The Association of Acute Aortic Dissection and COVID-19 Infection: A Case Report

Akut Aort Diseksiyonu ve COVID-19 Enfeksiyonu Birlikteliği: Olgu Sunumu

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Geliş Tarihi / Received : 31.05.2022 Kabul Tarihi / Accepted: 13.06.2022

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Hippocrates Medical Journal / Hippocrates Med J 2022, 2(2): 47-51 DOI: https://doi.org/10.29228/HMJ.19

Abstract

COVID-19, caused by SARS-CoV-2, is an infection that can progress with various clinical findings depending on the system and organ it infects. One of the targets of SARS-CoV-2 is the cardiovascular system. Many infectious diseases can potentially cause aneurysm or dissection by inducing lesions in the aorta or direct involvement. A 57-year-old male patient was admitted to our emergency department with complaints of sharp and stabbing pain in the chest and back. The patient stated that his current complaint began 1 h before that and had increased over time. On the thorax computerized tomography (CT), a dissection covering the ascending aorta, descending aorta, and aortic arch (De Bakey type 1, Stanford type A) was detected. At the same time, real-time reverse transcription-polymerase chain reaction (RT-PCR) test was applied to the patient upon the detection of ground-glass areas in the lung basal regions on the thorax CT and detected positive. The patient, who developed cardiac arrest in the emergency department, did not respond to cardiopulmonary resuscitation and was accepted as exitus. COVID-19 can cause fatal damage to the cardiovascular system. Clinicians should keep in mind the COVID-19 and cardiovascular system relationship.

Keywords Aortic Dissection, COVID-19, Emergency Department, SARS-CoV-2

Özet

SARS-CoV-2'nin neden olduğu COVID-19, enfekte ettiği sistem ve organlara göre çeşitli klinik bulgularla seyredebilen bir enfeksiyondur. SARS-CoV-2'nin hedeflerinden biri de kardiyovasküler sistemdir. Birçok bulaşıcı hastalık, aortta lezyonlar oluşturarak veya doğrudan tutulum yaparak potansiyel olarak anevrizma veya diseksiyona neden olabilir. 57 yaşında erkek hasta göğüs ve sırtta keskin, saplayıcı tarzda ağrı şikayeti ile acil servisimize başvurdu. Hasta mevcut şikayetinin bundan 1 saat önce başladığını ve giderek arttığını belirtti. Toraks bilgisayarlı tomografisinde (BT) asendan aorta, desendan aorta ve arkus aortayı kapsayan bir diseksiyon (De Bakey tip 1, Stanford tip A) tespit edildi. Aynı zamanda toraks BT'de akciğer bazal bölgelerinde buzlu cam alanları saptanması üzerine hastaya gerçek zamanlı polimeraz zincir reaksiyonu (RT-PCR) testi uygulandı ve pozitif saptandı. Acil serviste kardiyak arrest gelişen hasta kardiyopulmoner resüsitasyona yanıt alınamadı ve eksitus olarak kabul edildi. COVID-19 kardiyovasküler sistemde ölümcül hasara neden olabilir. Klinisyenler; COVID-19 ve kardiyovasküler sistem ilişkisini mutlaka akıllarında tutmalıdırlar.

Anahtar Kelimeler Aort Diseksiyonu, COVID-19, Acil Servis, SARS-CoV-2

INTRODUCTION

COVID-19, caused by SARS-CoV-2, is an infection that can infect many organs and systems and may reveal different clinical situations according to the organs and systems involved (1). SARS-CoV-2 shows its pathological mechanism by binding to the angiotensin-converting enzyme-2 (ACE-2) receptor. Organs and systems with ACE-2 receptors are among the targets of SARS-CoV-2 (2).

It has been reported that ACE-2 receptors, which are found in the lungs, intestines, kidneys, and central nervous system, are also commonly found in the cardiovascular system, which makes the cardiovascular system one of the targets of SARS-CoV-2 (3). Aortic dissection is defined as the separation of the media layer from the intima layer. This situation is an urgent cardiovascular disease with a poor prognosis and high mortality, with an incidence ranging from 4–6 cases/100,000 individuals/year (4).

In the current literature, it was stated that many infectious diseases can potentially cause aneurysms or dissections by inducing lesions containing the aorta or by direct involvement. It has been reported that SARS-CoV-2 infection, and the cytokine storm it creates, can cause endothelial damage and aortic pathologies (5).

In this article, the association of acute aortic dissection and COVID-19 infection was presented.

CASE PRESENTATION

A 57-year-old male patient was admitted to our emergency department with complaints of sharp and stabbing pain in the chest and back. The patient stated that his current complaint began 1 h before that and had increased over time. In the vital findings of the patient, whose general condition was moderate, oriented, and cooperative, he had a fever of 36.5° C, arterial blood pressure of 180/110 mmHg (right arm) and 140/90 mmHg (left arm), a pulse of 130 beats/min (right arm) and 120 beats/min (left arm), respiratory rate of 30/min and oxygen saturation of 97% in the room air.

