Deceased Donor Liver Transplantation from a SARS-CoV-2–Positive Donor to a SARS-CoV-2–Positive Recipient

TO THE EDITOR:

Liver grafts from deceased donors with active severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection carry an unknown risk of transmission. Recently, the Organ Procurement and Transplantation Network (OPTN) Ad Hoc Disease Transmission Advisory Committee (DTAC) summary stated that the decision to recover organs from donors with active coronavirus disease 2019 (COVID-19) should consider the recipient's risk of mortality by delaying the transplantation while waiting for a suitable donor and the potential risk of donor-derived SARS-CoV-2.[1] With the high likelihood of persistent community transmission, many deceased donor livers from SARS-CoV-2–infected donors will not be transplanted.[2] While the precise rate of discarded organs due to COVID-19 is not available, there was a 1.7% excess rate of discarded organs during the first 3 months of 2020 compared with the rest of the year.[3] As of now, SARS-CoV-2 donor–derived transmission has not been reported outside of lung transplantation.[3] Here, we present a case of successful transplantation of a liver from a SARS-CoV-2–positive deceased donor to a SARS-CoV-2–positive recipient.

A 48-year-old male with end-stage alcoholic cirrhosis, complicated with coagulopathy, hepatic encephalopathy, diuretic refractory ascites, esophageal varices, and hypervolemic hyponatremia, was found to have SARS-CoV-2 by polymerase chain reaction (PCR) on nasopharyngeal swab (cycling threshold: 26). Upon detection of SARS-CoV-2, he was made inactive. Ten days later, his condition deteriorated with worsening encephalopathy and coagulopathy with spontaneous bleeding. His Model for End-Stage Liver Disease score was 35. He had asymptomatic COVID-19, and his chest computed tomography was unremarkable. He did not require any SARS-CoV-2 therapy, and SARS-CoV-2 antibody was positive. Because of his worsening medical condition, he was made active on the list. There were no suitable organ offers for more than 24 hours. After 24 hours, an organ offer was made. The transplant donor was a deceased 17-year-old male donor who had SARS-CoV-2 detected by PCR from nasopharyngeal swab (cycling threshold: 12). Computed tomography of the chest showed minimal ground glass opacities. The cause of death was anoxia from hanging. Given the rapid decline of our recipient's condition, the organ offer was accepted. On the day of transplantation, the recipient's SARS-CoV-2 PCR remained positive (cycling threshold: 31). Standard transplantation was performed with 4.5 hours of cold ischemia time and 17 minutes of warm ischemia time. Because of coagulopathy and generalized oozing, packing of the upper abdomen fascial closure was delayed to the next day. The recipient received induction therapy with methylprednisolone 500 mg intravenously daily for 3 doses, and maintenance therapy with mycophenolate mofetil 500 mg bid (twice daily [bis in die]) and tacrolimus with target trough levels of 8-10 ng/dL. On postoperative day 1, the fascia was closed and he was extubated. His liver function improved, and he was discharged on day 10. Blood samples from the donor and recipient and liver graft biopsies before and 1 day after transplantation were negative for SARS-CoV-2

Abbreviations: COVID-19, coronavirus disease 2019; DTAC, Disease Transmission Advisory Committee; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; OPTN, Organ Procurement and Transplantation Network; PCR, polymerase chain reaction; RT-PCR, reverse transcription polymerase chain reaction; RT-PCR, reverse transcription polymerase chain reaction.

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by reverse transcription polymerase chain reaction (RT-PCR). Two weeks after transplantation, his repeat SARS-CoV-2 PCR was negative. Four months later, he remains clinically well with good graft function.

The cycling threshold refers to the number of cycles required to exceed the established threshold to call a result positive.[4] Low cycling thresholds represent higher viral loads. Higher viral loads may be associated with increased disease severity and mortality.[5] While the cycling threshold of the donor suggested a high viral load, there is no evidence that this correlates with a higher risk of transmission through nonlung organ donations. Furthermore, cycling thresholds vary widely between different platforms; thus, rendering their interpretation challenging. For this reason, we decided to accept the offer despite a low cycling threshold.

To the best of our knowledge, this is the first intentional deceased donor liver transplantation in the United States from a SARS-CoV-2–positive donor into asymptomatic SARS-CoV-2–positive recipient. Recently, the Italian National Transplant Center established that the heart and liver from SARS-CoV-2–infected donors can be procured and transplanted, yet only in waitlisted patients who are SARS-CoV-2 positive, or with a previous history of COVID-19. The first case of living donor liver transplantation without knowledge of the donor's SARS-CoV-2–positive status was reported from South Korea in 2020.[6] Subsequently, 3 living donor liver transplantations with positive SARS-CoV-2 tests in donors as well as recipients were reported from India. All were at least 14 days from the time of diagnosis and were asymptomatic at the time of transplantation.[7] We recognize that there is a small risk of transmission of SARS-CoV-2 through extrapulmonary solid organ transplantation. SARS-CoV-2 enters human cells by engaging with the cell surface receptor protein, angiotensin-converting enzyme 2, which has ubiquitous distribution in vascular endothelium and bile ducts. SARS-CoV-2 RNA has been isolated from the postmortem liver tissue in patients who succumbed to severe COVID-19.[8] However, relative to other organs such as the kidney, its detection is less frequent in livers.[9] We felt that the possibility of the presence of SARS-CoV-2 in the liver from an asymptomatic donor should be extremely low, and perhaps without significant consequences in a recipient who has antibodies against SARS-CoV-2.

Several reports of liver transplantations in patients who have recently recovered from COVID-19 have been published. However, due to high mortality associated with end-stage liver disease, patients with decompensated liver failure may not have the option of waiting until the viral shedding has resolved as the PCR can remain positive for long periods. Prior studies have shown that prolonged viral shedding beyond 8-10 days is not associated with prolonged infectivity.[10] Hence, detection of SARS-CoV-2 by PCR following resolution of symptoms should not discourage the transplantation team from considering transplantation. Given our patient's rapid deterioration, we believed that this was his only opportunity to be transplanted and without it his chances of long-term survival were negligible.

Our case exemplifies that judicious use of extrapulmonary organs from SARS-CoV-2–positive donors for transplantation in recipients with active or recovered SARS-CoV-2 infection may be considered if a recipient candidate's risk of mortality or further complications by delaying transplantation is high. However, larger experience is needed to allow changes in practice or policy.

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