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Case Report

A fatal association of COVID-19 and acute complicated Type-B aortic dissection: Interventional management in a difficult situation

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Introduction

The corona-virus disease-2019 (COVID-19) pandemic has severely strained health care systems all around the world. By the end of the year 2020, the total deaths worldwide due to COVID-19 crossed 1.8 million mark. The availability of man power and resources for managing critically ill patients is affected. The hardest hit departments were the one where procedures are conducted, like Cardiology and Cardio-thoracic surgery departments. Throughout the pandemic non-essential procedures were discouraged and at some places emergency procedures requiring specialized staff couldn’t do procedures in view of staff deficiency.

The procedure of choice for acute complicated Type-B aortic dissection (ACTBAD) is endovascular aortic repair (EVAR). We present a rare case of asymptomatic Type-B aortic dissection presenting as COVID-19 case with symptoms of dyspnoea, fever and cough.
Case report

A previously healthy 45-year-old male patient, non-smoker with no comorbidities presented to emergency room with 3 days history of fever, cough and dyspnoea. On examination patient was found to have tachycardia of 119/minute, pyrexia of 100.2°F Fahrenheit and saturation of 87%. The patient was administered oxygen (5 litres per minute) as well as intravenous paracetamol (1 gm). His computed tomography (CT)-chest showed multiple ground glass appearance with CORADS-5 (COVID-19 Reporting and DATA System) and CT severity score of 18/25. The CT scan also showed a significant aortic dissection with true and false lumens seen originating from the thoracic aorta 15mm below the origin of the left subclavian artery and extending up to the origin of the coeliac trunk from the early part of the abdominal aorta. There was significant compression of the true lumen compared to the false lumen (Fig. 1A-D; Video-1). Repeated enquiries to patient regarding the symptoms specific to the dissection were not fruitful. Echocardiography of the patient was normal with good ejection fraction with normal valves. He was shifted to intensive care unit (ICU) with a diagnosis of COVID-19 pneumonia and Type-B aortic dissection, where he was initiated on treatment for COVID-19 pneumonia with intra-venous antibiotics, vitamin supplements, prednisolone, non-invasive ventilation support, diuretics, nitrates and remdesivir. The reverse-transcriptase polymerase-chain-reaction (RT-PCR) tested positive. Patient improved with the above therapy and was shifted to the ward with oxygen support. On day 5, patient developed mild backache and hypotension, following which he was shifted back to ICU. He was initiated on inotropes and with a suspicion of false lumen leakage patient was immediately taken for ‘Endo-vascular Aortic Repair’ (EVAR) after discussing the prognosis with the relatives of the patient.

Supplementary video related to this article can be found at https://doi.org/10.1016/j.ihjccr.2021.05.001

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Healthcare professionals and support personnel used appropriate PPE (personal protection equipment) kits and infection control gears. As the patient was in hypotension with no peripheral pulses, right brachial access was obtained using arteriotomy and a pigtail was placed in the arch of the aorta via a 5-French sheath. This was followed by right femoral access using a 5-French introducer sheath and a pigtail catheter was passed over the 0.035-inch guidewire, carefully through the true lumen which was exchanged for 0.035-inch "super-stiff" wire to deliver the stent-graft. The position of the guide-wire was confirmed by aortic angiography (Fig. 2A; Video 2). After a careful planning of the endograft size and length, a Medtronic’s ‘VALIANT Captivia’ of 24 French, 34 mm × 167 mm, was chosen for the procedure among the available grafts. The landing zone was ascertained and the stent was deployed with some struts protruding into the origin of subclavian artery (Fig. 2B; Video 3). The delivery catheters were removed carefully after check aortogram (Fig. 2C). The check angiogram revealed contrast oozed into the false lumen from the exit point of false lumen (Video 4). The exit point of the false lumen was found to be quite large therefore the distal part of false lumen was sealed with coil and glue to make sure there is no flow across the false lumen (Fig. 2D; Videos 5, 6, 7). After the successful procedure the patient was shifted to ICU for monitoring and stabilization. He was continued on inotropes, ventilator support and other supportive medications. After 24 hours, patient was conscious, oriented and was able to move all four limbs. A large collection of haemothorax was drained using intercostal drainage. A gradual drainage technique was used to prevent haemorrhagic shock, and packed cell blood transfusion was used to compensate for the loss. He was continued on inotropes and ventilator support. The patient went into cardiac arrest 36 hours later and did not respond to resuscitation.

