Case Series

Cardiovascular manifestations of COVID-19: A case series

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Abstract

COVID-19 is known to present with respiratory symptoms, which can lead to severe pneumonia and respiratory failure. However, it can have multisystem complications such as cardiovascular and neurological manifestations. Cardiovascular complications of SARS-CoV-2 infection are still underreported in India. We have compiled four cases received in our emergency department with different cardiovascular manifestations at presentation and were diagnosed with COVID-19. The cardiovascular manifestations reported by previous studies comprise myocarditis, cardiogenic shock, arrhythmias, pulmonary embolism, deep vein embolism, acute heart failure, and myocardial infarction. Hence, a thorough cardiac examination with ECG correlations and point of care cardiac markers should be done in all the patients with COVID-19 infection. Immediate initiation of prophylactic anticoagulation in COVID-19 hospitalized patients is mandatory. Geriatric patients and those with co-morbidities can have a fulminant course of illness; so our treatment protocol should be more vigilant in these patients. However, most importantly, we must not forget the significance of bedside echocardiography, lung ultrasound, and point of care markers.

Keywords: Anticoagulants, arrhythmia, COVID-19, heart failure, myocardial infarction, pneumonia, rheumatic heart disease

Introduction

Severe Acute Respiratory Syndrome 2 (SARS-CoV-2) is a single stranded RNA virus that bears a striking similarity with the previous viruses causing outbreaks such as MERS and SARS. It has affected more than nine million people across the world. It was first detected in Wuhan district of China in December 2019 as an unknown cause of pneumonia. Thereafter, WHO declared it a pandemic on March 21, 2020. It continues to rise exponentially. It has varied presentations.[1] The most common presentation is fever, dry cough, breathlessness, myalgia, and fatigue. However, the cytokines and chemokines storm surge affect many other systems of the body such as the cardiovascular. The underlying co-morbidities predispose these patients to cardiovascular manifestations such as acute coronary syndrome, myocarditis, and acute heart failure.[2,3] We hereby report four cases of SARS-COV-2 infection presenting with various cardiovascular manifestations. Timely diagnosis and management of these complications can prevent significant mortality in these patients. Primary physicians are the frontline caregivers who can take relevant focused history and examine the patient so that such complications are not missed at and appropriate treatment can be started. Consideration of cardiovascular manifestations is necessary in supportive treatment with anticoagulants, continued used of renin–angiotensin–aldosterone system inhibitors and arrhythmia monitoring.

Case 1

A 65-year-old female patient presented with the complaints of dizziness since last 5 days associated with nausea and vomiting. There was no history of chest pain, dry cough, and fever. There was no history of syncope. On examination, she was alert. Her

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initial vitals were blood pressure- 100/70 mmhg, pulse rate-60 beats per minute, respiratory rate- 20 per minute, SpO2- 98%, and RBS- 93 MG/dl. She was RT-PCR positive for COVID-19. Her ECG [Figure 1] was suggestive of RBBB (Right Bundle Branch Block) with left anterior fascicular block with 2:1 AV block.

Cardiac enzymes were within normal limits. Bedside echocardiography and lung ultrasound were normal. Chest X-ray did not show any abnormality. Investigations revealed normal complete hemogram, kidney, and liver function tests. TSH- 7.89 microIU/ml, FT4-0.75 ng/dl, FT3-2.06 pg/ml. Next day, her pulse rate was 46 beats per minute and temporary pacemaker was implanted. Injection atropine (0.6 mg) was given when pulse was less than 40 beats per minute. Gradually, she maintained a steady pulse rate and pacemaker was removed. She was observed for 7 days and discharged in stable condition.

Case 2

A 62-year-old female patient presented to the Emergency Medicine Department with shortness of breath since 1 day and pain and swelling in right lower calf for the past two days. She had a history of fever, high grade, intermittent persisting for 7 days for which she went to a local doctor and was tested RT-PCR positive for COVID-19. After her fever subsided, she developed pain and swelling of right lower limb and shortness of breath. Ultrasound venous Doppler was suggestive of dilated and noncompression of distal superficial vein, popliteal vein with echogenic area within and extending to gastrocnemius vein. Point of care ultrasound (POCUS) showed B Profile of lungs and echocardiography was suggestive of dilated right atrium and ventricle with moderate tricuspid regurgitation, dilated inferior vena cava with less than 50% collapsibility [Figure 2].

