

CASE REPORT

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COVID-19 presenting after Elective Off-pump Coronary Artery Bypass Grafting and Lessons Learned

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Abstract

Background: Cases of COVID-19 presenting after elective cardiac surgery are rare. Published literature suggests that such cases have a high morbidity and mortality rate. Here, we report a case of COVID-19 presenting after an elective, isolated off-pump coronary artery bypass (OPCAB).

Case presentation: A 65-year-old obese, hypertensive, hypothyroid lady, with moderate left ventricular dysfunction, presenting with unstable angina, tested negative for COVID-19 at admission, having undergone thrombolysis for a recent inferior wall myocardial infarction, at an outside centre, and coronary angiography revealing left main triple vessel disease, developed signs and symptoms of COVID-19, four days after OPCAB. She was diagnosed with moderate COVID-19 infection. Subsequent contact tracing revealed that her husband was suffering from mild COVID-19 infection and was managed in home isolation. Isolation and early supportive management with moist oxygen, steroids, intravenous antibiotics, zinc and vitamin C helped the patient recover. She was followed up at one month, six months, one year and at eighteen months and has been doing well.

Conclusions: A strong clinical suspicion and repeat testing for COVID-19 is required as the diagnosis may often be missed with COVID-19 mimicking the signs and symptoms of post-cardiotomy syndrome. Preferentially dealing with such cases off-pump, thereby avoiding cardio pulmonary bypass-related complications, may improve outcomes. Isolation and early supportive management help. Adequate follow-up is required in all such cases as cardiovascular complications are common, alongside known long-term sequelae, like anxiety, depression, cardio-respiratory complications, venous thromboembolism and even postural orthostatic tachycardia syndrome.

Keywords: COVID-19, Coronary artery disease, Coronary artery bypass, Off-pump, Case report

Background

The epidemic of coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 or SARS-CoV-2 (2019-nCoV) coronavirus, was first reported on December 12, 2019, in Wuhan, China [1]. COVID-19 causes varying clinical characteristics

ranging from cough and fever to pneumonia to acute respiratory distress syndrome (ARDS) and shock [2].

Cases of COVID-19 presenting after elective cardiac surgery are rare. Published literature suggests that such patients have a high morbidity and mortality rate. To the best of our knowledge, there has been no previous case report of such a case of COVID-19, presenting after an elective, isolated off-pump coronary artery bypass grafting (OPCAB), with subsequent follow-up data.

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Case presentation

A 65-year-old obese lady (body mass index, BMI of 30.16) with hypertension, hypothyroidism, recent inferior wall myocardial infarction (thrombolysed at an outside centre), moderate left ventricular dysfunction (left ventricular ejection fraction of 38%) with hypokinetic infero-posterior wall on echocardiography, presented with unstable angina, diagnosed as a case of left main triple vessel disease on coronary angiography at another centre. There was no known COVID-19 infection in the family at that stage, and there was no significant travel history. She tested negative for COVID-19 reverse transcriptase polymerase chain reaction (RT-PCR) at admission for elective, isolated OPCAB. Written, informed consent was obtained from the patient for the procedure and further management.

Isolated OPCAB was done via median sternotomy. The surgery was uneventful, wherein she received four grafts off-pump (skeletonised left internal mammary artery to the left anterior descending artery, reversed saphenous vein graft, RSVG to the ramus intermedius and distal left circumflex artery sequentially and another RSVG was done to the posterior descending artery). She was shifted to the intensive therapy unit (ITU) with stable haemodynamics, in sinus rhythm, under elective mechanical ventilation and minimal inotropic supports. She was extubated after 12 h and had good urine output, her drainage overnight was 240 mL, and her post-operative chest X-ray was acceptable. Her intercostal chest drains were removed on the post-operative day 2 with an overall drainage of 510 mL, and she was off inotropic supports. She was haemodynamically stable, in sinus rhythm, maintaining a room air saturation of 98 and was mobilized from day 3.

On day 4, she became febrile and her total leukocyte count (TLC) was raised to 15,100/cmm. Urine was sent for routine examination and it showed numerous pus cells per high power field. Urine culture and blood culture tests were sent. Intravenous antibiotics (Meropenem 1 g thrice daily and Teicoplanin 400 mg once daily) were started and continued for 5 days. She had two episodes of low-grade fever on day 5. Her urine culture revealed no growth after 48 h, and subsequently, her blood culture was also negative. On day 6, she continued having low-grade fever and became dyspneic. Her room air saturation was 93 despite moist oxygen inhalation at 6 L/min. Her chest X-ray showed a hazy left hemithorax. A picture collage depicting her chest X-rays, from the pre-operative stage onwards, is presented in Fig. 1.

