

Case report

COVID-19 in a Traumatic Thoracic Aortic Injury Patient

Sara Besharat¹ , Nasser Malekpour Alamdari^{2*} 

Abstract

The number of traumatic thoracic aortic injuries being treated by endovascular procedures is on the rise. Coronavirus (COVID-19) has affected healthcare systems worldwide and was declared a global pandemic by the world health organization (WHO) in March 2020. In this study, we discuss a 37-year-old man with thoracic aorta trauma caused by a motor-vehicle accident that underwent Thoracic endovascular aortic repair (TEVAR) and was incidentally diagnosed with concurrent COVID-19. During this pandemic period, physicians should be on the lookout for COVID-19 with low thresholds for testing, as a timely diagnosis will improve patient outcomes and reduce the risk of transmission. A delay in diagnosis puts the patients at risk of not receiving effective treatment and may result in the transmission of infection to hospital staff, environment (i.e. operating rooms and equipment), and other members of the community.

Keywords: COVID-19, Computed Tomography, angiography, TEVAR

1. Department of Radiology, Clinical Research and Development Center, Shahid Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
2. Department of General Surgery, Critical Care Quality Improvement Research Center, Shahid Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Corresponding Author:

Nasser Malekpour Alamdari, MD, Department of General Surgery, Critical Care Quality Improvement Research Center, Shahid Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
Phone: +98-21-22074100
Email: nassermalekpour@gmail.com

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Introduction

Blunt traumatic aortic injury, a surgical emergency with a high mortality rate has been reported in acceleration-deceleration injuries. It is most commonly seen in motor vehicle accidents (1, 2). Thoracic endovascular aortic repair (TEVAR) has been established as a treatment for blunt traumatic aortic injury. It lowers mortality and morbidity in comparison with open repair (2, 3). Coronavirus (COVID-19) was first recognized in Wuhan, China in December 2019 and has since spread worldwide being labeled as a global pandemic by the world health organization (WHO) in March 2020. It is highly contagious with symptoms ranging from mild to severe respiratory

distress and death (4-7). The first patient with COVID-19 in Iran was officially reported in February 2020 and shortly after COVID-19 outbreak became evident in Iran (6-8).

Patients admitted to hospitals for vascular emergencies with concurrent undiagnosed COVID-19 infections are challenging as the infection complicates the diagnosis, pre, and post-operation course (8, 9).

In this study, we present a 37-year-old man with traumatic a thoracic aortic injury caused by a motor – vehicle accident that underwent TEVAR and was incidentally diagnosed with concurrent COVID-19. His legal attorney completed an informed consent form for publication of case details and images after his death.

Case Report

A 37-year-old Iranian man riding a motorcycle was hit by a car and referred to Modarres Hospital, Tehran, Iran for dissection and pseudoaneurysm repair in aortic arch descending thoracic aorta (Figure 1-A and 1-B). Due to his concerning unstable hemodynamic status, the patient was scheduled for emergent endovascular treatment just a few days before the COVID-19 outbreak in Iran in February 2020. He was unconscious due to diffuse axonal injury that was seen on his brain magnetic resonance imaging (MRI).

He was suffering from low blood pressure and bilateral hemothorax as well. He was febrile at the time of admission. Angiography with Computed Axial Tomography (CT angiography) showed dissecting intimal flap in distal of aortic arch and pseudoaneurysm at aortic isthmus. Bilateral collapse consolidation was visualized in lung bases as well (Figure 2).

After primitive management TEVAR by a board-certified vascular surgeon with advanced endovascular skills was performed in the operating

room under general anesthesia via left-sided common femoral artery access to the aorta. The endovascular stent graft was placed in the aortic arch and proximal descending thoracic aorta covering more than 95% left subclavian artery origin, using a Cook Zenith Alpha ZTA -P-28-109W graft; with a length of 109 mm and an Introducer Sheath ID/OD Fr (mm)/mm; COOK MEDICAL LLC, Bloomington, IN, United States; Figure 3A and 3B. The stent-graft was positioned perfectly and dissecting intimal flap and pseudoaneurysm were excluded and covered. The end angiography was normal.