Chest X-ray was suggestive of cardiomegaly with few fibrotic bands in the right lower zone and fibrotic patches in the left middle zone [Figure 3].

Investigations revealed raised D-dimer levels (2574.82 ng/ml) and normal troponin. Arterial blood gas analysis was suggestive of hypoxia (pH-7.4, pO2-84, PCO2-34.3, HCO3-22.5, lac-3.7). ECG was suggestive of S1Q3T3; T-wave inversions were seen in V1-V5 leads [Figure 4].

CT pulmonary angiography revealed thromboembolism in bilateral main pulmonary arteries and bilateral lobar arteries [Figure 5].

In the Emergency Medicine Department, patient was initiated on unfractionated heparin (5000 units followed by 1000 units per hour infusion.) She was admitted in COVID-ICU where she was thrombolyzed with Tenecteplase. The following day, she developed massive hemoptysis of around 800 ml, which continued for 2 days. During the course in COVID-ICU, she was transfused six units packed red blood cells and was started on inotropes (noradrenaline and adrenaline). She developed refractory shock and her GCS deteriorated. She was soon intubated and put on mechanical ventilation. After 2 days of vigorous efforts, she could not be saved and succumbed to death.

Case 3

A 45-year-old male, known diabetic, presented to the Emergency Medicine department with the complaints of shortness of breath and chest pain since 1 day. There was no history of palpitations, paroxysmal nocturnal dyspnea (PND), and fever. He was tested RT-PCR positive for COVID-19 infection. On examination, he was confused and not oriented to time with GCS of E3V4M6. His initial vitals were BP-130/70 mmhg, PR-140/min RR-42/min, SpO2- 74% in room air, random blood sugar was 257 mg/dl. He was immediately intubated with 8.5 mm Endotracheal tube. ECG was suggestive of ST elevation in leads II, III, aVF suggesting acute inferior wall myocardial infarction [Figure 6].

Point of care investigations were Pro-BNP- 1813 pg/ml, troponinI-16.84 ng/ml, and ABG (pH-7.4, PCO2-44.5%, HCO3-16.3 mmofhg, Lac-3.7). Patient was started on antiplatelets and anticoagulants (unfractionated heparin). After 6 hours of admission, he had cardiac arrest and succumbed to death.

Case 4

A 20-year-old patient, primigravida with 7 months of gestation arrived in the Emergency Department with the complaint of shortness of breath since last 2 days associated with pink frothy sputum. On arrival, she was conscious and oriented to time, place, and person. Her initial vitals were BP-100/70 mmhg, PR-150/min, RR was 40/min, SpO2-50% on room air. She was immediately intubated with 7.5 mm ET tube and started on mechanical ventilation. Chest X-ray was suggestive of acute pulmonary edema with bilateral pneumonia [Figure 7].

POCUS- revealed B profile of lungs, normal left ventricular ejection fraction, dilated left atrium, right atrium and right ventricle, severe mitral stenosis and tricuspid regurgitation [Figure 8], and IVC (inferior vena cava)-diameter-1.56 cm with more than 50% collapsibility. Lung ultrasound suggested consolidation with air bronchogram in postero-basal segment of middle and lower lobe, left-sided interseptal pleural lines with vertical lines seen. After stabilization, she underwent balloon mitral valvotomy, which was uneventful. During the hospital course, she received inotropes, diuretics, and antibiotics. Ultrasound for fetal well-being was done, which revealed a normal study. She was discharged in stable condition after 2 weeks of hospital stay with a healthy fetus.

Proper consent from the patient as well as from the institutional ethical committee has been taken.