A repeat COVID-19 RT-PCR test was positive. The hospital staff underwent the COVID-19 RT-PCR test and came out to be negative. Subsequent contact tracing was done, and the patient's husband also tested positive for

COVID-19. He was diagnosed as a case of mild disease and managed in home isolation. The institutional management protocol followed, for COVID-19, is shown in Table 1.

The lady was started on oral steroids (Dexamethasone 8 mg daily), zinc (50 mg orally, daily) and vitamin C (orally, 500 mg twice daily after meals) and shifted to the COVID-19 isolation ward under the hospital COVID-19 team of physicians. Her symptoms suggested moderate COVID-19 infection. Her C-reactive protein (CRP) level was 111.9 mg/L, and interleukin-6 (IL-6) level was 78.1 pg/mL. Her computed tomography (CT) chest revealed features suggestive of acute COVID-19 pneumonia. Medical management continued, and her CRP dropped to 57.9 mg/L, and TLC to 12,200/cmm. Her CRP level dropped further to 18.7 mg/L, and she maintained a room air saturation of 97 at discharge, after two weeks at the hospital. She was subsequently followed up by the cardiac surgical team and the COVID-19 team of physicians at one month, six months, one year, at eighteen months and has been haemodynamically stable, in sinus rhythm, fully ambulant, maintaining a room air saturation of 98. Her follow-up chest X-ray at six months is shown in Fig. 2.

The patient was happy with the way she was managed in hospital and at follow-up and the way her husband was managed during his home isolation period, through Tele-consultation with the hospital COVID-19 team of physicians.

Discussion

A patient asymptomatic for COVID-19, who tested negative at admission, subsequently turning out to be RT-PCR positive for COVID-19, following surgery, teaches us important lessons about this disease.

Firstly, the incubation period varies. The mean and median incubation period has been reported to be a maximum 8 days and 12 days, respectively [3]. In this case, symptoms suggestive of COVID-19 infection appeared on post-operative days 4 and 5 which led to a repeat RT-PCR test for COVID-19.

Secondly, the RT-PCR test for COVID-19 may not always yield correct results [4]. Even within 4 days of onset of symptoms, some patients may have negative test results.

Again, asymptomatic patients may not always test positive for COVID-19. Also, COVID-19 is notorious for mimicking post-cardiotomy characteristics like fever, dyspnea or a rise in TLC as was evident on post-operative day 4 in the case here. Early diagnosis, isolation and supportive management aided in early recovery.

Any of the above possibilities could hold true for the case in question. She may have been in the incubation

