Aortic Thrombus in patients with Severe Covid-19. Review of three cases

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Case Report

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Abstract

Coronavirus disease 2019 (COVID-19) is suspected to predispose to both venous and arterial thromboembolism, in the context of an exaggerated immune response to the virus, especially in severe patients. Even though aortic thrombi are a rare entity, the new COVID-19 establishes the need to include them in the diagnosis, especially in patients with severe disease and no clinical improvement. Herein, we describe a series of three cases of aortic thrombi diagnosed by computerized tomography (CT) angiography in patients with confirmed SARS CoV-2 infection.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a new type of respiratory virus that appeared in Wuhan, China, In December 2019 and rapidly spread worldwide.

The clinical spectrum of Coronavirus disease 2019 (COVID-19) is variable, from asymptomatic infection to mild respiratory tract illness or severe viral pneumonia with potential respiratory failure and even death. However, the involvement of many other organs has been reported, such as central and peripheral nervous system [2,3], cardiac involvement [4,5], or vascular involvement as thromboembolic events [6-9].

COVID-19 is suspected to predispose both venous and arterial thrombotic events, especially in severe patients. These vascular events could be associated with hyper-inflammatory processes, hypoxia, diffuse intravascular coagulation [10,11], and immobilization. An increase in the incidence of acute pulmonary thromboembolism (APE) has been recently reported in COVID-19 patients [12,13], but few acute arterial events in other territories have been reported.

Herein, we present three confirmed-patients for COVID-19 with atypical aortic thrombi.

Case 1

A 78-years-old man with dyslipidemia was admitted to our Emergency Department with four days of fever and no other symptoms. Clinical examination was normal apart from a temperature of 37.2ºC. Laboratory tests showed lymphopenia, increased fibrinogen, LDH and D-Dimer. Chest X-Ray (CXR) showed multilobar interstitial opacities in the right lung. Treatment with piperacillin-tazobactam, azithromycin, hydroxychloroquine, methylprednisolone and enoxaparin at a dose of 60 mg daily was started. Nevertheless, the patient continued with persistent fever and an increase in oxygen requirements. CXR presented rapid progression of opacities and a significant increase in acute reactants such as ferritin and IL-6 were detected. A single dose of 600 mg of tocilizumab was. The patient presented a clear improvement in the following 72 hours, with a decrease in C-reactive protein (CRP) and ferritin values. Despite an initial decrease of D-Dimer a significant increase of 3570 µg/L was found. A CT- angiography showed multiple segmental pulmonary embolisms, multilobar pneumonia, and three floating thrombi in descending aorta of 12.2 mm, 8.7 mm, and 10.2 mm. Low weight molecular heparin (LWMH) was started at anticoagulant dose. Nevertheless, the patient evolved to severe respiratory failure and died.

Case 2

A 76-year-old man with hypertension, dyslipidemia, and diabetes mellitus was admitted to our emergency department with fever, asthenia, and pain in the lower back area for the last two weeks. Upon arrival, he presented high-temperature, 120 beats per minute, basal oxygen saturation of 87%, and 22 breaths per minute. Laboratory tests showed lymphopenia and increased fibrinogen D-Dimer, LDH, creatinine and CRP. CXR revealed unilobar opacities in the lower left lobe.

Treatment with azithromycin, hydroxychloroquine, ceftriaxone, methylprednisolone and enoxaparin 40 mg daily was started. The patient continued with fever, dyspnea, and tachypnea, requiring high oxygen flow to increase oxygen saturation up to 92%. CRP, D-dimer, ferritin and IL-6 values increased progressively. CXR presented a worsening with the appearance of multilobar and bilateral opacities. LMWH dose was increased to 60 mg daily. A single dose of tocilizumab was administered, without any clinical improvement. On day 11 of admission, the patient presented an acute ischemic stroke of the left middle cerebral artery. A supra-aortic CT scan was performed, showing complete occlusion of the left internal carotid artery and left media cerebral artery, two intraluminal thrombi of 8 mm in ascending aorta and a 45 mm aneurysmatic dilatation of ascending aorta. LMWH dose was increased to anticoagulant doses. Patient was discharged to a mid-stay center to complete rehabilitation.