Discussion

COVID-19 disease, a global pandemic, can have a wide spectrum of presentations. Initially, it was found to affect lungs as the

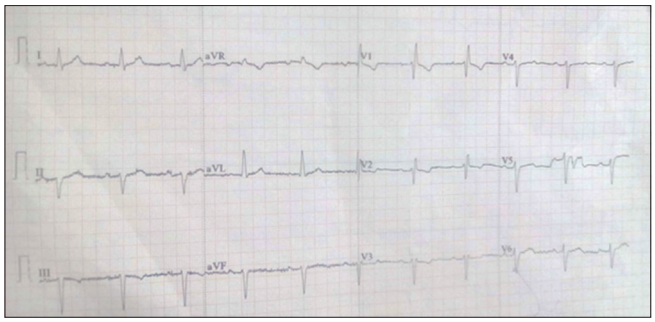

Figure 1: ECG suggestive of RBBB (Right Bundle Branch Block) with left anterior fascicular block with 2:1 AV block

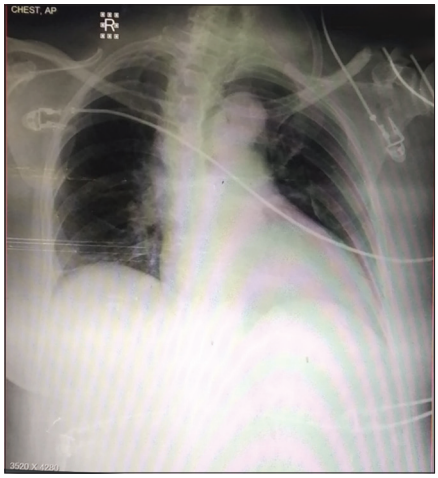

Figure 3: Chest X-ray suggestive of apparent cardiomegaly with few fibrotic bands in the right lower zone and fibrotic patches in the left middle zone

main target organ but ongoing research hints at multisystem involvement of the virus. Moreover, geriatric population as well as patients with multiple co-morbidities have been found to have more severe form of disease. It has been observed that around 10% of the patients with COVID-19 infection present with gastrointestinal symptoms. SARS-CoV-2 infection can present as cardiovascular, cerebrovascular, and gastrointestinal manifestations. In a study conducted by Wang *et al.*[4] in China, cardiovascular manifestations were observed in 20 (14.5%) patients out of 138 COVID-19 patients. Early in the pandemic, cardiovascular manifestations has proven to have a more severe course of illness. After more than a year, we find ourselves at a very critical point in the COVID timeline especially with new variants of the virus. As physicians we must be vigilant and up to date with the latest evidence of acute COVID-19 infections.

In our first case report, we describe a 65-year-old female patient with COVID-19 infection with arrhythmia (Right bundle branch block with left anterior fascicular block with 2:1 AV block). A similar case report has been reported by Gubitosa *et al.*[5] He described a case of a 74-year-old lady, known diabetic with COVID-19 infection with incomplete trifascicular block and normal cardiac enzymes. Another case report by Kir *et al.*[6] discussed a case of a 49-year-old gentleman with bradycardia

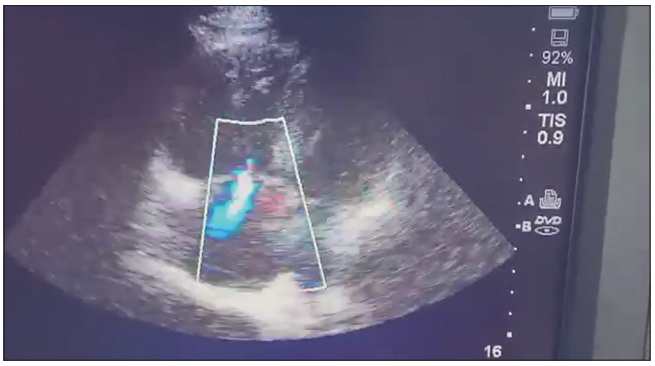

Figure 2: Bedside ECHO suggestive of dilated Right atrium and ventricle with Tricuspid regurgitation in the 4-chamber apical view