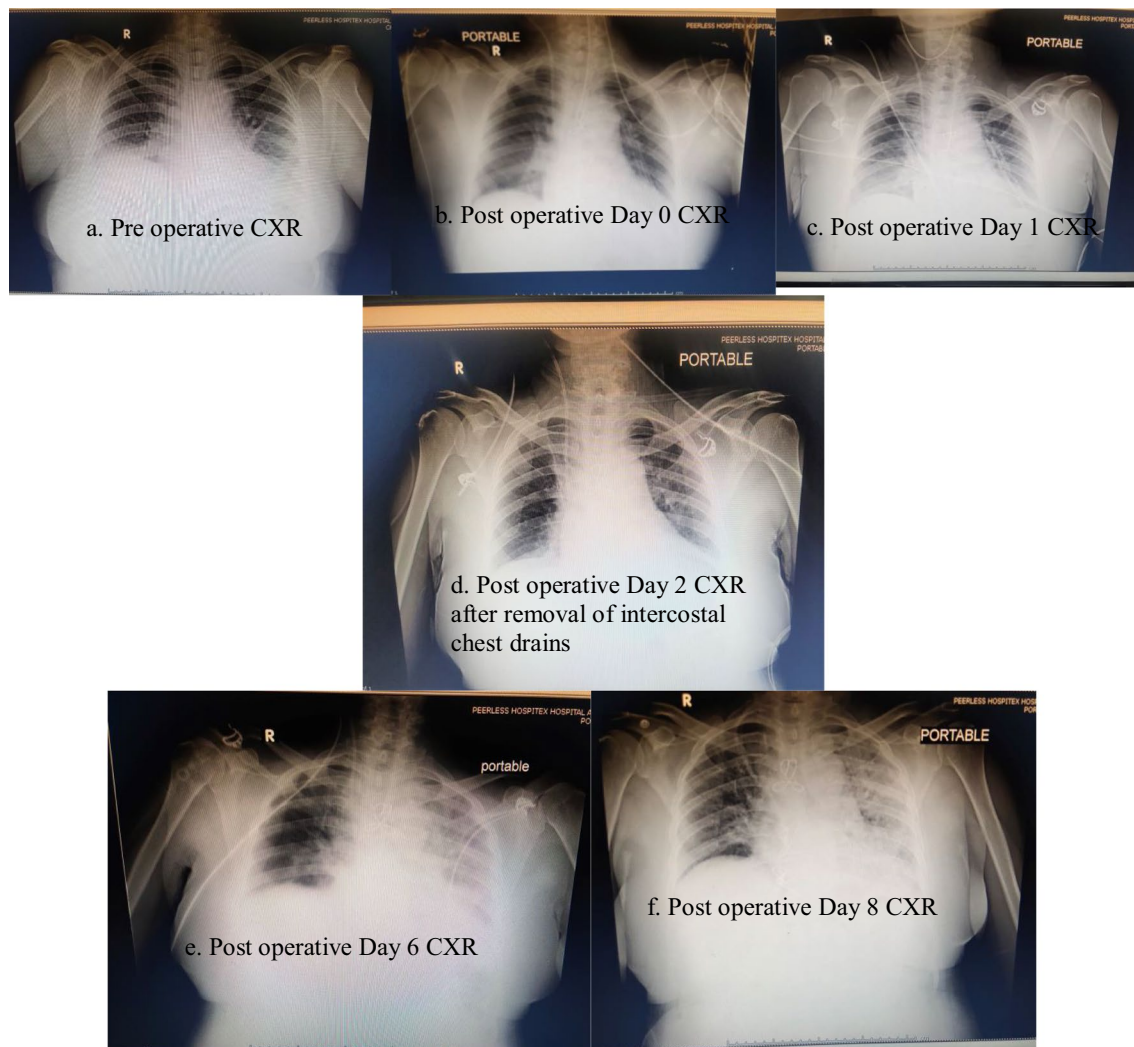


Fig. 1 a–f A collage of chest X-rays (CXR) of the patient during her hospital stay

period at admission, when she tested negative for COVID-19 on RT-PCR. Or, she was asymptomatic at admission and her initial RT-PCR test yielded an incorrect result. Thus, it was a case of COVID-19, diagnosed late, who underwent OPCAB, was discharged from hospital in two weeks' time and has been doing well at a follow-up period of eighteen months.

Similar cases of COVID-19 have been reported, who underwent coronary artery bypass grafting, but some perished to ARDS and shock [5], and no follow-up data has been reported for discharged patients [6].

The other reported cases have been done on pump, and cardiopulmonary bypass (CPB) is known to be associated with a systemic inflammatory response, increased red blood cell damage, qualitative and quantitative damage of platelets, raised catecholamine levels, complement

activation, protein denaturation, raised extracellular fluid volumes, neurological events like stroke and damaging effects on the heart, kidneys, liver, lungs, etc. Again, non-pulsatile flow, hypothermia, duration of CPB, hypoperfusion and gaseous/particulate microemboli contribute to end organ injury. This case, having been done electively, off-pump, might have helped improve outcome, thereby avoiding known CPB-related complications, which could have been aggravated with COVID-19.

