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Severe Aortic Thrombosis in the Early Period after COVID-19: Two Cases

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A total occlusion of the aorta is a rare condition; however, while rare, it has a very high mortality rate. Coronavirus disease 2019 (COVID-19) poses serious health problems, including vascular problems. Inflammatory changes produced by viral infections can cause serious disturbances in the coagulation system. Although cases showing a marked increase in thrombotic activity in the venous system have been presented, thrombosis in the arterial system, especially in the aorta, has rarely been reported. Here, we present 2 patients admitted to our hospital with an acute aortic thrombosis.

Coronavirus disease 2019 (COVID-19), which first started in Wuhan, China at the end of 2019, became a pandemic in a short time. COVID-19 is a viral infection and is also defined as severe acute respiratory syndrome (SARS-CoV-2).¹ It has been reported that the respiratory system is mainly affected by this severe disease, and coagulopathy has an important place in the high mortality rate.² It has been demonstrated that pathophysiological mechanisms, such as inflammation, immobilization, and endothelial dysfunction, are involved in the occurrence of this condition.³ Thrombus events (e.g., deep vein thrombus and pulmonary embolism), especially in the venous system, have been well defined since the onset of the disease.^{4,5} Arterial occlusions due to susceptibility to this coagulopathy are also expected. However, arterial occlusion events reflected in the literature have been limited compared to those reporting venous events. Thromboses, especially at

the aortic level, have rarely been reported. In this report, we present 2 patients, one with a total aortic thrombosis and the other with a partial thrombosis of the descending aorta and a subsequent lower extremity arterial thrombosis. Permissions for these presentations were obtained from the patients and their relatives.

CASE REPORTS

COVID-19 diagnoses of both patients were confirmed by reverse transcriptase-polymerase chain reaction (PCR) examinations in the healthcare institutions they applied to before being admitted to our hospital. Moderate COVID-compatible changes were detected in the computed tomography (CT) examinations of both patients. In [Table 1](#), laboratory data and other demographic characteristics of both patients at the time of admission to our hospital are given.

Patient 1

A 70-year-old male patient applied to another center apart from our hospital 1 week earlier with complaints of cough and fever. Upon the presence of moderate pneumonic infiltrations compatible with COVID-19 in his thoracic CT, he was hospitalized, and the diagnosis of COVID-19 was confirmed with a PCR test and treatment began. He was discharged after 15 days of treatment. He had no other chronic diseases other than chronic hypertension (15 years) and hyperlipidemia (10

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Table 1. Demographic/clinical data, and laboratory findings

	Patient 1	Patient 2	Reference Value
<i>Demographic characteristics</i>			
Sex (M/F)	M	M	
Age (years)	70	49	
BMI (kg/m ²)	29	30,4	
<i>Clinical characteristics</i>			
Risc factors	Hypertension, smoking, dyslipidemia	Coronary artery disease, diabetes mellitus	
Pneumonic infiltration compatible with COVID (%)	Yes (30-40)	Yes (20-25)	
Hospital treatment time (for COVID) (days)	16	13	
Thrombosis clinic after how many days after discharge (days)	6	7	
Manifestation of thrombotic event	Abdominal and bilateral lower pain	Right lower pain, heat loss in the leg	
Anticoagulation before thrombotic event	No	No	
Aortic thrombosis type	Total occlusion (infrarenal)	Partial aortic thrombus, right femoral thrombus	
Outcome	Dead	Discharged (with amputation)	
<i>Laboratory findings</i>			
White blood cell (/mL)	8300	12700	3900-10800
Hemoglobin (g/dL)	19,9	21,2	14,4-18,3
Hematocrit (%)	61,2	63,7	41,2-52,0
Platelet (/mL)	98	240	145-345
Lymphocytes, %	10,2	15,6	16,1-48,7
D-dimer, mg/L	12500	5890	0-500
Fibrinogen, mg/dL	983	781	245-400
Troponin-I (pg/ml)	84	71,5	0-14
BUN (mg/dl)	25	41	10-40
Creatinine (mg/dL)	0,57	1,01	0,7-1,17
LDH (U/L)	1456	216	0-248
AST	34	251	0-40
ALT	21	205	0-41
Albumin (g/dL)	2,91	2,14	3,5-5,0
INR	1,06	2,04	0,8-1,24
PT (sec)	14,1	20,1	9,7-13,0
aPTT (sec)	42,9	51,3	22-45
CRP	4,77	2,61	0-0,5
Ferritin (ng/mL)	969,3	687	30-400

BMI: Body Mass Index, LDH: Lactate Dehydrogenase, AST: Aspartate Transaminase, ALT: Alanine aminotransferase, INR: International Normalized Ratio, PT: Prothrombin Time, aPTT: activated Partial Thromboplastin Time, CRP: C-Reactive Protein

years). For approximately 40 years, he smoked an average of 1 pack of cigarettes per day. The patient, who was followed up in intensive care for 4 days during the period he received COVID-19 treatment, received favipiravir (2×1600 mg loading dose, 2×600 mg maintenance dose/10 days), prednisolone (2×40 mg), levofloxacin (1×500 mg/7 days), and enoxaparin (2×0.6 IU/mL). Anticoagulant treatment was not given once the patient was discharged. Six days after his discharge, he applied to the same center with complaints of abdominal and low back pain and

cold legs. The patient, who was rehospitalized, was sent to our hospital when it was observed that the aorta was thrombosed in the contrast-enhanced CT taken after cyanosis began in the legs in the following hours (Fig. 1). On admission to our hospital, there was significant cyanosis in both extremities. After the necessary preparations were made, he was urgently surgically treated.