He was admitted to ICU for a postoperative course. His fever persisted for the days to follow and we encountered an unfounded lymphopenia and high C-reactive protein whilst the patient's hemoglobin remained stable. Another CT angiography was performed, revealing bilateral multilobar ground-glass opacities and consolidations lacking specific distribution. We supposed that they could be attributable to pulmonary contusion and superimposed infection (Figure 4A, 4B, 4C, and 4D). The patient's condition deteriorated and he did not respond to

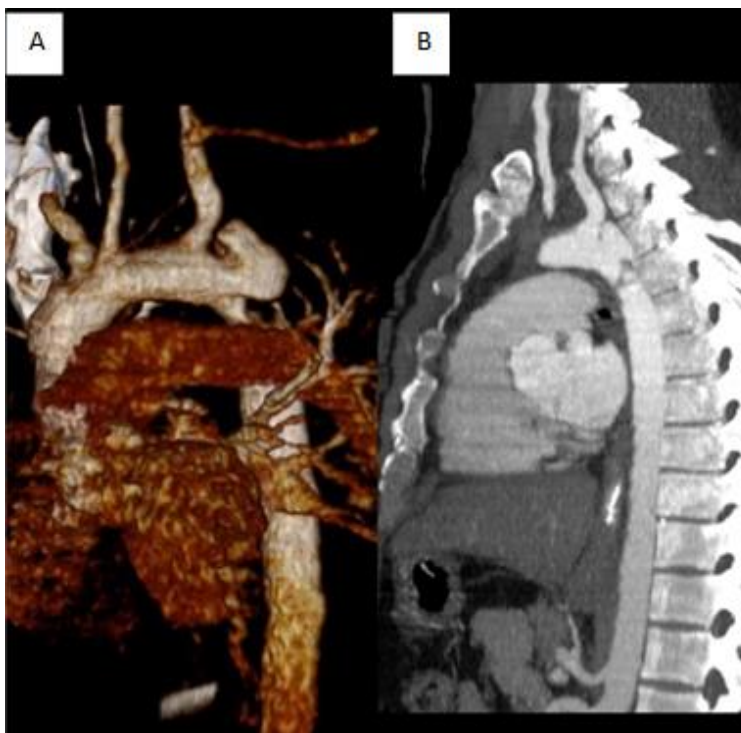


Figure 1. 1A, 1B: VR and MIP reconstruction of preoperative CT angiography depicting pseudoaneurysm.

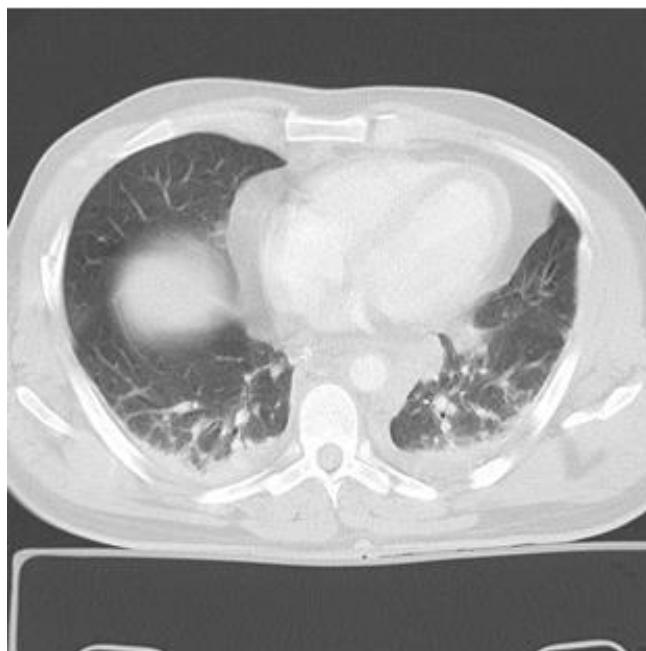


Figure 2. Collapse consolidation in lung bases associated with hemothorax bilaterally.

