A rare case of multiple aortic thromboses associated with severe COVID-19 infection

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DESCRIPTION
A 56-year-old woman with a medical history of hypothyroidism, major depression, iron deficiency anaemia, vitamin D deficiency and postherpetic neuralgia presented to the hospital after a fall with worsening dyspnoea for 2 days. She also reported ongoing fevers and malaise for the last 7 days. On examination, the patient was tachypnoeic, hypoxicemic and febrile. Initial investigations revealed multilobar ground-glass infiltrates on the chest X-ray and positive test for COVID-19 on real-time PCR assay. CT of the head and cervical spine performed due to her recent fall were unremarkable.

Treatment was initiated with remdesivir and dexamethasone for COVID-19 and ceftriaxone for secondary bacterial infection coverage. She became progressively more hypoxicemic and delirious requiring eventual orotracheal intubation. Laboratory test showed elevated D-dimer of 1.58 µg/mL with normal platelet count of 304×10^9/µL and prothrombin time was 11s, stable low haemoglobin level of 95 g/L. Peripheral smear was negative for schistocytes which made disseminated intravascular coagulation less likely. All four extremities of the patient with palpable pulses were without any oedema. Bilateral lower extremity Doppler results were negative for venous thrombosis. CT angiogram of the chest, performed after the patient was stabilised, was negative for pulmonary embolism but did demonstrate aortic thrombosis in the arch of the aorta and descending thoracic aorta (figure 1 and video 1). CT of the head showed no signs of large ischaemic thromboembolic strokes. ECG showed sinus tachycardia. Echocardiogram revealed normal left ventricular and right ventricular function and size without any thrombosis and normal valve functions. Enoxaparin 1 mg/kg every 12 hours was initiated but later switched to intravenous heparin due to worsening acute renal failure. The patient did not develop any overt arterial or venous thromboembolic events so no surgical interventions were required. She developed post-critical illness neuromyopathy eventually needing a tracheostomy and percutaneous endoscopic gastrostomy tube placement. Anticoagulant was transitioned to apixaban, and the patient was discharged to rehabilitation centre with outpatient evaluation by a cardiovascular surgeon after 6 months of anticoagulation.

COVID-19 infection is associated with increased risk of venous thromboembolism. Though less frequent, arterial thrombosis and subsequent embolic events have been reported, with a pooled incidence of 4.4% in critically ill patients with COVID-19 and occurred most commonly in the extremities and cerebral vessels. Of all reported arterial thrombosis cases associated with COVID-19, incidence of great vessel involvement has been estimated to be around 19%. Underlying cardiovascular disease, diabetes mellitus, hypertension, atrial fibrillation and chronic kidney disease have been documented as risk factors for developing thrombosis with COVID-19 infection. Ascending aortic thrombosis is extremely rare due to higher pressures and blood flow but has been reported associated with embolic phenomena.

COVID-19 causes a hypercoagulable state via multiple mechanisms including a profound systemic inflammatory response and cytokine storm, evidenced by increased D-dimer, prothrombin and fibrinogen levels. These effects, along with prolonged immobilisation, complete Virchow’s triad. Our patient’s only known thrombotic risk was severe COVID-19 infection and associated inflammatory response. The identified thromboses were attached to the endothelium, suggesting that diffuse endotheliitis could have promoted their development. Surgical interventions are warranted.
if there are systemic embolic complications from aortic thromboses. Given these were not identified in this case and in view of the patient’s critical illness, the treating physicians decided against the surgical intervention.

**Patient’s perspective**

The patient’s husband stated, “Nine years ago, the patient was in a major car accident and had poly trauma and she was able to survive that after many months of hospital and rehabilitation stay. I know she is very sick, but I am very hopeful and staying positive and know my wife will survive this severe COVID-19 disease and complications associated with it. All the family and friends have been praying for her and ever since she has been in the hospital in the ICU, every night I call her on the speaker phone and whole family speaks to her and ICU nurse helps us with this phone call.”

**Learning points**

- COVID-19 is a hypercoagulable state that can be associated with arterial thrombosis in rare cases.
- The presence of thromboembolic phenomenon should increase the suspicion of arterial thrombosis in patients with COVID-19.
- Clinicians should be vigilant for both arterial and venous thromboses in patients with COVID-19, despite administration of pharmacological thromboembolism prophylaxis.

**Acknowledgements**

We, the authors, acknowledge all of the frontline workers in their efforts against the COVID-19 pandemic.

**Contributors**

IRK treated the patient, wrote the manuscript, and created the image and video file. MJ treated the patient, revised the manuscript and obtained consent from the patient’s husband. AK revised the manuscript and corrected it for grammar. BAJ treated the patient and revised the manuscript.

**Funding**

The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests**

None declared.

**Patient consent for publication**

Next of kin consent obtained.

**Provenance and peer review**

Not commissioned; externally peer reviewed.

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