Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

0003-4975/$36.00 e267
https://doi.org/10.1016/j.athoracsur.2021.07.003

Heart Transplantation Complicated by COVID-19 Infection

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The influence of Coronavirus-2019 (COVID-19) on heart transplantation is considerable. Reports of COVID-19 infection in recently transplanted patients are scarce. We present a 60-year-old male patient with COVID-19 infection, diagnosed 6 days after transplantation. His clinical course revealed 2 phases. Initially, there were mild respiratory symptoms for which he was treated with remdesivir and noninvasive respiratory support. In a second phase with clinical deterioration on postoperative day 22, further respiratory decline led to the administration of convalescent plasma, with satisfactory response and further improvement of his condition.

(Ann Thorac Surg 2022;113:e267-e269)

The Coronavirus-2019 (COVID-19) pandemic affected the field of heart transplantation tremendously.[1] Over the last year, a significant decrease in organ procurement has been observed, with subsequent reduction of transplanted patients,[2] mainly due to limited resources and uncertainty regarding possible effects of COVID-19 infection on a recipient receiving immunosuppressive therapy. Data discussing infection in the heart transplant cohort have become available,[3] indicating a mortality twice as high as in the normal population. Reports of infection in the immediate posttransplant period however, are still scarce.[4]

A 60-year-old male patient with lamin A/C gene mutation causing atrioventricular conduction pathology with subsequent tachy-arrhythmia evolved towards terminal heart failure and was listed for heart transplantation. A suitable donor was found, COVID-19 screening through polymerase chain reaction for both donor and recipient was negative. An uneventful orthotopic heart transplantation (HTX) was performed, with a total ischemia time of 147 minutes. Postoperative echocardiography revealed a good biventricular function, with a trace of mitral and tricuspid valve regurgitation, and a pulmonary pressure of 25 mm Hg. According to institutional protocol, mycophenolate mofetil (1 g) and methylprednisolone (250 mg after induction and 250 mg during reperfusion) was administered intraoperatively. On the intensive care unit, antithymocyte globulin was started 12 hours after surgery (2-3 mg/kg) together with mycophenolate mofetil (1 g/12 h). Methylprednisolone was continued 8 hours after induction (125 mg/8 h). Because of renal insufficiency, initiation of tacrolimus was delayed. The patient was extubated on the second postoperative day (POD), and received 3 L/min oxygen with nasal cannula. One day later, kidney function improved and tacrolimus was started. On POD 6, there was a rise in body temperature to 37.8°C. *Escherichia coli* and *Klebsiella pneumoniae* was cultured from the mouth swab and antibiotics (amoxicillin with clavulanic acid) were started. A new COVID-19 test was positive. Respiratory deterioration with tachypnea was treated with noninvasive positive pressure ventilation (NIPPV). Serial biochemical analysis is shown in Figure 1. Additionally, remdesivir was given for 10 days. Because of thrombopenia, antithymocyte globulin was stopped. On POD 11, 5 days after COVID-19 diagnosis, NIPPV could be stopped. On POD 13, the patient was discharged from the intensive care unit and sent to a step-down respiratory unit for COVID-19 patients. His clinical condition improved further. However, on POD 22, 16 days after the COVID-19 diagnosis, we observed a new respiratory deterioration, with lower saturation levels and the need for NIPPV. Subsequent chest computed tomography showed bilateral ground glass opacification with multilobar involvement (Figure 2). The computed tomography severity score index was 10 out of 25.[5] A new polymerase chain reaction test remained positive, no immunoglobulin G antibodies were found. Therefore, remdesivir was readministered. His clinical condition did not show improvement, however, with ongoing need for noninvasive ventilation. Five days later, after careful deliberation within the team, convalescent plasma was given. The evolution was favorable and 2 weeks later, the patient could be discharged to a medical rehabilitation unit. Six months after HTX, the patient shows a satisfactory clinical condition, with a normal biventricular function and increasing respiratory capacity, enabling resumption of work.

COMMENT

Reports on clinical outcomes of HTX patients with COVID-19 infection are limited,[4,6] especially for infection during the immediate postoperative period. In a German study following 21 HTX patients with COVID-19, 8 of them (38%) developed severe respiratory failure

Accepted for publication Jul 11, 2021.
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Ann Thorac Surg
2022;113:e267-e269

