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## Abdominal Visceral Infarction in 3 Patients with COVID-19

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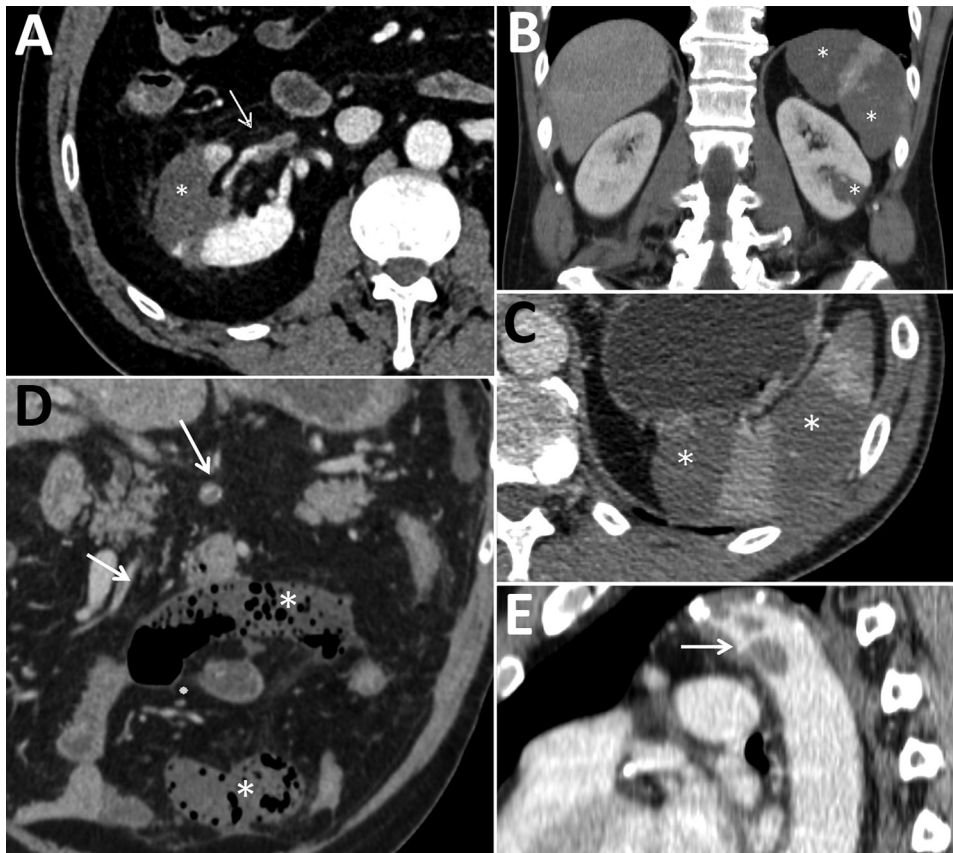
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DOI: <https://doi.org/10.3201/eid2608.201161>

A high incidence of thrombotic events has been reported in patients with coronavirus disease (COVID-19), which is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection. We report 3 clinical cases of patients in Italy with COVID-19 who developed abdominal viscera infarction, demonstrated by computed tomography.

**F**requent thrombotic events, mostly pulmonary embolisms, have been reported in patients with coronavirus disease (COVID-19) (1-4). We describe 3 cases of COVID-19 complicated by abdominal visceral infarction that occurred in inhabitants of the Emilia Romagna region in northern Italy.

Patient 1, a 54-year-old male former smoker with a history of asthma and quiescent ulcerative colitis not receiving any treatment, was admitted to the emergency department (ED) on February 28, 2020, for syncope. He was discharged after undergoing chest radiography and brain computed tomography (CT), the results of which were unremarkable. He returned to the ED after 5 days for treatment of dyspnea, fatigue, and fever. Blood tests revealed decreased oxygen saturation (94%), increased C-reactive protein (CRP) level (5.38 mg/dL; reference <0.5 mg/dL), and lymphopenia ( $0.69 \times 10^3$  cells/mm<sup>3</sup>; reference range  $0.8-4 \times 10^3$  cells/mm<sup>3</sup>). Chest CT scan demonstrated bilateral viral pneumonia, and nasopharyngeal and oropharyngeal swab specimens were positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). He was hospitalized and treated with lopinavir/ritonavir (400/100 mg orally 2×/d), and hydroxychloroquine (200 mg orally 2×/d). He was discharged to home after 3 hospital days, on therapy; no anticoagulant prophylaxis was suggested. He was rehospitalized 6 days after discharge when he developed sharp right flank and lumbar pain, fever, and dysuria. Blood and urine tests revealed neutrophilia ( $9.9 \times 10^3$  cells/mm<sup>3</sup>; reference range  $1.6-7.5 \times 10^3$  cells/mm<sup>3</sup>), increased lactate dehydrogenase (LDH) (1,507 U/L; reference range 28-378 U/L), increased CRP (1.43 mg/dL), and proteinuria (50 mg/dL). CT scan demonstrated a large right kidney arterial infarction (Figure, panel A). He was treated with low molecular weight



