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CASE REPORT

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COVID-19 infection in left ventricular assist device patients

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Abstract

We describe two cases of favorable and unexpected recovery in positive patients with coronavirus disease 2019, suffering from multiorgan comorbidity and already assisted with the left ventricular assist device. We have observed that, although in the presence of more comorbidities, when the maintenance of a valid support of the cardiovascular function is guaranteed, the possibility of successfully overcoming the severe acute respiratory syndrome coronavirus 2 infection is still alive.

KEYWORDS

cardiovascular pathology, cardiovascular research

1 | INTRODUCTION

Coronavirus pandemic is a serious public-health issue.[1,2] Many patients present mild symptoms like fever, cough, pharyngodynia, and fatigue, the minority of them (14%) develop more severe symptoms.[1-3]

Even though it has been suggested that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) can cause cardiac involvement, particularly in patients with underlying risk factors and diseases, data is still scarce and controversial.[1-3] As far as left ventricular assist device (LVAD) is concerned, no reports have been published.

We describe two positive coronavirus disease 2019 (COVID-19) patients, affected by multiorgan comorbidities and assisted with LVAD, who favorably resolved.

2 | CASE REPORT

2.1 | Patient 1

On March 2020, a 61-year-old patient was admitted to our department because of acute right heart failure, 2-month after LVAD (HeartMate III) implantation for primary dilated cardiomyopathy. He was also affected by obesity with body mass index of 36 kg/mq, type 2 diabetes, chronic obstructive pulmonary disease, chronic kidney disease (CKD), atrial flutter, moderate to severe mitral regurgitation. A cardiac resynchronization therapy defibrillator had been implanted 6 years before.

Clinical examination at admission revealed peripheral edema, severe dyspnea and increased weight (>10 kg compared with previous discharge). He was apyretic, hemodynamically stable with an oxygen saturation of 98%. Patient's chest X-ray is shown Figure 1, with evidence of left pleural effusion. Transthoracic echocardiogram concluded for right ventricular dysfunction and pulmonary hypertension. The LVAD was functioning well. Infusion of dobutamine, levosimendan and furosemide was immediately started.

The day after the admission, a nasopharyngeal swab was positive for SARS-CoV-2. Thus he was transferred to a dedicated COVID-19 ward.

During the following days his hemodynamic condition gradually improved, with a weight loss of 10 kg. Dobutamine was progressively reduced and discontinued. We report a unique episode of fever during the second day after admission, which was treated with paracetamol. The patient did not develop pneumoniae and, after 8 days, since clinical conditions, blood and radiological tests improved, he was discharged.

At clinical follow up two and half months later he was hemodynamically stable, without signs of right heart failure. At follow-up the swab test for SARS-CoV-2 was negative.

2.2 | Patient 2

A 72 years old man, affected by post-ischemic dilated cardiomyopathy and supported with Jarvik 2000 LVAD since 2016, was admitted to our hospital for exit-site infection of the LVAD cable. He presented also

Antonio Piperata and Tomaso Bottio contributed equally to this work.

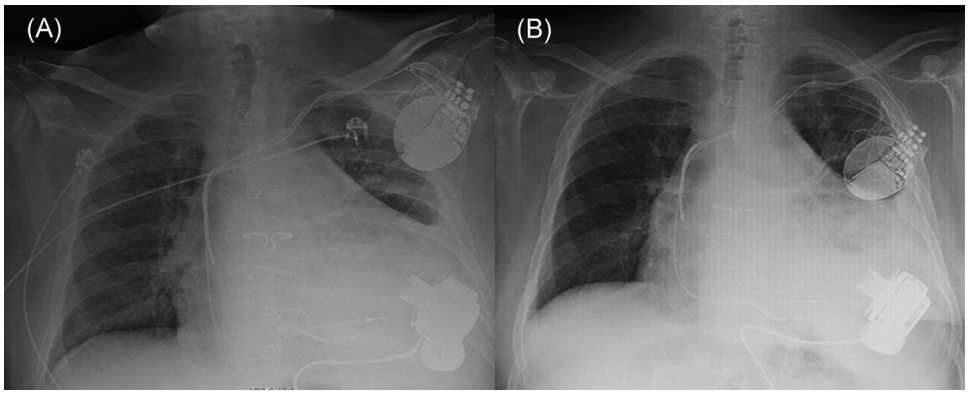

FIGURE 1 Posteroanterior chest radiographies of patient 1 with HeartMate 3. Chest X-ray of patient 1 at the (A) admission and (B) discharge

several comorbidities, such as type 2 diabetes, CKD, atrial fibrillation, dyslipidemia, and a history of endocarditis and two cerebral ischemic strokes. Ten days before the admission he reported an episode of fever, treated at home with paracetamol. During the hospitalization, his roommate suddenly developed an acute respiratory syndrome. He was tested for COVID 19, found positive and died after 2 days. For this reason, our patient underwent a nasopharyngeal swab resulting positive for SARS-CoV-2.

The exit-site infection was successfully treated with antibiotics (levofloxacin) and no other problems related to the device were found. He did not develop any pulmonary symptoms or computed tomography-scan signs of pneumonia. Patient's chest X-ray is shown in Figure 2. He is still in hospital under monitoring.

