



ISHLT

A Society that Includes Basic Science, the Failing Heart, & Advanced Lung Disease

Deceased donor and recipient selection for cardiothoracic transplantation during the COVID-19 pandemic

Recommendations from the ISHLT COVID-19 Task Force

April 12, 2021

As the COVID-19 pandemic continues into its second year with ongoing high infection rates in many parts of the world, testing of transplant donors and candidates remains an imperative strategy to allow us to continue with life-saving transplant activities.

Recently, two cases of donor-derived transmission of SARS-CoV-2 via lung transplantation from deceased donors were reported.(1, 2) Both cases occurred in the setting of negative SARS-CoV-2 PCR from nasopharyngeal samples; however retrospective testing of stored bronchoalveolar lavage (BAL) fluid was positive by PCR for one case and an intra-operative BAL PCR was positive in the second case.(1) Both recipients developed severe COVID-19 leading to death in one. The transplanting surgeon was infected in one case where N-95 masks were not routinely worn. Notably kidney and liver recipients from the second donor did not develop SARS-CoV-2 infection. A third case of donor-derived infection has been reported to the Disease Transmission Advisory Committee in the US as well. Lastly, successful transplantation from donors with recent COVID-19 as well as recipients with recent COVID-19 has been described including in the setting of lung transplantation.(3-6)

Asymptomatic and pre-symptomatic viral shedding is well described with SARS-CoV-2 infection with high viral load early in the infection course when infection is most likely to be transmitted. (7, 8) Additionally, PCR testing detects the virus in the upper respiratory tract early in the infection, peaking in the first week of illness; lower respiratory tract may be more sensitive later in the infection.(9, 10) Prolonged viral shedding up to 5 weeks is noted in a minority of immunocompetent patients and up to 70-143 days in very immunocompromised hosts.(11-16)

We strongly recommend SARS-CoV-2 RNA testing of both donor and recipient prior to transplantation.(17) For patients with end-stage heart or lung disease waitlisted for transplant who contract COVID-19 and show prolonged viral shedding, we recommend a case-by-case approach to reactivation and transplantation. Considerations include complete resolution of symptoms related to COVID-19 and the acute need for organ transplantation, as noted in the table.

Multiple cases of lung transplantation (LT) for COVID-19 related acute respiratory distress syndrome have been described.(18-21) We believe that LT will be appropriate for a minority of patients with COVID-19. We recommend proceeding with listing for an otherwise healthy patient with COVID-19 related respiratory failure in carefully selected cases based on the severity and irreversibility of respiratory failure, at least 28 days since onset of severe lung injury, negative SARS-CoV-2 PCR tests separated at least 24-48 hours, with at least one of the PCRs from a deep respiratory specimen, presence of single organ failure related to COVID-19, nutritional status and rehabilitation potential of the patient, assuming other listing criteria based on local center policies are met.

Consensus Recommendations:

Pre-transplant testing for deceased donor:

1. We recommend pre-transplant COVID-19 symptom assessment. Donor currently suffering from a clinical syndrome compatible with COVID-19, regardless of known exposure within the past 10 days and negative PCR test results, should be avoided (unless alternative diagnosis is made).
2. We recommend testing for SARS-CoV-2 RNA by nasopharyngeal/ oropharyngeal swab, sputum/ tracheal aspirate, bronchial wash, or bronchoalveolar lavage (BAL) less than 72 hours before organ donation.
3. We strongly recommend a deep respiratory specimen (bronchial wash, BAL, mini-BAL, or tracheal aspirate) for SARS-CoV-2 RNA for all lung donors.
4. A thoracic CT scan may show signs of COVID-19 pneumonia even before development of symptoms or positive PCR and thus should be considered for donor assessment and possible risk of COVID-19 in donors and heart candidates.
5. Antigen test is not acceptable for donor evaluation.
6. COVID-19 vaccination status of the donor does not alter these recommendations

Pre-transplant testing for cardiothoracic candidate:

1. We recommend pre-transplant COVID-19 symptom assessment. Candidate currently suffering from a clinical syndrome compatible with COVID-19, regardless of known exposure within the past 10 days and negative PCR test results, should be deferred (unless alternative diagnosis is made).
2. We recommend PCR based test in the asymptomatic waitlisted candidate prior to transplant surgery and recommend deferring transplant on PCR+ waitlisted candidates except in specific circumstances as noted in Table 1.
3. We recommend testing for SARS-CoV-2 RNA by nasopharyngeal/ oropharyngeal swab, sputum/ tracheal aspirate, bronchial wash, or bronchoalveolar lavage (BAL).
4. COVID-19 vaccination status of the transplant candidate does not alter these recommendations.