Case 3

A 64-years-old man, a former smoker, with hypertension and severe obstructive sleep apnea syndrome, attended our emergency department due to dry cough, dyspnea, and a high fever for the last four days. Clinical examination was normal apart from a temperature of 37.3ºC. Laboratory tests showed increased fibrinogen, D-Dimer and CRP. CXR showed unilobar interstitial opacities in the right upper lobe. Treatment with hydroxychloroquine and azithromycin was started and the patient was discharged 48 hours later. During ambulatory follow- up, CXR evolved with extensive pulmonary opacities, lymphopenia and significant increase of CRP. The patient was re-admitted adding to the previous treatment methylprednisolone and tocilizumab. All the laboratory inflammation markers improved but D-Dimer sharply increased to 4640 µg/L. CT angiography showed a mural thrombus in the middle segment of the descending thoracic aorta. LMWH at an anticoagulant dose was started. The control CT angiography, seventeen days later, did not find aortic thrombi.

Discussion

To our knowledge, the presence of aortic thrombus as an atypical manifestation affecting large vessels in the context of SARS-CoV-2 infection has been scarcely reported [14]. We have described three COVID-19 patients over 60 years and with cardiovascular risk factors, who presented aortic thrombus despite the use of LMWH prophylaxis. Vascular wall changes described in severe COVID-19 patients or in cytokine storm, together with coagulation abnormalities could explain our findings [15].

SARS-CoV-2 can directly infect endothelial cells, platelets, and megakaryocytes inducing platelet and endothelial damage. These changes trigger the recruitment of macrophages and granulocytes synthesizing pro-inflammatory cytokines. If the infection is not controlled the inflammation progresses, and stimulate the extrinsic pathway of coagulation, inhibiting fibrinolysis, which could trigger a consumption coagulopathy aggravated by hypoxia [16]. D-dimer increases and thrombopenia would be the analytical reflection of this mechanism.

Likewise, the acute respiratory distress syndrome (ARDS) is a procoagulant state [17]. The diffuse pulmonary endothelial damage associated with platelet activation could predispose the formation of micro and macro thrombi, in situ or with an embolic origin [18]. Nevertheless, an aortic thrombus is an uncommon condition even in common hypercoagulability states as sepsis, polycythemia, disseminated intravascular coagulation, autoimmune diseases, pregnancy, and cancer [19], and it is also an uncommon cause of peripheral arterial embolization.

Our local incidence for incidental aortic thrombus is 0.75% in moderate-severe COVID-19 patients, representing 6.6% of 45 arterial thrombosis diagnosed. This finding provides insight in prothrombotic changes resulting in both micro and macrovascular thrombosis [18]. COVID-19 has been recently linked to large vessel stroke in young adults [20], but the contribution of aortic thrombus, as seen in one of our patients, and embolism events in other territories, remains to be determined.

Further investigation is necessary to confirm if this is a novel and atypical form of thrombotic events associated with COVID-19. Clinical protocols should include a CT scan as a standard technique to diagnose as many thrombotic events as possible.

Declarations

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Conflicts of interest

The authors declare that they have no conflicts of interest

Oral informed consent for data publication was obtained from the three patients or their families if dead or not consciuos.