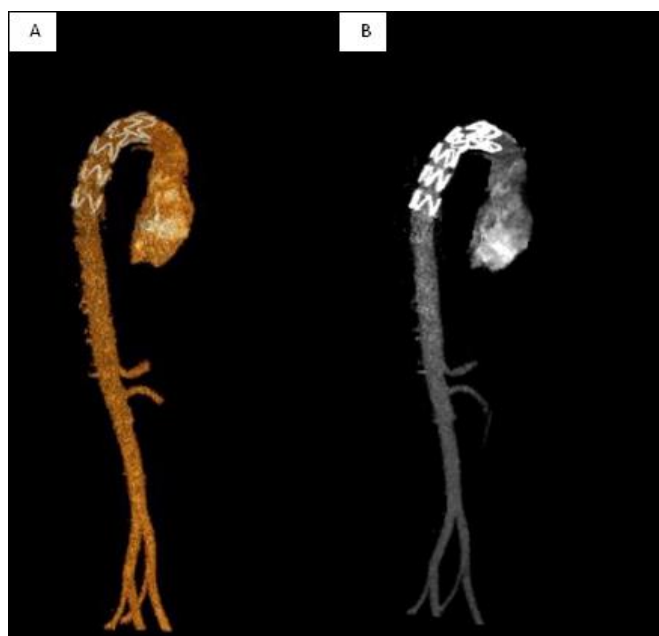


Figure 3. A, B: VR and MIP reconstruction of postoperative CT angiography with stent graft.

ordinary treatments. Meanwhile, the COVID-19 outbreak was announced officially in Iran; so, the patient's nasopharyngeal swab specimens were performed for reverse transcription-polymerase chain reaction (RT-PCR) analysis, leading to early COVID-19 confirmed diagnosis.

Discussion

COVID-19 outbreak has affected healthcare systems globally as they face new challenges regarding diagnosis and treatment of affected patients, especially