Cardiovascular complications are common post-COVID-19 infection [7]. Patients with acute coronary syndrome, who are infected with COVID-19, often have a poor prognosis. The case in question had recent inferior wall myocardial infarction. Also, COVID-19 infection has known long-term sequelae [8] like fatigue, anxiety, depression, cardio-respiratory complications,

Table 1 The classification of COVID-19 (mild, moderate and severe disease) and the institutional management protocol, which was followed, both in the case of the patient and her husband, as per the guidelines of the Government of West Bengal, India

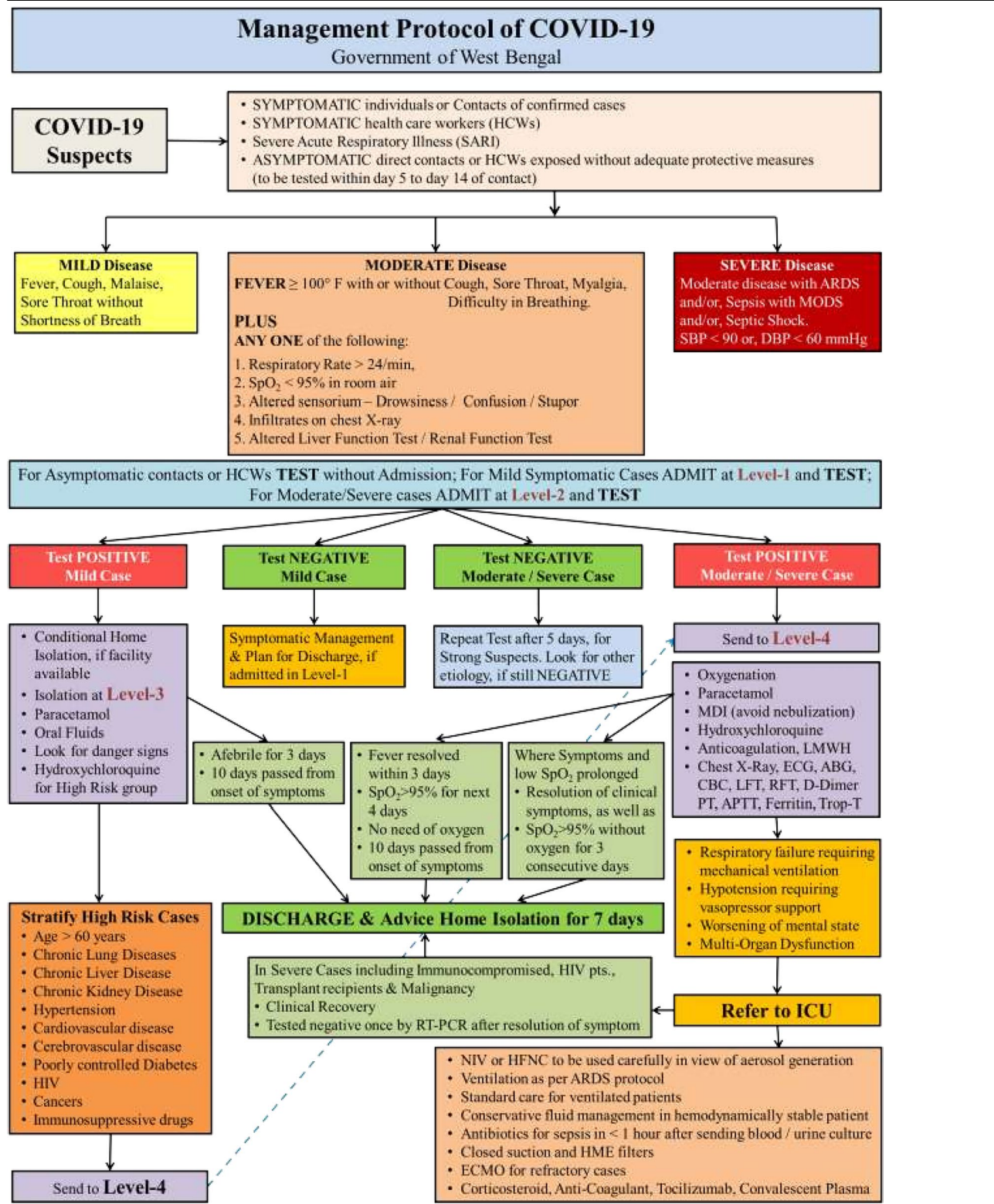


Table 1 (continued)