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Figures

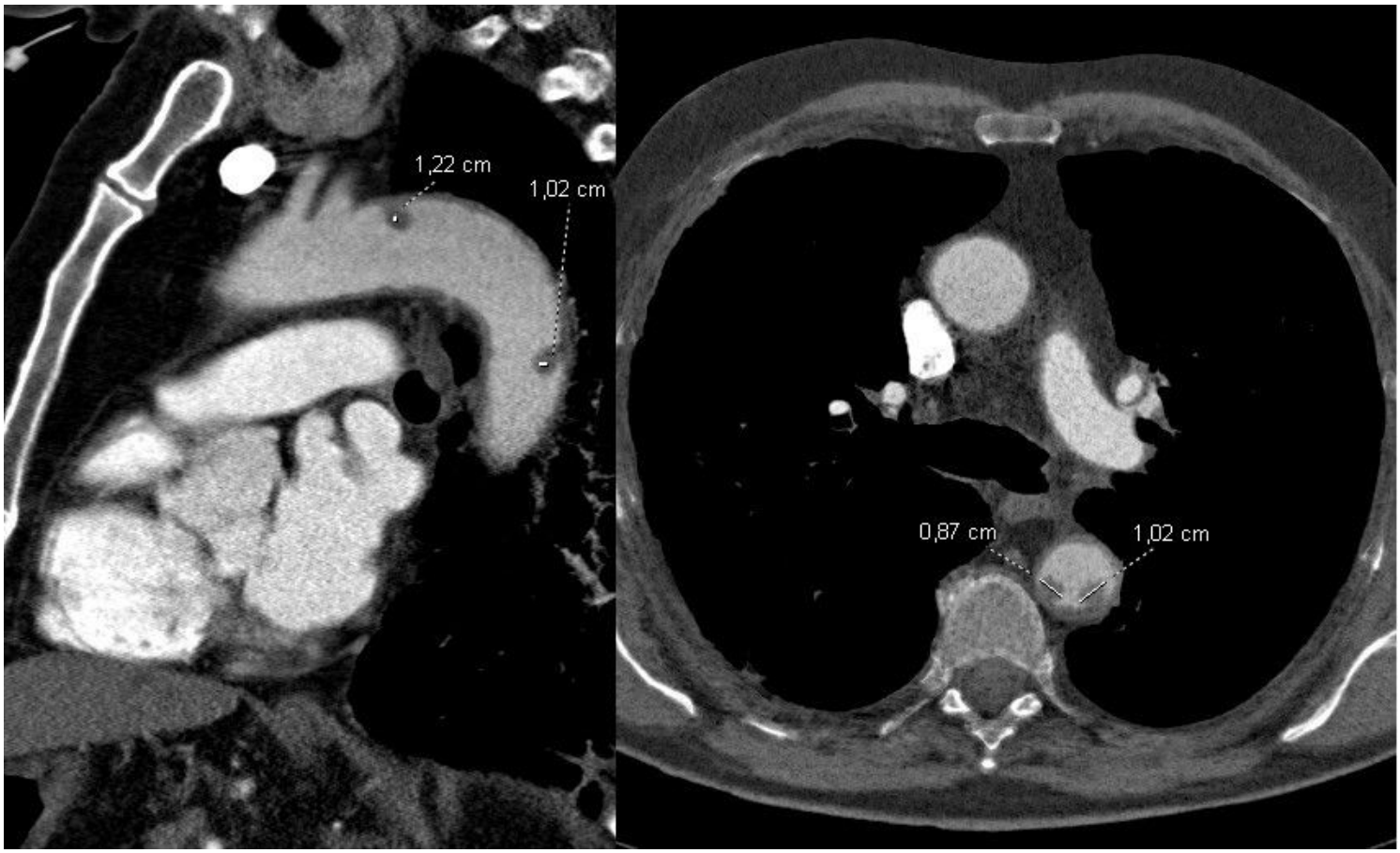

Figure 1

CT angiography of pulmonary arteries.