Surgical Procedure

A thrombectomy was performed with a Fogarty catheter from the common femoral arteries with

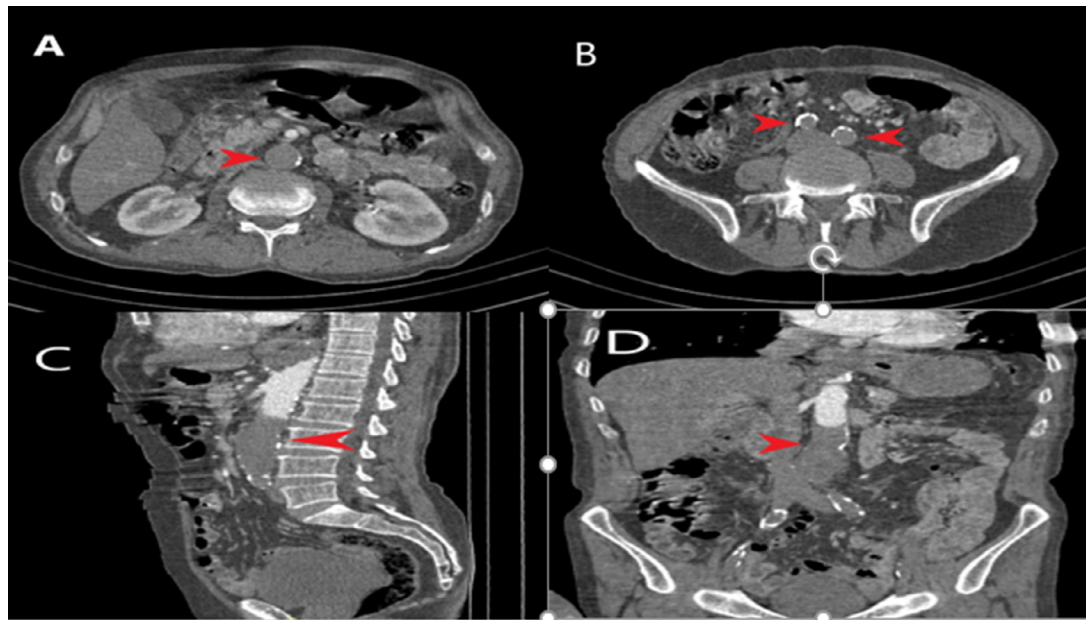


Fig. 1. Patient 1: Computed tomographic image of aortic thrombosis (infrarenal and total). (A and B) transverse section, (C) sagittal, (D) coronal section.

incisions made under local anesthesia in both groin areas. Abundant thrombus material was taken from both femoral arteries. The operation was performed because of the strong antegrade flow and sufficient retrograde flow. A pulse was obtained in both lower extremities after the procedure. However, as metabolic acidosis became evident in the following hours, he died at the postoperative 18th h.

Patient 2

A 49-year-old male patient applied to another hospital with a fever and cough 20 days before his admission. The patient had a history of diabetes mellitus (20 years) and coronary artery disease (5 years) and was hospitalized with moderate pulmonary involvement after a thoracic CT. With a positive PCR test, the diagnosis of COVID-19 was confirmed. He was hospitalized for 13 days. He was then readmitted to the hospital with sudden pain and a loss of heat in his right leg 7 days after discharge. Surgical intervention (embolectomy) was performed following the detection of a thrombus in both the descending aorta and the right main femoral artery (Fig. 2). The same surgical intervention was performed again when there were signs of ischemia after the procedure (6 h later). In the hours after this procedure, the patient, whose ischemia continued to increase at the level below the knee, was transferred to our hospital. The patient, who had signs of compartment syndrome

on admission to our hospital, was surgically treated after the examinations.

Surgical Procedure

Revascularization (popliteal artery-tibialis posterior) and a fasciotomy were performed using the saphenous vein. He was amputated below the knee level due to both bleeding that was difficult to control and ischemia. He was discharged after wound care.