1.	Hydroxychloroquine. Dose : 400 mg BD on day one, then 400 mg OD x 4 days. Adverse Effects : Gastrointestinal, QT Prolongation in ECG. Contraindication : QTc >500 mSec, Myasthenia Gravis, Porphyria, Retinal Pathology, Epilepsy. Pregnancy is not a contraindication										
2.	Tocilizumab. May be considered in Moderate / Severe cases, if IL-6 is more than 5 times of the Upper Limit of Normal (ULN). Recommended first dose is 400 mg (4 - 8 mg/kg) in 100 ml NS, over >1 hour. For patients with poor initial efficacy, an additional 400 mg can be repeated after 12 hours. Maximum number of administration is two times, and maximum single dose is 800 mg. Not recommended in patients with active hepatic disease or hepatic impairment with baseline ALT or AST >1.5 times of ULN										
3.	Corticosteroids. Methylprednisolone 1- 2mg/kg/day or equivalent may be used for a short period of time of 3 to 5 days in patients with progressive worsening of oxygenation indicators, imaging and excessive activation of body's inflammatory response.										
4.	Anti-Coagulation. Low Molecular Weight Heparin e.g. Enoxaparin 1mg/kg/day, SC, in moderate to severe patients with increased D-dimer level, P-time, APTT, or with features of DIC or Hypercoagulability, or in patients requiring DVT prophylaxis.										
5.	Convalescent Plasma Transfusion. May be considered in Moderate / Severe cases, if there is progressive worsening of condition										
<p>Mandatory Monitoring:</p> <ul style="list-style-type: none"> • Body temperature at regular interval • Pulse oximetry monitoring for SpO₂ • Vital Signs <p>Tests Required:</p> <ul style="list-style-type: none"> • CBC, Urea, Creatinine, LFT, Sugar, Na⁺, K⁺, Pulse Oximetry, ABG • ECG at presentation. If initial QTc>450 mSecs, try to avoid quinolones/macrolides in them or monitor QTc closely • Chest X Ray at presentation and then as needed • Serum Ferritin, LDH, CRP, Trop-T, Lactate for assessment of prognosis in moderate to severe patients • D-Dimer, P-Time, APTT, Platelet to assess the need for Anti-coagulants in moderate to severe patients • Blood Culture, Urine Culture, Procalcitonin to assess the need for Antibiotics in moderate to severe patients <p>Discharge Criteria:</p> <ul style="list-style-type: none"> • Mild/ Very Mild/ Pre-symptomatic cases can be discharged after 10 days of symptom onset and no fever for 3 days • Moderate cases whose symptoms resolve within 3 days and maintains SpO₂ above 95% for next 4 days can be discharged after 10 days of symptom onset if there is Absence of fever without Paracetamol, Resolution of breathlessness and No oxygen requirement • Moderate to severe cases whose fever does not resolve within 3 days and demand of oxygen therapy continues can be discharged only after Resolution of clinical symptoms and ability to maintain oxygen saturation above 95% for 3 consecutive days • Severe Cases (including Immunocompromised patients, HIV patients, Transplant recipients and Malignancy) can be discharged only after Clinical recovery and the patient's swab test becomes negative once by RT-PCR after resolution of symptoms <p>Follow Up:</p> <ul style="list-style-type: none"> • Home isolation for further 7 days after discharge • Follow up after 2 weeks and 4 weeks, or as required in between 											
<p>Chemoprophylaxis : Hydroxychloroquine Recommended for Chemoprophylaxis of COVID-19 (Dose as per ICMR Guidelines)</p>											
<ol style="list-style-type: none"> 1. For Asymptomatic HCWs in the treatment of suspect and confirmed patients : Dose is 400 mg BDPC on day 1, followed by 400 mg once weekly for 7 weeks 2. For Asymptomatic household contacts of laboratory confirmed cases : Dose is 400 mg BDPC on day 1, followed by 400 mg once weekly for 3 weeks 											
<p>Contraindications: Children below 15 years, known case of Retinopathy and History of Hypersensitivity to Hydroxychloroquine</p> <p>Key Considerations:</p> <ol style="list-style-type: none"> 1. Drug to be used only under prescription of a Registered Medical Practitioner 2. Consult doctor in cases of drug reaction 3. All asymptomatic contacts should remain in home isolation. 4. Asymptomatic individuals showing symptoms should immediately seek medical advice 											
<table border="1"> <thead> <tr> <th>Status of the Patient</th> <th>COVID Hospital Levels</th> </tr> </thead> <tbody> <tr> <td>Suspected Mild Case, Not Yet Tested</td> <td>Level 1</td> </tr> <tr> <td>Suspected Moderate / Severe Case (SARI), Not Yet Tested</td> <td>Level 2</td> </tr> <tr> <td>Test Confirmed Mild Case</td> <td>Level 3</td> </tr> <tr> <td>Test Confirmed Moderate / Severe Case And Test Confirmed Mild Case with High Risk</td> <td>Level 4</td> </tr> </tbody> </table>		Status of the Patient	COVID Hospital Levels	Suspected Mild Case, Not Yet Tested	Level 1	Suspected Moderate / Severe Case (SARI), Not Yet Tested	Level 2	Test Confirmed Mild Case	Level 3	Test Confirmed Moderate / Severe Case And Test Confirmed Mild Case with High Risk	Level 4
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<p>According to severity Level 1 and 2 are for COVID Suspects</p> <p>According to severity Level 3 and 4 are for COVID Cases</p> <p>Positive Cases and Not-yet-Tested Suspects Must Not Be Kept in the Same COVID Hospital Building</p>											