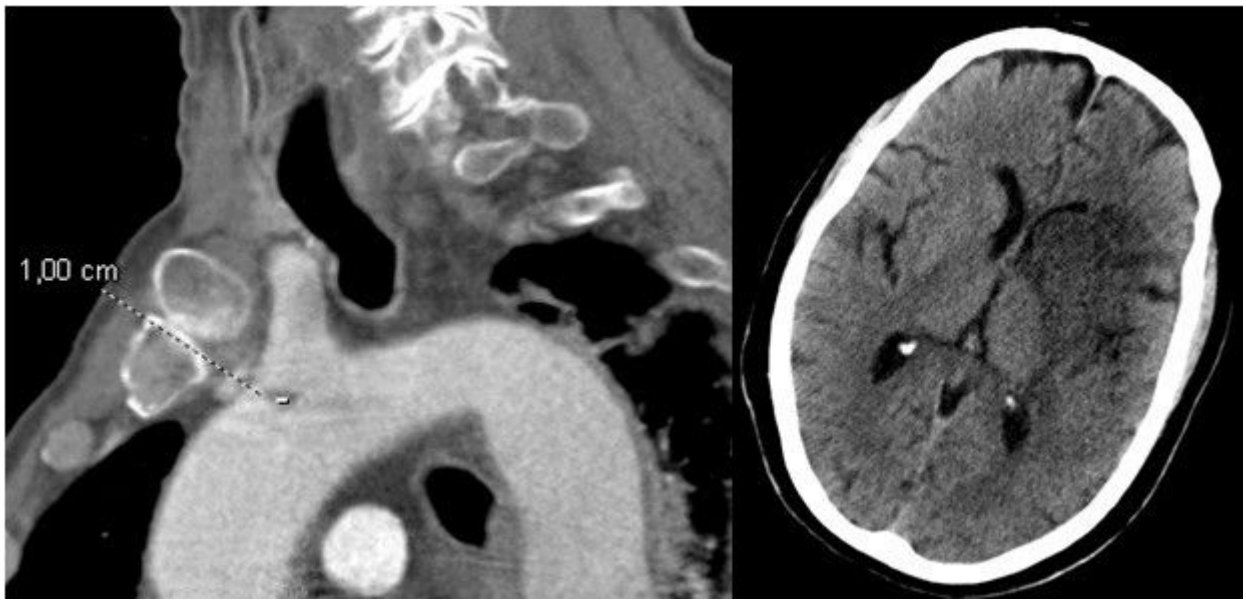

Figure 2

CT angiography of cerebral and supra-aortic arteries.

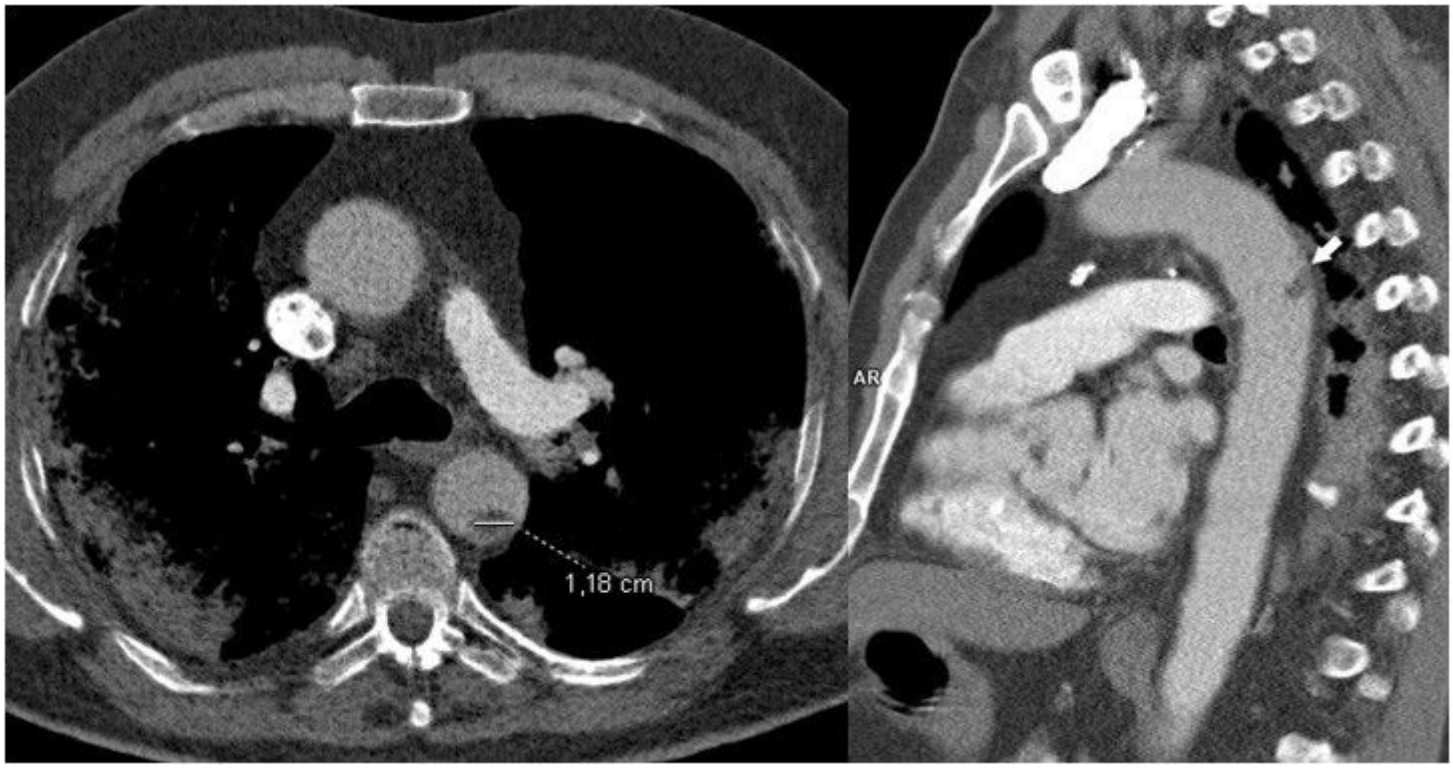

Figure 3

CT angiography of cerebral and supra-aortic arteries.