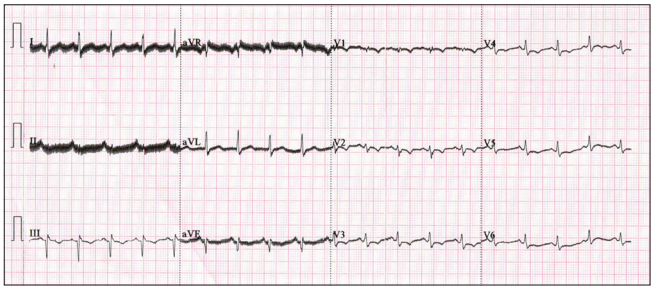

Figure 4: ECG suggestive of S1Q3T3, T-wave inversions seen in V1-V5 leads

and intermittent high-degree atrioventricular block. His cardiac markers and echocardiography was normal. The 74-year-old lady suffered a more severe course of illness who eventually succumbed to death, whereas the 49-year-old was managed symptomatically and was finally discharged. Geriatric age group with co-morbidities have more severe outcome in our case series.

The second case discussed is a 62-year-old female patient of COVID-19 infection with deep vein thrombosis and pulmonary embolism. In a prospective multicenter study conducted by Helms *et al.*,[7] out of 150 patients with severe SARS-COV-2 infection 64 (14.4%) patients presented with thrombotic complications. Pulmonary embolism was reported in 16.7% patients with severe SARS-COV-2 infection admitted in ICU.

SARS-CoV-2 invokes systemic inflammatory response syndrome (SIRS) leading to activation of coagulation cascade. The underlying pathogenesis of thrombosis remains unclear. Hypoxemia causes vasoconstriction and vascular occlusion leading to activation of hypoxia inducible factors. This leads to activation of plasminogen activator inhibitor (PAI-I) impairing the fibrinolytic pathway. Hence, COVID-19 is a procoagulant state.

The third case described is a 45-year-old male diabetic patient of COVID-19 infection, presenting with acute inferior wall myocardial infarction. Juthani *et al.*[8] described a case of 29-year-old male patient of COVID-19 infection with acute anterolateral myocardial infarction. Direct cardiac injury as well as cytokine surge leading to systemic inflammation initiated the cycle

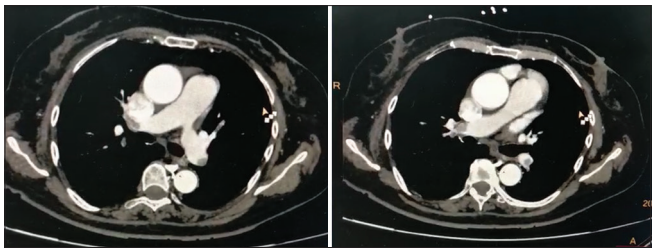

Figure 5: CT pulmonary angiography revealed thromboembolism in bilateral main pulmonary arteries and bilateral lobar arteries

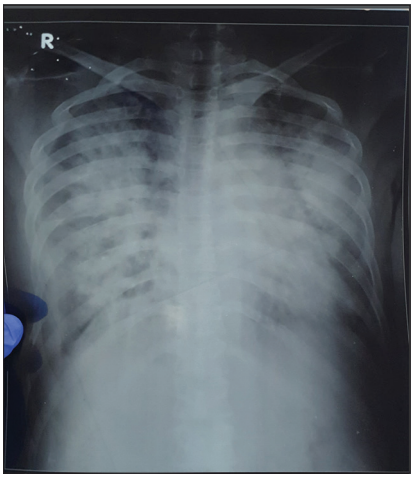

Figure 7: Chest X-ray shows bilateral patchy and confluent areas of air space opacities involving predominantly the middle and lower lung zones

of myocardial injury. The reported incidence of acute myocardial injury in patients with COVID-19 infection is around 8–12%.[9] In a study done by Tao Guo, among 187 patients with COVID-19, mortality was higher in patients with elevated TnT (Troponin T) levels than in patients with normal TnT.[10]

The World Heart Federation ranks Rheumatic heart disease as a risk factor for severe COVID disease in low-income countries. However, there is limited data on patients of rheumatic heart disease and the impact COVID-19 infection has on them. These patients have dysfunction in the left chamber of the heart or high pressure in their lungs predisposing them to complications of COVID-19.[11]

The prevalence of cardiac injury as seen with an elevated troponin level in the acute infection of COVID-19 has brought the attention of physicians to an ongoing acute MI, viral myocarditis, cytokine storm-induced cardiac injury, arrhythmias, and pulmonary embolism.[12] These are important clinical concerns, the implications of which need to be addressed promptly.

