

A Fatal Association of COVID-19 and Acute Type A Aortic Dissection

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December 15, 2021

Abstract

We represent a case with simultaneous COVID-19 and acute type A aortic dissection. Type A aortic dissection, an aortic catastrophic event, seems to have higher mortality on coexistence with COVID-19.

A Fatal Association of COVID-19 and Acute Type A Aortic Dissection

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Key Clinical Message

We represent a case with simultaneous COVID-19 and acute type A aortic dissection. Type A aortic dissection, an aortic catastrophic event, seems to have higher mortality on coexistence with COVID-19.

Keywords: aortic dissection, COVID-19, coronavirus, cardiovascular disorders

As the patient was deceased, a written informed consent was obtained from the patient's next of kin to publish this report in accordance with the journal's patient consent policy and all of the authors declare that confidentiality of the patient was respected.

Introduction

Corona virus disease 2019 (COVID-19) is a respiratory disease caused by novel corona virus, severe acute respiratory syndrome coronavirus 2 (SARS-COV-2), which was first reported in Wuhan city of China on December 31, 2019 to world health organization ¹. Since then, more than 250 million people around the world have been infected and unfortunately more than five millions of them have lost their lives to date (November 2021) ². Covid-19 can present in a wide range of clinical manifestations, more commonly as respiratory symptoms such as shortness of breath and cough. Furthermore, it can manifest as cardiovascular symptoms such as palpitations and chest pain ³ and cardiovascular complications such as aortic dissection ⁴. Aortic dissection is described as a tear in the intima layer of aortic wall which allows blood to flow and accumulate between aortic layers and can propagate along the length of aorta. It can manifest as various

symptoms such as chest pain, weakness, fatigue and unequal extremity pulses and blood pressures⁵. Despite all advances in medicine in the field of diagnostics and treatments, aortic dissection has still a high rate of mortality which makes it extremely considerable⁶. In this report, we aim to present our patient with aortic dissection and recent COVID-19 and report her final destiny.

Case history/examination

A 46 years old woman was admitted to our emergency room on September 21st 2021, with acute onset chest pain which was retrosternal and radiating to the left arm and between two shoulders with a feeling of heaviness in the chest. The pain had a continuous nature from two hours before admission. In addition, she mentioned nausea, vomiting and cold sweat. The patient was nonsmoker and had a past medical history of stage 1 hypertension based on ACC/AHA 2021 hypertension guidelines for about three years and hyperlipidemia. She was under a single-drug treatment with a daily dosage of 25 mg of losartan tablet for hypertension and was under control. She was also affected by COVID-19 three weeks ago and underwent outpatient treatment with remdesivir for five days during which the patient didn't experience fluctuations in blood pressure.

On physical examination, a systolic blood pressure difference of 40 mmHg between arms (140/80 mmHg in right arm versus 100/80 mmHg in left arm) was detected by sphygmomanometer in the assessment of vital signs. Her heart rate was 82 beats per minute. Respiratory rate was 16 per minute and arterial O₂ saturation was 96%. Pulmonary and heart auscultation were unremarkable. A discrepant pulse between left and right radial artery was felt which the left radial pulse was weaker. Routine neurological examination was normal, and the power in all limbs was 5/5, with a Glasgow coma scale of 15/15. Pupils were 3 mm bilaterally equal and reactive to light, the abdomen was soft and lax with no tenderness.

Differential diagnosis, investigations and treatment

Initial ECG showed normal sinus rhythm, normal axis with ST elevation in aVR and V1 leads and ST depression in I, aVL, V4-6 leads (Figure 1). According to patient's presentation with chest pain, unequal radial pulses, a difference in blood pressures of arms and her ECG, aortic dissection was the most likely diagnosis and aortic computed tomography (CT) angiography was requested for the patient.

In laboratory tests, D-dimer was 4820 ng/ml (reference up to 600), serum ferritin 417.4 ng/ml (reference 10-291), lactate dehydrogenase 666 U/lit (reference 230-480), troponin 0.2 ng/ml (normal population < 0.05), CPK 58 U/lit (24-170), CK-MB 20 U/lit (reference 1-24), C-reactive protein 16 mg/lit (reference up to 5.9), ESR 26 mm/h (reference up to 20 in below 50 years old patients). Other para-clinical tests were normal.

Following aortic CT angiography, aortic dissection type A according to Stanford classification and type 1 according to DeBakey classification was diagnosed for the patient.

The intimal flap started at aortic valve extending to ascending aorta, aortic arch, descending thoracic aorta, abdominal aorta to right common iliac artery and then terminating in right external iliac artery. Dissection flap extension to right carotid artery, right common carotid artery and left subclavian artery were noted (Figure 2). Right coronary artery was supplied by true lumen and left main artery was supplied by false lumen. The chest CT scan showed patchy ground glass opacity in anterior segment of superior and middle lobes of right lung consistent with COVID-19 infection.

Due to the diagnosis of aortic dissection, the patient was candidate for emergency surgery and due to inadequate facilities, she was prepared to be transferred to another hospital, but as soon as she entered the ambulance, she became bradycardic, leading to asystole. Cardiopulmonary resuscitation was performed and she was returned to the first hospital. The patient underwent intubation and atropine injection, after which the patient was successfully recovered after a few minutes and she regained consciousness. After an hour, she was transferred to another hospital for emergency surgery.

Outcome and follow-up

The patient was unfortunately expired before entering the operating room.