There were no features in his medical or family history. There was no drug, smoking, or alcohol use. His medical history revealed that he had not got a COVID-19 shot. On physical examination, on auscultation, there was a 3/6 diastolic murmur in the aortic area and a weak pulse was detected in the femoral arteries. Other physical examination findings were normal.

The test results revealed the following: leucocyte: 15.03 (4.60–10.20) K/µL, hemoglobin: 15.3 (12.20–18.10) g/dL, lymphocyte: 1.07 (0.60–3.40)) K/µL, neutrophil: 12.93 (2-7) K/µL platelet: 152,000 (100,000-450,000) K/µL, lactate dehydrogenase (LDH): 465 (225–450) IU/L, sodium: 139 (136–146) mmol/L, potassium: 3.3 (3.5–5.1) mmol/L, calcium: 9.2 (8.8–10.6) mg/dL, urea: 38 (17–43) mg/dL, creatinine: 0.75 (0.67–1.17) mg/dL, D-dimer: 13,100 (0–500) µg FEU/L, C-reactive protein (CRP): 62.1 (0–5) mg/dL, troponin I: 2.4 (2.3–27) ng/mL, and ferritin: 404 (4.63–204) ug/L.

No features were detected in the electrocardiography (ECG) evaluation. Mediastinal enlargement, deviation of the trachea to the right, compression on the left main bronchus, and calcium sign (>10 mm) were detected in the posteroanterior chest radiography (Figure 1).

According to the Aortic Dissection Detection Risk Score (ADD-RS)(6), there was no high-risk condition for aortic dissection, but there were high-risk pain features as well as high-risk exam features (systolic blood pressure differen-

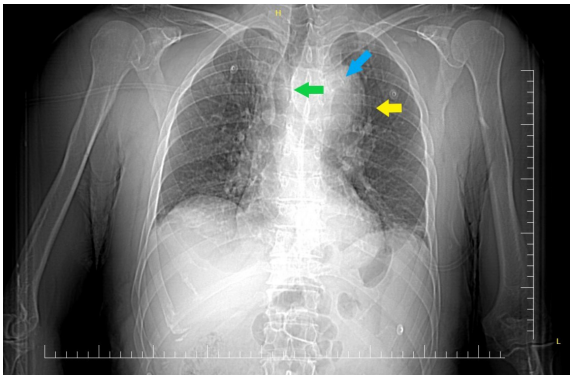

Figure 1 *Chest radiogram of the patient. Mediastinal enlargement (yellow arrow), deviation of the trachea to the right (green arrow), compression on the left main bronchus, and calcium sign (>10 mm) (blue arrow)*

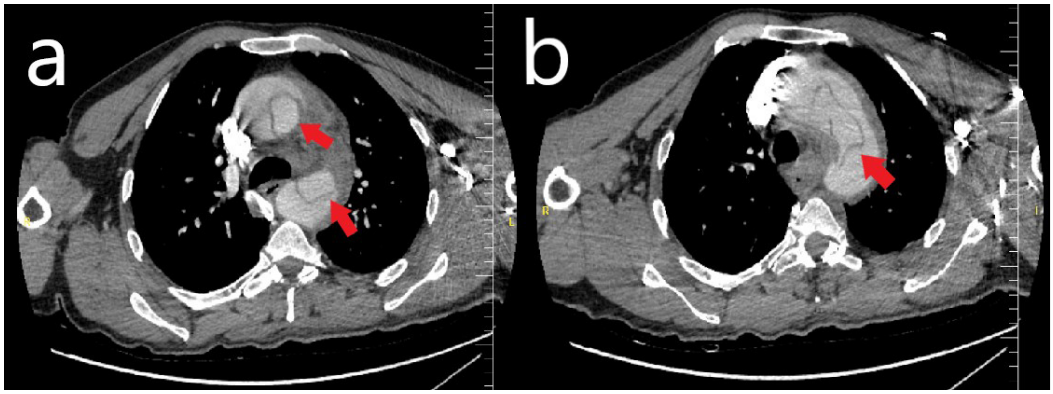

Figure 2 *a) Dissection of the ascending and descending aorta (red arrows). b) Dissection of the aortic arch (red arrow)*

ce between the extremities and a diastolic murmur with a sign of aortic regurgitation in the aortic area on auscultation).

Based on the ADD-RS plus D-dimer elevation, a thorax CT evaluation was performed. In the thorax CT, dissection (De Bakey type 1, Stanford type A) covering the ascending aorta, descending aorta, and aortic arch were detected (Figures 2a and 2b).