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Discussion

We present an asymptomatic type-B aortic dissection detected incidentally during evaluation of COVID-19 on CT scan. The patient became unstable and he underwent successful EVAR on emergency basis. But 36 hours later patient died following sudden cardiac arrest. This case clearly demonstrates that the COVID-19 related

Figure 1. Coronal section of thoracic-abdominal CT-scan showing type-B Aortic dissection with ‘Entry’ point into the false lumen (→) arising from 14cm distal to left subclavian artery from true lumen (←) and ‘Exit’ of false lumen ending 18cm proximal to left renal artery origin [A]; The 3D reconstruction of the true (←) and false lumen (→) of the Aorta showing the relative size and length [B]; Contrast CT-scan with cross section of thorax showing both true and false lumen [C]; Contrast CT-scan with cross section of thorax showing both true (←) and false lumen (→) with anterior false lumen showing leakage of blood (↓) into the pleural space [D].
Figure 2. LAO-cranial fluoroscopic still showing ascending, arch and descending aorta with type-B aortic dissection ‘Entry’ origin distal to left subclavian artery highlighted by the contrast being injected from the pigtail inserted from femoral access into the aortic sinus [A]; Next step showing placement of the Aortic stent and deploying [B and C]. This still shows a well deployed Aortic stent with no leakage of contrast into the false lumen, contrast being injected via a pigtail catheter inserted from right brachial access [D].

Table 1
The list of all cases of COVID-19 pneumonia associated with acute aortic dissection.

| Author  | Country | Age | Sex | Associated Co-morbidity | Symptoms                  | Dissection type | Extension of Dissection | Procedure          | Outcome | Reason for poor outcome |
|---------|---------|-----|-----|--------------------------|---------------------------|-----------------|------------------------|-------------------|---------|-------------------------|
| Akgul   | Turkey  | 68  | Female | COVID                   | Chest Pain Breathlessness | Type A          | Right Common Iliac artery   | Surgical Aortic Repair | Good    | -                       |
| Fukuhara | USA     | 52  | Male | COVID                    | Chest pain Abdominal Pain | Type A          | Renal Artery             | Surgical Aortic Repair | Poor    | Respiratory and renal failure |
| Ikeda   | USA     | 35  | Female | COVID, Marfans Syndrome | Chest pain Abdominal Pain | Type B          | Right Common Iliac artery | TEVAR             | Good    | -                       |
| Mamishi | Iran    | 14  | Male | COVID, Marfans Syndrome | Chest Pain Breathlessness | Type A          | Not mentioned            | Medical management   | Poor    | Not described            |
| Martens | Belgium | 64  | Male | COVID, Hypertension      | Chest Pain Right leg ischemia | Type A          | Iliac artery             | Surgical Aortic Repair | Good    | -                       |
| Shahzad | Qatar   | 35  | Male | COVID, Marfans Syndrome | Breathlessness Cough       | Type A          | Right Common Carotid artery | Surgical Aortic Repair | Good    | -                       |
| Tabaghi | Iran    | 47  | Female | COVID                   | Chest pain Breathlessness | Type A          | Not mentioned            | None              | Poor    | Shock                   |

Abbreviations: USA – United States of America; COVID-19 – corona-virus disease-2019; TEVAR – Thoracic endo-vascular repair.
mortality is quite high among patients who underwent major procedures.\textsuperscript{2,3} Although at what point of time patient developed aortic dissection is not clear. Our patient gives no history of backache, chest pain, loss of consciousness or abdominal pain; so there was no suspicion of aortic dissection at presentation. Once diagnosis was made, patient didn’t show signs of any complications, like resistant hypertension, mal-perfusion, partial false lumen thrombosis or total aortic diameter of $\text{> 55mm}$.\textsuperscript{4} Because the patient was stable and asymptomatic, the heart team at our center decided to begin medical care for COVID-19 illness until he was transferred out from the ICU. During his continued stay in ICU he underwent second CT-scan which too revealed no change in the dimension of the dissection. Once patient developed shock, he underwent EVAR promptly with the available hardware. The stent graft could cover the origin of aortic dissection and not the exit point of dissection.