Key Take Home Message:

- Patients with co-morbidities such as cardiovascular disease, diabetes, and hypertension are at higher risk of COVID-19-related mortality.

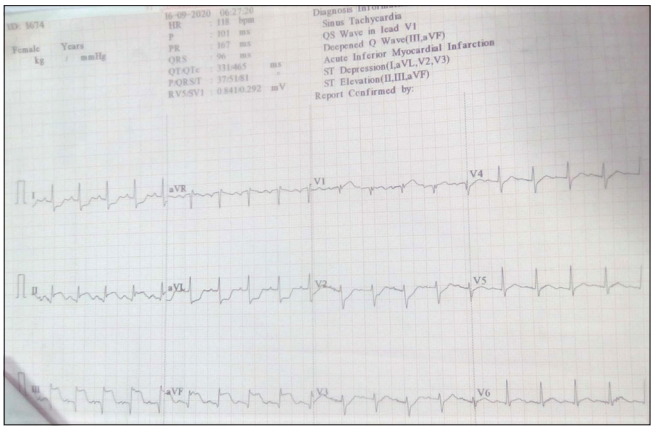

Figure 6: ECG suggestive of ST elevation in leads II, III, aVF, and ST depression in I, aVL, V2, V3

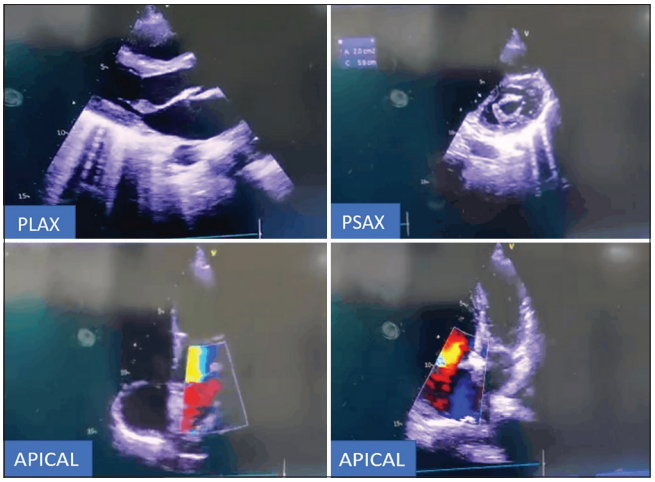

Figure 8: Bedside Transechocardiography revealed a normal left ventricular ejection fraction, dilated left atrium, right atrium and right ventricle, severe mitral stenosis, and tricuspid regurgitation. PLAX: Parasternal long axis, PSAX: Parasternal short axis

- COVID-19 infection is a hypercoagulable state. These patients are more vulnerable to develop pulmonary embolism, deep vein thrombosis, and myocardial infarction. Hence, immediate prophylactic anticoagulation is initiated in patients with moderate to severe SARS-CoV-2 infection. Higher dose of thromboprophylaxis should be started in those with a high risk for developing VTE admitted to the hospital.
- In addition, a thorough cardiac examination with electrocardiographic correlations should be performed on all patients with COVID-19.
- Detailed monitoring of both cardiovascular and respiratory complications in patients with COVID-19 infection utilizing point of care biomarkers can aid in early diagnosis as well as timely management of various complications of COVID-19 infection.
- As a family physician, one must be aware of the chronic co-morbidities and the associated symptoms that a patient shows, which will not only help with the early diagnosis of the disease but also ensure to be vigilant in the treatment of the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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