Criteria for proceeding with cardiothoracic transplantation based on various COVID-19 related clinical scenarios:

WAITLISTED CANDIDATE – HEART/ LUNG	
Exposure to confirmed or suspected case of COVID-19 within past 10 days	<p>May be considered for transplant if: Asymptomatic AND >7 days since exposure AND One negative SARS-CoV-2 PCR test within 24 hours prior to transplant AND high risk of mortality without organ transplantation</p> <p>If above criteria not met, suggest avoiding cardiothoracic transplant within the 10-day incubation period.</p>
Previous symptomatic COVID-19	<p>Clinical resolution AND >21 days from onset of symptoms in an immunocompetent patient* AND one negative SARS-CoV-2 PCR test</p> <p>*time period may be shortened to >14 days in candidate with high risk of mortality without transplant if other criteria are met</p> <p>If SARS-CoV-2 PCR remains positive after resolution of illness and > 28 days from initial diagnosis, may be considered for transplant if high risk of waitlist mortality OR if serial cycle threshold (Ct) values obtained on the same platform is suggestive of non-viable virus</p>
Previous asymptomatic COVID-19 with positive SARS-CoV-2 PCR	<p>May be considered for transplant if: >14 days since diagnosis unless high risk of mortality without organ transplantation AND one negative SARS-CoV-2 PCR test within 72 hours of transplant</p> <p>If SARS-CoV-2 PCR remains positive and candidate remains asymptomatic > 28 days from initial diagnosis, may be considered for transplant if high risk of waitlist mortality OR if serial cycle threshold (Ct) values obtained on the same platform indicate non-viable virus</p>
DONOR – HEART	
Exposure to confirmed or suspected case of COVID-19 within past 10 days	<p>Organ may be considered for transplant if: Donor has been asymptomatic AND >7 days since exposure AND at least one negative SARS-CoV-2 PCR test within 24 hours prior to transplant AND</p>

	CT chest negative for pulmonary infection AND potential candidate with high risk of mortality without organ transplantation
Donor with prior confirmed COVID-19	<p>May be considered for transplant if: Clinical resolution of COVID-19 symptoms AND >21 days from onset of symptoms in an immunocompetent donor AND at least one negative SARS-CoV-2 PCR within 72 hours of procurement</p> <p>PCR+ donors may be considered on a case by case basis if other criteria are met and candidate is at high risk of waitlist mortality, and/ or candidate with recent resolved COVID-19 with positive serology.</p>
DONOR – LUNG	
Exposure to confirmed or suspected case of COVID-19 within past 10 days	Organ may be considered for transplant if: Donor has been asymptomatic AND >7 days since exposure AND at least one negative SARS-CoV-2 PCR test from a lower respiratory sample within 24 hours of transplant AND CT chest negative for pulmonary infection AND potential candidate with high risk of mortality without organ transplantation
Donor with prior confirmed COVID-19	<p>May be considered for transplant if: Clinical resolution of symptoms due to COVID-19 AND >21 days from onset of symptoms in an immunocompetent donor AND no significant pulmonary disease due to COVID-19 (for e.g. required intubation) AND at least one negative *SARS-CoV-2 PCR AND CT scan of the chest negative for evidence of pulmonary infection/chronic lung injury A lower respiratory sample for SARS-CoV-2 PCR is strongly recommended for all lung donors</p>
LUNG TRANSPLANT LISTING FOR COVID-19 RELATED RESPIRATORY FAILURE	
	<p>May consider lung transplant in carefully selected patients based on the following criteria: Severe lung injury has been present for > 28 days AND markers of irreversibility noted on imaging and ventilatory studies AND Single organ disease from SARS-CoV-2 AND</p>

	<p>Two negative SARS-CoV-2 PCR tests 24-48 hours apart with at least one deep respiratory specimen), AND otherwise considered to be a candidate based on the transplant center's local policies.</p> <p>In case of persistent viral shedding, recommend bilateral lung transplant only.</p>
--	---

References:

1. Kaul DR, Valesano AL, Petrie JG, et al.: Donor to recipient transmission of SARS-CoV-2 by lung transplantation despite negative donor upper respiratory tract testing. *Am J Transplant* 2021.
2. Kumar D, Humar A, Keshavjee S, Cypel M: A call to routinely test lower respiratory tract samples for SARS-CoV-2 in lung donors. *Am J Transplant* 2021.
3. Kulkarni AV, Parthasarathy K, Kumar P, et al.: Early liver transplantation after COVID-19 infection: The first report. *Am J Transplant* 2021.
4. Manzia TM, Gazia C, Lenci I, et al.: Liver transplantation performed in a SARS-CoV-2 positive hospitalized recipient using a SARS-CoV-2 infected donor. *Am J Transplant* 2021.
5. Ceulemans LJ, Van Slambrouck J, De Leyn P, et al.: Successful double-lung transplantation from a donor previously infected with SARS-CoV-2. *Lancet Respir Med* 2021;9:315-8.
6. Kute VB, Godara S, Guleria S, et al.: Is it Safe to Be Transplanted From Living Donors Who Recovered From COVID-19? Experience of 31 Kidney Transplants in a Multicenter Cohort Study From India. *Transplantation* 2021;105:842-50.
7. Kimball A, Hatfield KM, Arons M, et al.: Asymptomatic and Presymptomatic SARS-CoV-2 Infections in Residents of a Long-Term Care Skilled Nursing Facility - King County, Washington, March 2020. *MMWR Morb Mortal Wkly Rep* 2020;69:377-81.
8. Qian G, Yang N, Ma AHY, et al.: A COVID-19 Transmission within a family cluster by presymptomatic infectors in China. *Clin Infect Dis* 2020.
9. Sethuraman N, Jeremiah SS, Ryo A: Interpreting Diagnostic Tests for SARS-CoV-2. *JAMA* 2020;323:2249-51.
10. Cevik M, Tate M, Lloyd O, Maraolo AE, Schafers J, Ho A: SARS-CoV-2, SARS-CoV, and MERS-CoV viral load dynamics, duration of viral shedding, and infectiousness: a systematic review and meta-analysis. *Lancet Microbe* 2021;2:e13-e22.
11. Wolfel R, Corman VM, Guggemos W, et al.: Virological assessment of hospitalized patients with COVID-2019. *Nature* 2020.
12. Ai Tang Xiao MD, Yi Xin Tong, M.D, Ph.D, Sheng Zhang, M.D: Profile of RT-PCR for SARS-CoV-2: a preliminary study from 56 COVID-19 patients. *Clinical Infectious Diseases* 2020.
13. Avanzato VA, Matson MJ, Seifert SN, et al.: Case Study: Prolonged Infectious SARS-CoV-2 Shedding from an Asymptomatic Immunocompromised Individual with Cancer. *Cell* 2020;183:1901-12 e9.
14. Aydillo T, Gonzalez-Reiche AS, Aslam S, et al.: Shedding of Viable SARS-CoV-2 after Immunosuppressive Therapy for Cancer. *N Engl J Med* 2020;383:2586-8.
15. Choi B, Choudhary MC, Regan J, et al.: Persistence and Evolution of SARS-CoV-2 in an Immunocompromised Host. *N Engl J Med* 2020;383:2291-3.
16. Hensley MK, Bain WG, Jacobs J, et al.: Intractable COVID-19 and Prolonged SARS-CoV-2 Replication in a CAR-T-cell Therapy Recipient: A Case Study. *Clin Infect Dis* 2021.
17. Hanson KE CA, Arias CA, et al. : Infectious Diseases Society of America Guidelines on the Diagnosis of COVID-19: Molecular Diagnostic Testing. *Infectious Diseases Society of America* 2020; Version 2.0.0. Available at <https://www.idsociety.org/practice-guideline/covid-19-guideline-diagnostics/>. Accessed 4/12/21.
18. Bharat A, Querrey M, Markov NS, et al.: Lung transplantation for patients with severe COVID-19. *Sci Transl Med* 2020;12.
19. Han W, Zhu M, Chen J, et al.: Lung Transplantation for Elderly Patients With End-Stage COVID-19 Pneumonia. *Ann Surg* 2020;272:e33-e4.

20. Lang C, Jaksch P, Hoda MA, et al.: Lung transplantation for COVID-19-associated acute respiratory distress syndrome in a PCR-positive patient. *Lancet Respir Med* 2020;8:1057-60.
21. Machuca TN, Bharat A, Kurihara C, et al.: International Experience with Lung Transplantation for COVID-19 Associated Acute Respiratory Distress Syndrome. *The Journal of heart and lung transplantation : the official publication of the International Society for Heart Transplantation* 2021;40:S12-S.