Note: Hydroxychloroquine was initially a part of the proposed management protocol in 2020, which was subsequently taken down in 2021. Neither the patient, nor her husband received Hydroxychloroquine as a part of their management in hospital and in home isolation, respectively



Fig. 2 Her chest X-ray (CXR) at a follow-up period of 6 months

venous thromboembolism and even postural orthostatic tachycardia syndrome. Therefore, adequate follow-up is necessary. Rescigno et al. [9], in their case report of a similar patient, suggest concern about adverse outcomes, in patients undergoing cardiac surgery, who might be infected with COVID-19 and underline the importance of additional investigations and experience. Ours has been an attempt in this regard to bridge this gap.

Conclusions

Cases of COVID-19 presenting after elective cardiac surgery are rare. Most of those reported in the literature have had a high morbidity and mortality rate. Preferentially dealing with such cases off-pump, thereby avoiding CPB related complications, may help improve outcomes. A strong clinical suspicion and repeat testing for COVID-19 is required, as the diagnosis may often be missed with COVID-19 mimicking the signs and symptoms of post-cardiotomy syndrome. Isolation and early supportive management with moist oxygen, steroids, intravenous antibiotics, zinc and vitamin C are beneficial. Here, although we describe this case as COVID-19 presenting post-operatively after an elective OPCAB, a thorough evaluation indicates that the patient was either in the incubation period, when she was tested at admission, or she may have been infected with COVID-19 at admission, but was asymptomatic at that stage, and was false negative on RT-PCR. Thus, she actually may have contracted the virus pre-operatively. She presented late, and with her signs and symptoms mimicking post-cardiotomy syndrome, she was diagnosed only on day 6 following OPCAB, when she underwent a repeat RT-PCR for COVID-19. Subsequent contact tracing showed that her husband was also suffering from mild COVID-19, and he was managed through Tele-consultation. Thus, the case in question

was actually a case of COVID-19, who underwent OPCAB. The patient has been followed up, both by the cardiac surgical team and the COVID-19 team of physicians, and has been doing well at a follow-up period of eighteen months. Adequate follow-up is required in all such cases as cardiovascular complications are common, alongside known long-term sequelae, like anxiety, depression, cardio-respiratory complications, venous thromboembolism and even postural orthostatic tachycardia syndrome.

Abbreviations

ARDS: Acute Respiratory Distress Syndrome; BMI: Body Mass Index; COVID-19: Coronavirus Disease 2019; CPB: Cardio Pulmonary Bypass; CRP: C-Reactive Protein; CT: Computed Tomography; IL-6: Interleukin-6; ITU: Intensive Therapy Unit; OPCAB: Off-Pump Coronary Artery Bypass surgery; RSVG: Reversed Saphenous Vein Graft; RT-PCR: Reverse Transcriptase Polymerase Chain Reaction; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2; TLC: Total Leukocyte Count.

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Author contributions

AB conceptualized and designed the study. SB collected the data, analysed the data and was the major contributor in writing the manuscript. SB, AB, SP, SD and AKD were actively involved in drafting the manuscript. AB critically reviewed and edited the manuscript. All authors read and approved the final version of the manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The case was approved by the institutional ethical committee, namely the Clinical Research Ethics Committee, for publication (Reference number: PHH&RCL-CREC/S03/2021). All procedures involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Written, informed consent was obtained from the patient for the procedure and further management.

Consent for publication

Written, informed consent was obtained from the patient for the use of clinical data and images relevant to this case, for publication.

Competing interests

The authors declare that they have no competing interests.

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