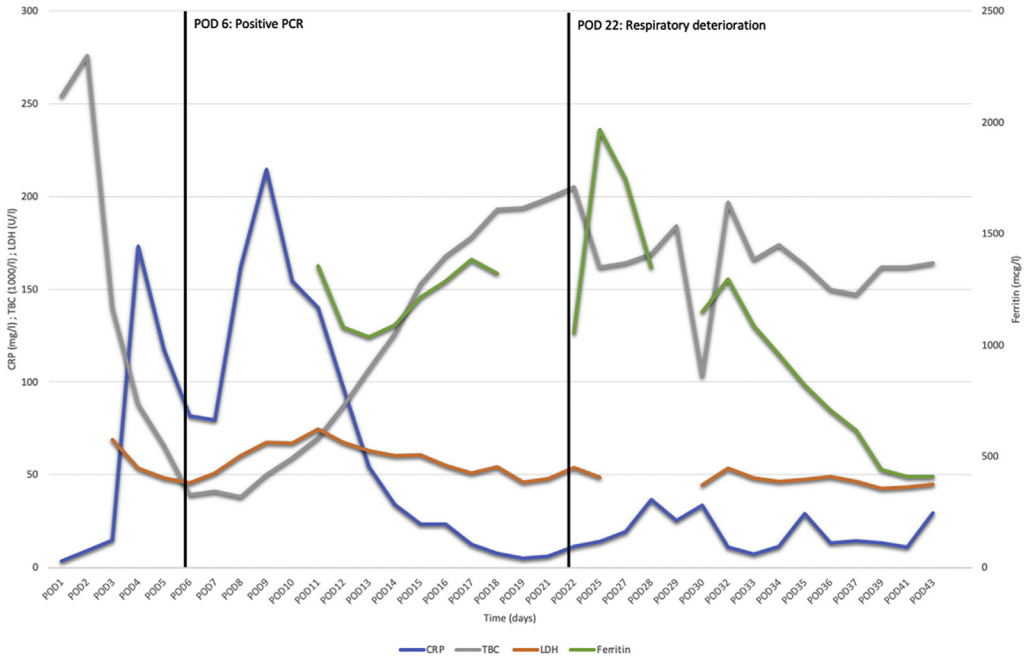

FIGURE 1 Biochemical analysis. (CRP, C-reactive protein; LDH, lactate dehydrogenase; mcg, microgram; PCR, polymerase chain reaction; POD, postoperative day; TBC, thrombocytes; U, units.)

requiring mechanical ventilation. Three patients needed extracorporeal membrane oxygenation.[7] The majority of patients were long-term transplants. A unique report of 2 patients with COVID-19 infection in the immediate postoperative period was recently published,[4] illustrating severe clinical burden, finally leading to loss of life in both patients.

The clinical course of our patient revealed 2 distinct phases. Infection was confirmed on POD 6, with low-grade fever and moderate respiratory symptoms. Improvement was seen with NIPPV and remdesivir. A second, clinically more serious phase was seen on POD 22, with multilobar involvement on computed tomography (Figure 3). After 5 days of remdesivir without clinical improvement, it was decided to administer convalescent plasma. The evidence for efficacy of convalescent plasma was low, but a recent study confirmed reduction of disease progression in older

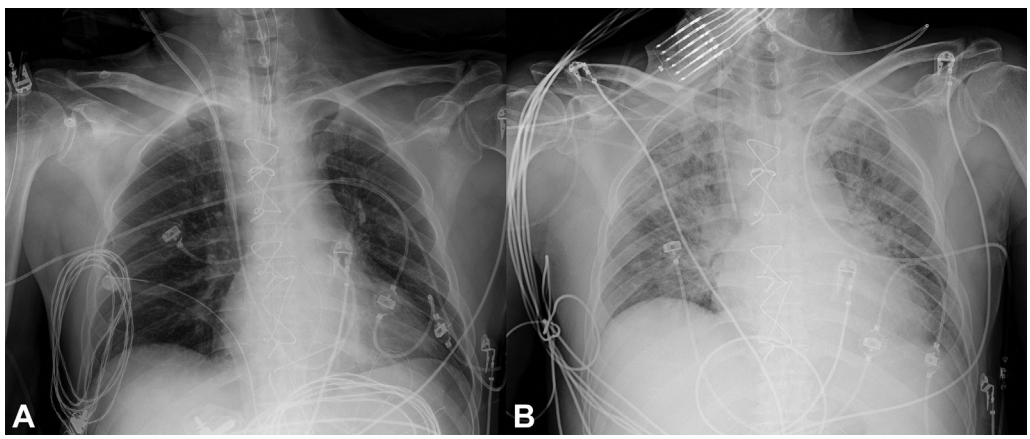

FIGURE 2 Chest roentgenogram on (A) postoperative day 1 and (B) postoperative day 7.

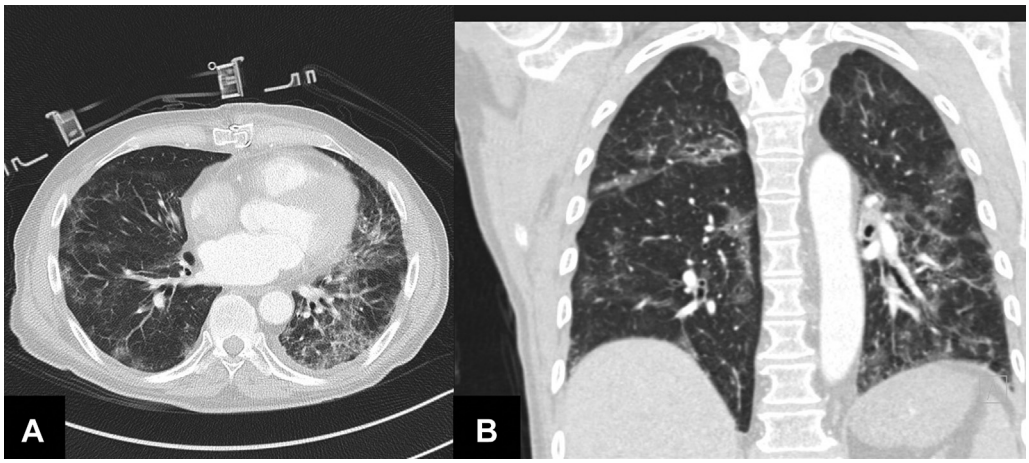

FIGURE 3 Chest computed tomography (postoperative day 22) revealing bilateral ground glass opacity. (A) Transverse plane. (B) Coronal plane.

patients.[8] Our report suggests possible benefit of this strategy in immunocompromised HTX patients. This patient did not need invasive mechanical ventilation and showed a full recovery.

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