DISCUSSION

Although serious thrombi in the aorta are extremely rare, they can have serious clinical consequences. An acute aortic obstruction is a rare condition that occurs with a saddle embolism of the aorta or an atherosclerotic aortic thrombosis.⁶ Although it is rarely seen, it has a mortality rate reaching 75%.^{7,8} Because it is a rare condition, the information in the literature is generally in the form of case reports. COVID-19 creates a viral infection picture that can cause serious mortality risks, especially in patients with comorbid risk factors.⁹ Clotting and related complications are a typical feature of this viral infection. Although this is more common in venous structures, it can also be seen in arterial structures. There have been few case reports concerning thromboses in medium-and large-sized arteries.¹⁰⁻¹² The inflammatory process triggered by this viral infection and the thrombotic process

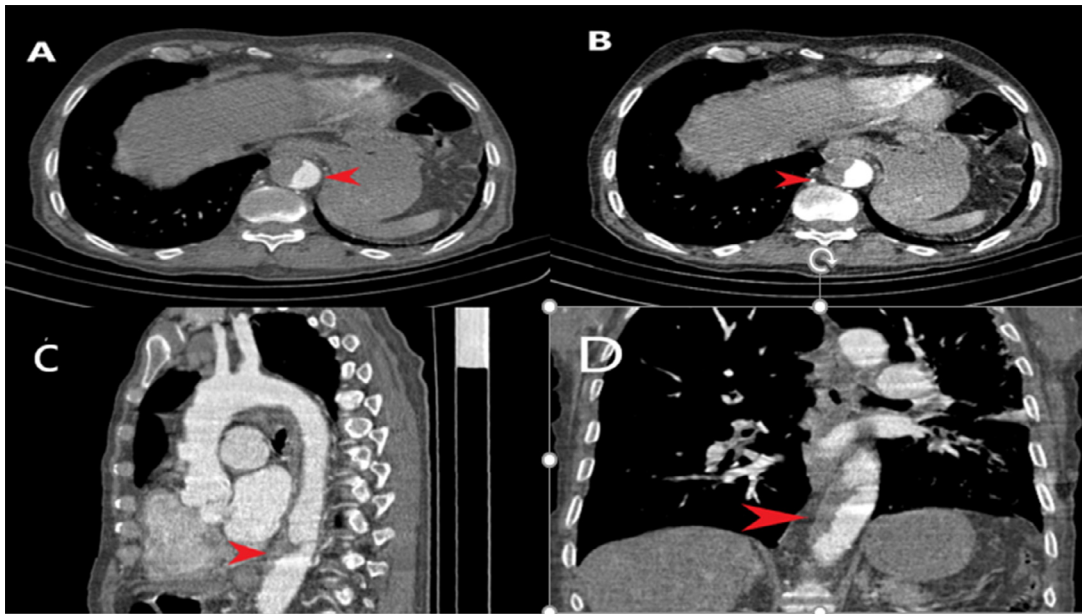


Fig. 2. Patient 2: Computed tomographic image of aortic thrombosis (descenden aorta). (A and B) transverse section, (C) sagittal, (D) coronal section.

can accelerate after macrophage activation.¹³ The absence of a vascular problem and a risk factor, such as atrial fibrillation, in our 2 patients suggested a viral infection as the cause of coagulopathy. Endothelial dysfunction can easily occur in these patients with the direct effect of the virus on the endothelial cells and the effect of cytokines and acute phase reactants.¹⁴ The marked elevation in the laboratory values in both patients supports this idea. As in other patients presenting with a vascular thrombosis, D-dimer, fibrinogen, ferritin, and C-reactive protein values were markedly elevated in our patients. Another reason for an increased susceptibility to hypercoagulopathy may be that these patients had not fully mobilized because they were still in the recovery process after the disease. Although some theories have been proposed, it is unclear how COVID-19 causes coagulopathy. While neither of our patients had a previously diagnosed hematological disease, the high hematocrit and hemoglobin values suggest that it may affect the formation of thromboses by increasing the viscosity of the blood.

Although the etiopathogenesis is not fully clear, it is accepted that patients with COVID-19 have severe coagulation disorders. This shows us the importance of anticoagulant therapy in the active infection period and during the early discharge period when the inflammatory process continues. Studies have shown that heparin use significantly reduces mortality, especially in patients with high D-dimer levels.¹⁴ The absence of anticoagulant

therapy for the period after discharge seems to have contributed significantly to the occurrence of these clinical complications. Thromboses, which resulted in limb loss and mortality, occurred over a very short period in both of our patients after the COVID-19 treatment was completed and the patients were discharged. There is a significant increase in the risk of thrombosis in both the arterial and venous systems in patients with COVID-19. Therefore, it is important to evaluate the appropriate prophylaxis and vascular structure.¹⁵ It would not be wrong to think that the inflammatory process triggered by the disease continues and this situation lays the groundwork for coagulopathy. The large amount of laboratory data in our 2 patients, which are considered as poor prognosis criteria in the process of viral infection treatments, indicates the importance of continuing anticoagulant treatment, especially in these patients after discharge.

RESULT

COVID-19 creates a pronounced tendency for thrombosis, especially in the venous system. Although a thrombosis at the aortic level is rare, it would be appropriate to continue anticoagulant therapy after discharge, especially in patients with severe disease and poor prognosis criteria (such as high D-dimer or high fibrinogen). It is clear that more studies are needed on this subject.

AUTHORS' CONTRIBUTIONS

FB: design, performed vascular surgery, writing of original draft; BE: performed vascular surgery. All authors read and approved the final version of the manuscript.

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