Discussion

In this report, we described a 46 year old woman with past medical history of stage 1 hypertension which was under control, hyperlipidemia and recent COVID-19 whom represented with acute chest pain and cold sweat. The patient reported no traumatic events and no history of connective tissue disorders. Her clinical examination showed unequal radial pulses and a blood pressure difference between arms. During patient's hospitalization, her blood pressure was within the normal range. The laboratory tests showed elevated D-dimer, troponin, ESR and CRP. The diagnosis and management of aortic dissection in early stages is of importance since it has numeric manifestations and can mimic other life threatening events such as myocardial infarction and pulmonary embolism⁷. Silvestri et al., reviewed seventeen cases of aortic pathology in patients with clinically suspected or PCR confirmed COVID-19 and also reported hypertension as the most frequent comorbidity; they suggested a potential link between COVID-19 and aortic dissection⁸.

There are some potential mechanisms for arterial pathology in COVID-19 patients. SARS-CoV-2 has spike proteins on its surface that binds a receptor which is expressed in the endothelium called angiotensin converting enzyme 2 (ACE-2). This means that SARS-CoV-2 can injure vascular endothelium in the body⁹. SARS-CoV-2 downregulates ACE-2 which leads to over activation of classical renin-angiotensin system (RAS) and vasoconstriction¹⁰. ACE Inhibitor (ACEI) and angiotensin receptor blocking (ARB) drugs, which are used commonly for hypertension as in our patient, upregulate ACE-2 expression that can potentially increase the vascular entry of and injury by SARS-CoV-2. On the other hand, upregulation of ACE-2 can have vasodilatory and anti-inflammatory effects as a result of conversion of angiotensin II to angiotensin 1-7¹¹. However, in a study of 1128 hospitalized patients with COVID-19, those who took ACEI/ARB drugs had a lower all-cause mortality than those who didn't take¹².

Another possible cause of arterial dissection in COVID-19 patients can be cytokine storm and inflammatory responses which leads to endothelial dysfunction¹³. Inflammation may cause rupture of atherosclerotic plaque which can lead to dissection¹⁴. Studies have shown that the number of patients with aortic dissection were increased during the influenza season^{15, 16}. Akgul et al., presented an aortic dissection in a COVID-19 patient which during the aortomy, they noticed significant aorta wall thickening as seen in inflammatory aortic pathologies¹⁷. Their finding is consistent with the potential association of inflammation caused by SARS-CoV-2 with aortic dissection.

As it has been suggested before, SARS-CoV-2 is a virus that causes multi-organ diseases and can manifests as life-threatening events¹⁰. Therefore, it is important to evaluate the association between COVID-19 and aortic dissection and the pathophysiology of it. Further studies are needed to establish this association.

Conflict of interest

The authors have no conflict of interests to declare.

Acknowledgement

The authors of the present study sincerely thank all of the medical staff in Shohadaye-Tajrish hospital, Tehran, Iran, who cooperated with us for completion of this study. All of the data in this report was extracted from the patient's hospital medical records.

Ethical statement

As the patient was deceased, a written informed consent was obtained from the patient's next of kin. All of the authors declare that confidentiality of the patient was respected.

Funding

There is no funding to the present study.

Author's contribution

Rana Irilouzadian: conceptualization, writing original draft, review and editing

Hossein Salehi Omran: data collection, writing original draft

Toktam Alirezaei: data curation, supervision, review and editing

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Images, graphs and videos

Figure 1. Initial ECG of patient: normal sinus rhythm, normal axis, ST elevation in aVR and V1 leads and ST depression in I, aVL, V4-6 leads

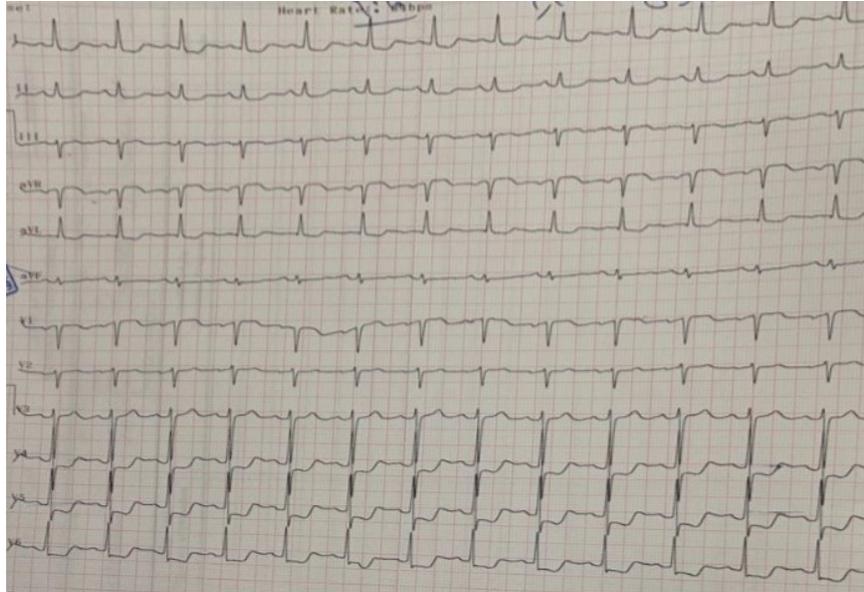


Figure 2. Aortic CT angiography: type A according to Stanford classification and type 1 according to DeBakey classification