At the same time, a real-time reverse-transcription polymerase chain reaction (RT-PCR) test was applied to the patient upon the detection of ground-glass areas in the lung basal regions on the thorax CT (Figure 3), and it was determined that the results were positive.

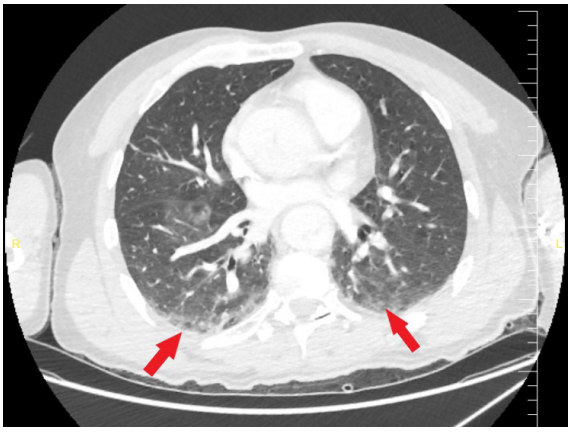

Figure 3 *Ground glass areas in the lung basal regions (red arrows).*

An intravenous infusion of metoprolol at a rate of 4 mg/h was begun to reduce the pressure caused by the patient's hypertension.

The patient, whose consciousness and vital signs deteriorated during the follow-up, was intubated and developed sudden cardiac arrest during transfer, did not respond to cardiopulmonary resuscitation, and was accepted as exitus.Written informed consent was obtained from the legal representative of the patient that his medical data could be used.

DISCUSSION

In this case report, a patient who was diagnosed with COVID-19 concurrently as a result of the evaluations due to the suspicion of aortic dissection was presented.

Studies have shown that viral infections can cause vascular damage. It was reported that SARS-CoV-2 can cause endothelial damage with perivascular inflammation as well as viral involvement (5). Mamishi et al., in their study on inflammatory responses from COVID-19, stated that it causes aortitis and endothelial damage as well as acute aortic dissection caused by elastin arteriopathy (7). Similarly, in the current case, acute phase reactants showing the level of inflammation were found to be high, which may have caused endothelial damage. Manenti et al. described two main courses that lead to vascular damage in infections. The first course is acute endothelitis due to endothelium infiltration by neutrophils and mononuclear cells involved in the inflammation, while the second course is when the aortic endothelium, where the ACE-2 receptors are located, is directly attacked by viruses and can lead to an endothelium that can later be complicated by a hypersensitivity vasculitis (8). It was also emphasized that the loss of vas-

cular elasticity as a result of these processes may lead to the development of dissection. The aortic dissection in the current case may have developed as a result of the direct attack of SARS-CoV-2 on the aortic endothelium or due to endothelial infiltration created by the cytokine storm during the COVID-19 infection. Wang et al. reported that serum proinflammatory cytokines increase in COVID-19 infection, which causes lung damage and an increase in micro thrombotic events (9). It can be deduced that the presence of D-dimer elevation and lung damage in the current case may have been due to the increase in proinflammatory cytokines and that the existing inflammation may cause damage to the vessel wall.

Akgul et al. reported that they observed thickening of the vessel wall, as seen in inflammation of vessels, during the surgery of the aortic type A dissection of a patient that COVID-19 positive. They added that this inflammatory process may have been due to SARS-CoV-2 infection. They also stated that the bleeding at the suture line during the operation was due to the loss of the elastic structure and strength of the vessel wall (10). It was emphasized that this situation may be common in the acute phase of inflammatory aortopathy and may turn into aneurysm formation in the chronic phase.

Due to the development of cardiac arrest in the emergency room before cardiovascular surgery in our case, further investigations could not be performed. The cardiovascular risk could not be defined due to the patient's lack of medical follow-up. The aortic dissection in the current case may have occurred as a result of the rupture of the plaque caused by existing atherosclerosis due to the mechanisms created by the COVID-19 infection.

CONCLUSION

COVID-19 can cause fatal damage to the cardiovascular system. Clinicians should keep in mind the COVID-19 cardiovascular system relationship. Case series and histopathological studies will shed light on the clarification of this relationship.

Informed Consent: Written informed consent was obtained from the legal representative of the patient that his medical data could be used.

Authorship Contributions: *Surgical and Medical Practices – E.E., Y.C., F.M., M.R.A; Concept - E.E., Y.C., F.M., M.R.A; Design – E.E., Y.C., F.M., M.R.A; Data Collection or Processing – E.E., Y.C., F.M., M.R.A; Analysis or Interpretation – E.E., Y.C., F.M., M.R.A; Literature Search – E.E., Y.C., F.M., M.R.A; Writing – E.E., Y.C., F.M., M.R.A.*

The case has never been presented anywhere before.

Funding: No funding declared.

Conflicts of interest/Competing interests: All authors no conflict of interest/competing interests.

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