The exit point showed retrograde filling from the aorta therefore it was sealed with coils and glue. This is an innovative way to plug all the opening to the false lumen. Despite normal arterial blood gas analysis and other metabolic parameters, the patient had sudden ache, chest pain, loss of consciousness or abdominal pain; so there have been 7 cases of aortic dissection with COVID-19 pneumonia reported in the literature, 6 out of 7 cases had type-A aortic dissections and one had type B. Three cases of type-A aortic dissection (50%) had a poor outcome, with mortality caused primarily by complications such as respiratory/renal failure and persistent shock.

Conclusion

Presentation of simultaneous COVID-19 pneumonia and aortic dissection is rare occurrence. Major cardiac procedures done with concurrent concurrentCOVID-19 have high mortality. Critically ill COVID-19 patients suffer non-shockable rhythms which cannot be resuscitated. EVAR remains procedure of choice for critically ill patients presenting with Aortic dissection.

Source of funding

None.

Declaration of competing interest

None.

Acknowledgement

Dr Kashyap Vyas, Resident of Cardiology, Yashoda Hospitals. 
Mr Naveen Ponugoti, Chief Cathlab technician, Yashoda Hospitals. 
Mrs Annapurna and Mr Sunil, Nursing staff of Cathlab, Yashoda Hospitals.

References

1. Roff M, Capodanno D, Windecker S, Baumbach A, Dudek D. Impact of the COVID-19 pandemic on interventional cardiology practice: results of the EAPCI survey. EuroIntervention. 2020;16:247–250. https://doi.org/10.4244/EIJ-D-20-00526.

2. Abate SM, Manteferado B, Basu B. Postoperative mortality among surgical patients with COVID-19: a systematic review and meta-analysis. Patient Saf Surg. 2020;14:37. https://doi.org/10.1186/s13037-020-00262-6.

3. Wang K, Wu C, Xu J, et al. Factors affecting the mortality of patients with COVID-19 undergoing surgery and the safety of medical staff: a systematic review and meta-analysis. EClinicalMedicine. 2020;29–30:100612. https://doi.org/10.1016/j.eclinm.2020.100612.

4. Nienaber CA, Divchev D, Palisch H, Clough RE, Richartz B. Early and late management of type B aortic dissection. Heart. 2014;100:1491–1497. https://doi.org/10.1136/heartjnl-2013-305133.

5. Thapa SB, Kakar TS, Mayer C, Khanal D. Clinical outcomes of in-hospital cardiac arrest in COVID-19. JAMA Intern Med. 2020. https://doi.org/10.1001/jama.2020.4796.

6. Akgul A, Turkyilmaz S, Turkyilmaz G, Toz H. Acute aortic dissection surgery in a patient with COVID-19. Ann Thorac Surg. 2021;111:e1–e3. https://doi.org/10.1016/j.athoracsur.2020.06.005.

7. Fukuhara S, Rosati CM, El-Dalati S. Acute type A aortic dissection during the COVID-19 outbreak. Ann Thorac Surg. 2020;110:e405–e407. https://doi.org/10.1016/j.athoracsur.2020.04.008.

8. Iloeda S, Shih M, Rhee RY, Youdelman BA. Acute complicated type B aortic dissection during the New York City COVID-19 surge. J Card Surg. 2020;35:1736–1739. https://doi.org/10.1111/jocs.14678.

9. Mamishi S, Navaesan A, Shahbani R. Acute Aortic Dissection in a Patient with Williams Syndrome Infected by COVID-19 n.d.:3. https://doi.org/10.1016/j.athoracsur.2020.05.001.

10. Martens T, Vande Weygaerde Y, Vermassen J, Malfait T. Acute type A aortic dissection complicated by COVID-19 infection. Ann Thorac Surg. 2020;110: e421–e423. https://doi.org/10.1016/j.athoracsur.2020.05.001.

11. Shahzad T, Mohamed Salih Mustafa M, Bhutta ZA, Edmund Harris TR. A case of aortic dissection with highly suggestive features of COVID-19. Qatar Med J. 2020;2020. https://doi.org/10.5339/qmj.2020.34.

12. Tahaghi S, Albarzadeh MA. Acute type A aortic dissection in a patient with COVID-19. Future Cardiol. 2020. https://doi.org/10.2217/fca-2020-0103. fca-2020-0103.