**Figure.** Abdominal contrast-enhanced computed tomography scans of 3 coronavirus disease patients with abdominal visceral infarction, Italy. A) Patient 1 (axial view) showing intraarterial thrombi in the renal artery (arrow) and kidney and splenic infarctions (asterisk), seen as large wedge-shaped hypodense parenchymal areas. B, C) Patient 2 (B, coronal view; C, axial view) showing kidney and splenic infarctions (asterisks), seen as large wedge-shaped hypodense parenchymal areas. D, E) Patient 3 (D, coronal view; E, sagittal view), showing intraarterial thrombi in the superior mesenteric artery and its branches (arrows in D) and thoracic descending aorta (arrow in E), as well as small bowel ischemia (asterisks in D), seen as small bowel loops with decreased or absent wall enhancement. In patients 1 and 2, scans did not show notable signs of atherosclerosis.

heparin (LMWH) (6,000 UI 2×/d) and discharged to home after 4 days.

Patient 2, a 53-year-old man with hypertension and a history of mitral valve replacement (June 2019), came to the ED on March 11, 2020, with fever, cough, and sore throat. At admission, he had decreased oxygen saturation (94%) and increased CRP (6.99 mg/dL). Chest CT scan demonstrated bilateral viral pneumonia, and nasopharyngeal and oropharyngeal swab specimens were positive for SARS-CoV-2. He was hospitalized and treated with lopinavir/ritonavir (400/100 mg orally 2×/d) and hydroxychloroquine (200 mg orally 2×/d); he also received 2 administrations of tocilizumab (8 mg/kg, an off-label use) on hospital day 3 because his respiratory function was worsening. Because of his previous mitral valve replacement, he was already being treated with antiplatelet prophylaxis with acetylsalicylic acid but not with anticoagulants. On hospital day 6 he reported severe left flank pain; blood tests revealed neutrophilia ( $11.74 \times 10^3$  cells/mm<sup>3</sup>) and increased LDH (932 U/L) and CRP (4.42 mg/dL). CT scan demonstrated large infarcted areas involving the spleen and the left kidney (Figure, panels B,C). He was treated with LMWH (6,000 UI 2×/d) and discharged home after 7 days.

Patient 3, a 72-year-old man with stage 3 kidney failure, hypertension, previous myocardial infarction, and type 2 diabetes, came to the ED on March 25, 2020, with shortness of breath and dry cough. At admission, he had increased CRP (19.3 mg/dL) and high glucose level (1,000 mg/dL; reference <100 mg/dL) with severe metabolic acidosis. Nasopharyngeal and oropharyngeal swab specimens were positive for SARS-CoV-2. He was hospitalized, began antithrombotic prophylaxis with LMWH (4,000 UI 1×/d), and continued secondary prophylaxis with acetylsalicylic acid. He was transferred in the intensive care unit the day after admission; a few hours later, he developed severe abdominal pain. Blood tests revealed neutrophilia ( $17.69 \times 10^3$  cells/mm<sup>3</sup>) and increased LDH (1,510 U/L), CRP (48 mg/dL), and D-dimer (6,910 ng/mL), with normal prothrombin time and activated partial thromboplastin time. Antiphospholipid antibodies were not detected. CT scan demonstrated small bowel ischemia associated with massive splenic infarction (Figure, panels D,E). He underwent resection of the ischemic bowel loop and splenectomy, was treated with heparin in continuous infusion, and was discharged from the ICU 2 days later. As of May 9, he was still hospitalized but his condition was improving.

Between the start of the SARS-CoV-2 outbreak in Reggio Emilia at the end of February and March 24, the province has had 460 hospitalizations in all hospitals. Among these, 2 (0.4%) patients (1,2) had acute ischemic events involving abdominal viscera; therefore, these events should not be considered too rare. Visceral infarction is probably a clinical manifestation of the prothrombotic state that has been described in patients with COVID-19 (1–6). Consistently, reports about pathological changes in organs other than the lungs describe parenchymal cells necrosis and small-vessel thrombosis (7).

The possibility of abdominal visceral infarction during COVID-19 has major implications in clinical practice. First, when patients with COVID-19 report severe abdominal pain, visceral infarction should be considered in differential diagnosis and taken into account in laboratory and imaging diagnostic work-ups. Second, this finding should further prompt the scientific community to stress the need to routinely use LMWH in patients with COVID-19 and to open the debate on the appropriate dosage. Finally, the prothrombotic state in patients with COVID-19 may justify therapeutic rather than prophylactic LMWH.

#### Acknowledgment

We thank Jacqueline Costa for English language editing.

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## Collateral Benefit of COVID-19 Control Measures on Influenza Activity, Taiwan

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DOI: <https://doi.org/10.3201/eid2608.201192>

Taiwan has strictly followed infection control measures to prevent spread of coronavirus disease. Meanwhile, nationwide surveillance data revealed drastic decreases in influenza diagnoses in outpatient departments, positivity rates of clinical specimens, and confirmed severe cases during the first 12 weeks of 2020 compared with the same period of 2019.

After the 2003 severe acute respiratory syndrome coronavirus epidemic, the government and public of Taiwan have been vigilant about the threat of emerging infectious diseases. The government of Taiwan took swift action to prevent coronavirus disease (COVID-19) importation and outbreaks (1). The public