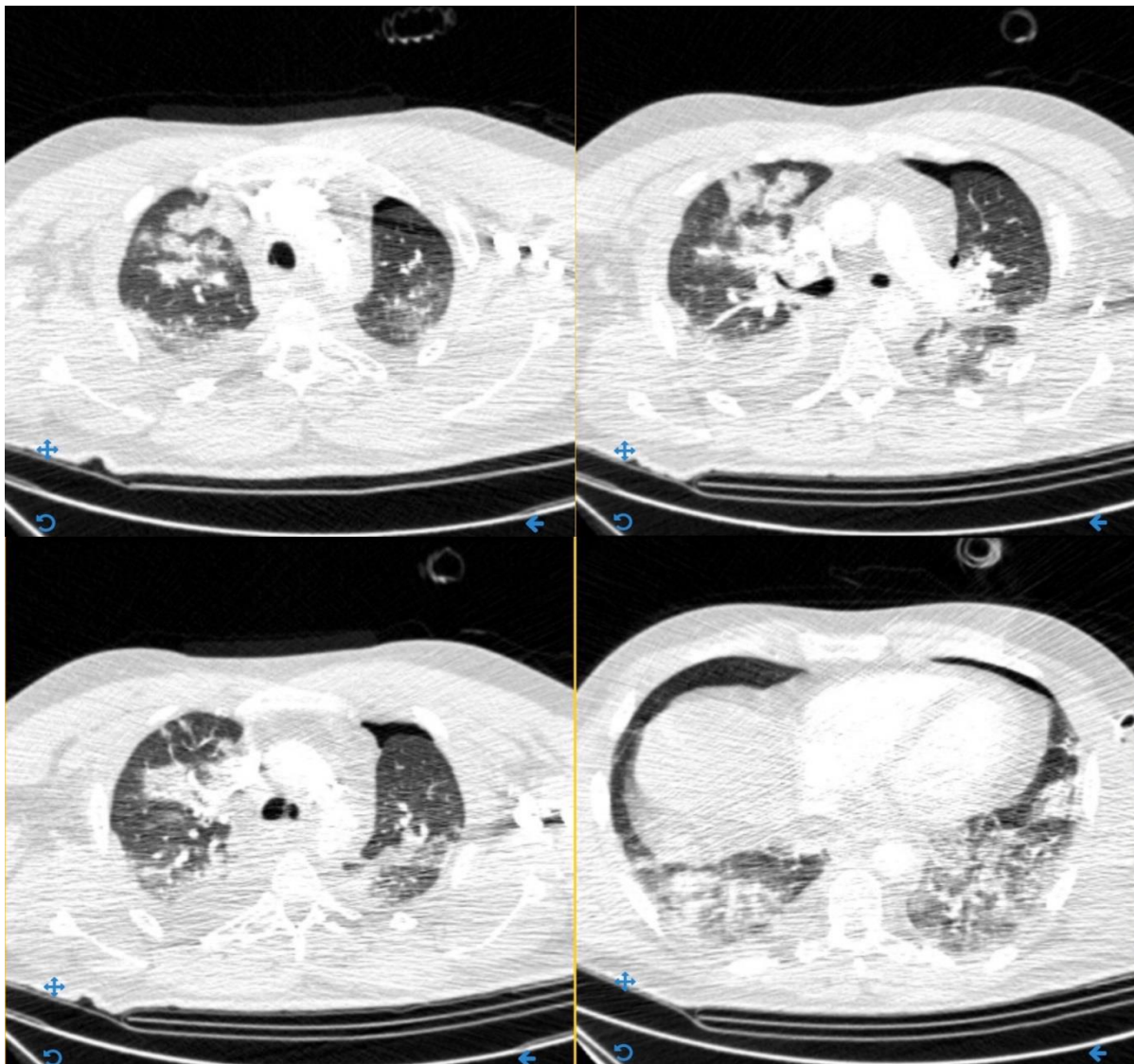


Figure 4. A, B, C and D: bilateral multi lobar ground glass opacities and consolidations in post-operative course.

that are asymptomatic or admitted to hospitals for reasons other than COVID-19 (9).

Cardiopulmonary conditions, diabetes, immunocompromised status, and obesity are considered risk factors for severe illness (5, 10); however, there is no evidence that surgery imposes a higher risk for severe illness on patients. Common traumatic and postoperative complications may mimic the pulmonary symptoms of COVID-19 potentially delaying a positive diagnosis (11). Pulmonary contusion, aspiration pneumonia, pulmonary emboli, pulmonary edema, viral and bacterial pneumonia are some conditions with similar radiographic presentations to COVID-19.

It seems prudent that during a pandemic period physicians should have a lower threshold for testing, as a timely diagnosis will improve patient outcomes and reduce the risk of transmission (4). A delay in diagnosis puts the patients at risk of not receiving effective treatment and may result in the transmission of infection to hospital staff, environment (i.e. operation rooms and equipment), and other members of the community (12).

Since the effect of COVID-19 in the postoperative course is unknown, it is unclear whether vascular surgeries should be performed during the pandemic period. Life-threatening conditions such as ruptured symptomatic thoracic aorta aneurysm or

abdominal aorta aneurysm, aortic dissection, and pseudoaneurysm should not be postponed according to the American College of Surgery guidelines, whilst others believe that we can shorten the peak time and reduce the number of new infections by avoiding surgery (13).

On the other hand, vascular pathology is a major potential source of disease pathophysiology in COVID-19 with an important role in the global patient outcome; hence the term is known as “COVID-19-associated endotheliopathy” has been coined (14-16)

The prerequisite for SARS-CoV-2 infection is the angiotensin-converting enzyme 2 (ACE2) receptors; these receptors are abundantly found on the surface of endothelial cells; which would be the exact receptor for the virus. This leads to increased coagulation and severe endothelial inflammation. In pathologic findings, the following items found in COVID-19-associated endotheliopathy (14-16):

- extensive thrombosis associated with microangiopathy
- severe cellular level injuries in the endothelial vascular layer
- escalated vascular angiogenesis

Considering the above findings, it is a delicate balance between risks and benefits. The risk assessment analysis will be conducted by the vascular surgery team who will need to consider the risks/benefits for surgical candidates on one hand and the risks/benefits for society and the health care system on the other hand.

Conclusion

During this pandemic period, physicians should be on the lookout for COVID-19 with low thresholds for testing, as a timely diagnosis will improve patient outcomes and reduce the risk of transmission.

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Conflicts of Interest

The authors declare that there are no conflicts of interest.

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