3 | DISCUSSION

COVID-19 has rapidly spread from China all over the world due to its highly contagious nature. Symptoms mostly involve mild respiratory problems in the vast majority of COVID-19 patients, with complete recovery within a few weeks. However, about 14% of cases are severe and 5% are critical, with an estimated mortality ranging from 2.3% to 3.83%[1-3]

Few data is currently available regarding the incidence of late complications, viral persistence, or the prognoses in different categories of patients.[4] There are few and conflicting data focusing on cardiac involvement in COVID-19 patients.[5]

It is established that patients at highest risk of mortality are older and with additional comorbidities.[6,7]

For instance, as reported by Yang et al,[8] patients with cardiovascular diseases are vulnerable to complications of COVID-19, that can lead to death. These data have been confirmed by two reports published by Shi[6] and Guo[7] who highlighted that patients with diabetes and cardiovascular comorbidities tend to have more severe acute COVID-19 illness and higher short-term mortality rate.

On the other hand, the virus itself might cause cardiac injury, with different mechanisms. First, it has been suggested that the inflammatory response in patients with COVID-19 could provoke plaque erosion or rupture in patients with coronary atherosclerosis. Second, the respiratory disease, causing hypoxemia, might be a trigger for atrial fibrillation and other arrhythmias.[8]

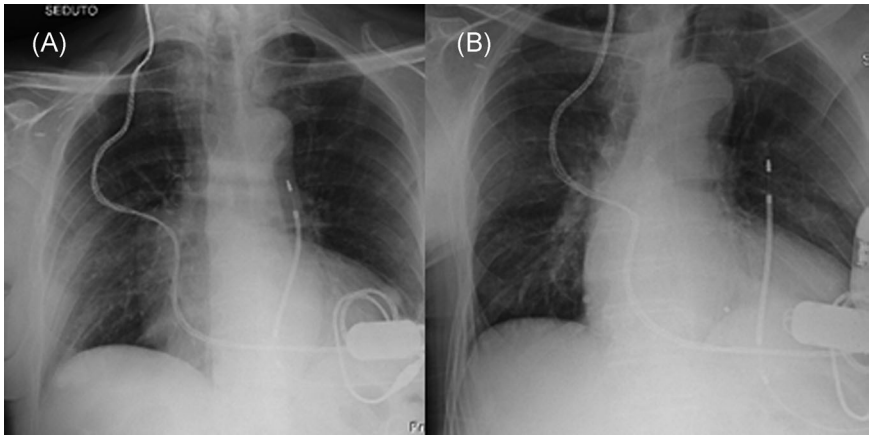

FIGURE 2 Posteroanterior chest radiographies of patient 2 with Jarvik 2000. Chest X-ray of patient 2 at the (A) admission and (B) discharge

To summarize, the virus is able to cause death through several mechanisms, among which the exacerbation of underlying cardiac disease could cause rapid worsening of patients' clinical conditions.[6,7]

According to the first hypothesis, it can be assumed that, in presence of low cardiac output, the virus pathogenicity is favored. In our two cases, no adverse events occurred, the hospital stay was uneventful (without multiorgan involvement) with hospital discharge in few days. Thus, although in the presence of more comorbidities, the maintenance of a valid support of the cardiovascular function seems to play a role on overcoming the SARS-CoV-2 infection.

Fried et al[9] described the case of a COVID. 19 patient with acute respiratory distress syndrome, who was initially supported with veno-venous extracorporeal membrane oxygenation (ECMO), then upgraded to veno-arterial. The authors concluded that "the addition of an arterial conduit might provide the necessary circulatory support without inducing left ventricular (LV) distension."

This concept is even more emphasized in LVAD patients where LV unloading is more granted than with ECMO.

The second hypothesis deals with the protective role of anticoagulation. Preliminary data suggest that SARS-CoV-2 infection could be a precipitant factor for acute venous thrombo-embolism.[10] In this scenario, the compulsory anticoagulation needed in patients with LVAD can be a protective factor as well. Focusing on the anticoagulation strategy, we left unchanged our protocol which consists on oral anticoagulation with a target of 2.5 to 3.0 INR, adding only with HMIII and HVAD antiplatelets agents according to aggregometry profiles, and without with the Jarvik 2000 due to its intrinsic negative action on platelets count.[11]

In this case report, we would like to highlight the unpredictable behavior of SARS-CoV-2 infection. Up to now, the virus has been more aggressive in fragile individuals and our patients were at extremely high risk due to their multiple comorbidities. As far as the minimally invasive approach concerns, this type of approach has been widely used at our cardiac unit,[12-17] as well as in others centers.[18] The reduced invasiveness of these procedures showed better outcomes on so fragile patients, with shorter intensive care unit and Hospital stays, improved right ventricle function, and lower infections' susceptibility. In this particular pandemic context, a minimally invasive approach should be recommended in case of LVAD implantation.

We report that the presence of LVAD per se and the oral anticoagulation that VAD-required, might played a role in mitigating the cardiovascular complications of COVID. 19.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ETHICS STATEMENT

It is declared that every reasonable effort was made to obtain informed consent to participate in this study. However it is noted that there is already mention of the use of data for scientific and research purposes in the current informed consent in use at their Center. The authors also guaranteed the respect of anonymity and professional secrecy and used the collected data and the statistical analysis just for the scientific purposes granted in accordance with the law in force (GDPR).

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