was not a surgical candidate and endovascular treatment was contraindicated due to pres-

## Discussion

The presented case illustrates an uncommon thromboembolic manifestation associated with SARS-CoV2 infection. The patient had been complicated with superior mesenteric thrombus, bowel ischemia and segmental renal infarction. Coronavirus disease 2019 (COVID-19) has been associated with cardiovascular complications like thromboembolism [2]. Coagulopathy is a frequent high-risk factor for severe COVID-19 infection and has been termed “sepsis-induced coagulopathy” (SIC) [8, 9]. Sepsis-induced coagulopathy is a precursor of disseminated intravascular coagulation (DIC) and usually associated with high D-dimer levels and elevated fibrinogen [8,10]. SIC usually leads to both venous and arterial thromboembolic manifestations. It is believed to be secondary to an infection-induced systemic inflammatory response with cytokine storm resulting in endothelial dysfunction and microthrombosis [7,8]. Other proposed etiologies include pro-coagulant activity, immobilization, and hypoxia [3,5,11]. The virus itself could induce coagulopathy through activation of coagulation cascade, with disruption of fibrinolysis and pri-



**Fig. 2 – Superior mesenteric artery thrombosis in a 49-year-old man with RT-PCR confirmed COVID-19 pneumonia. Coronal CT images of the abdomen (A and B) demonstrate curvilinear foci of air within the bowel wall, pneumatosis (arrows) and free intra-peritoneal air foci (arrowheads). Coronal CT image of the abdomen shows non-obstructing superior mesenteric artery thrombus (arrow), and segmental infarct of the transplanted kidney (outlined arrow).**

primary hemostasis [1]. Angiotensin-converting enzyme 2 (ACE-2) is expressed in lung, and endothelial and smooth muscle cells of the intracranial vessels [8,12]. ACE-2 has a cardioprotective and neuroprotective actions as it counteracts and regulates ACE-1-angiotensin II-AT1 axis [8,13,14]. The novel corona virus binds into ACE-2 receptors and leads into its depletion through endocytosis [8]. Thus ACE-1 will be unopposed with upregulation of angiotensin-II, increasing potential to cardiovascular hazards [8]. Other proposed mechanisms for thromboembolism in COVID-19 patients include elevated inflammatory markers, sepsis and hypoxia [5,15,16].

Laboratory testing with D-dimers, prothrombin time, and platelet count were recommended by the international society on thrombosis and hemostasis (ISTH) to identify patients who need hospital admission and whom are at risk of adverse outcome [17]. In addition, they also recommended prophylactic antithrombotic therapy with LMWH for all COVID-19 in-patients to prevent thromboembolism, unless contraindicated [1,7].

Abdominal thromboembolic manifestations have been described in COVID-19 [18–20]. These manifestations include mesenteric ischemia which present radiologically with bowel wall thickening, pneumatosis, free intra-peritoneal air and/or portal venous gas [18,20]. In addition to mesenteric ischemia, bowel wall pneumatosis could result from direct viral infection, small vessel thrombosis, or positive pressure therapy [18,20,21]. The large amount of ACE-2 surface receptors within the gastrointestinal tract could explain the abdominal manifestations in COVID-19 [18,21]. Our case showed partial mesenteric artery occlusion with pneumatosis and free peritoneal air. Segmental infarct of the transplanted kidney has been also observed in our case.

Acute superior mesenteric occlusion leads into mesenteric ischemia which needs prompt diagnosis and high index of suspicion [16,22]. Mesenteric ischemia is an abdominal emergency that carries high morbidity and mortality rates [22]. Vascular surgical intervention is the treatment of choice and should be performed within 12 hours of symptoms before bowel gangrene to occur [23]. Unfortunately, patients with COVID-19 often manifest late due to ambiguity of symptoms and predominance of respiratory manifestations [15]. Clin-

icians should suspect mesenteric ischemia in any patients with COVID-19, presented with abdominal pain and elevated inflammatory markers [16]. Abdominal computed tomography with angiographic phase is the imaging modality of choice for early detection of mesenteric ischemia [22]. Careful observation of peritonitis is critical as these patients should undergo emergent laparotomy. Findings of bowel necrosis on imaging such as pneumatosis without clinical manifestation of peritonitis would be considered for exploratory laparotomy. Endovascular thrombectomy or embolectomy procedures should be preserved for patients without evidence of bowel ischemia or clinical manifestation of peritonitis [23].

In conclusion, the physicians should pay attention to early symptoms that suggest underlying thromboembolic complication. The prompt imaging evaluation and early prophylactic anticoagulant therapy could decrease rate of thromboembolic complication and adverse outcomes in COVID-19 patients.

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### Patient consent

Informed consent for patient information to be published in this article was obtained.

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### IRB approval

Our study was exempt from institutional review board adjudication per institutional policy regarding small case series.

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### Declaration of Competing Interest

None

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### Acknowledgment

None.

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