

**LETTER TO THE EDITOR**

# Kidney transplantation in patients with prior coronavirus disease 2019 (COVID-19)

To the editor,

The coronavirus disease 2019 (COVID-19) pandemic led to a precipitous drop in the number of kidney transplants performed in 2020, due to the redistribution of healthcare resources to assist with managing the surge in critically ill patients, as well as concern for increased infection-related mortality with chronic immunosuppression.<sup>1,2</sup> While many transplant centers have subsequently resumed normal transplant activities, 2021 brings with it the new challenge of managing waitlist candidates with prior COVID-19 infections, which will disproportionately impact already marginalized communities.<sup>3</sup> Decisions regarding the timing of transplantation as well as immunosuppressant selection will be critical to restoring access to transplant while ensuring optimal patient and allograft outcomes.<sup>4</sup>

At our transplant center, which was part of the initial epicenter of the COVID-19 outbreak in the United States, we activate waitlist candidates for kidney transplantation if they are at least 4 weeks post-infection, have clinical resolution of symptoms, and have one negative SARS-CoV-2 nasopharyngeal PCR swab specimen. Patients with prolonged PCR positivity beyond 4 weeks may be considered on a case-by-case basis after consultation with an infectious disease specialist if viral shedding is thought to reflect the circulation of dead viral gene fragments. Higher cycle thresholds to viral RNA detection may be considered as a semi-quantitative measure of diminished viral replication and infectivity, as suggested by Gaston *et al.*<sup>5</sup> Donor allograft selection criteria remain unchanged, and standard doses of induction and maintenance immunosuppression, which includes antithymocyte globulin, tacrolimus, mycophenolate, and tapering corticosteroids, are administered at the time of transplantation. Each transplant candidate undergoes SARS-CoV-2 rapid PCR testing upon admission for transplant, and repeat PCR testing, as well as post-transplant allograft biopsies, are only performed for cause.

Between 4/1/2020 and 10/1/2020, we performed 81 isolated kidney transplants at our institution, all of which were SARS-CoV-2 PCR negative at the time of transplant, but included 13 (16%) patients with prior confirmed COVID-19. The majority of patients

(69%) had mild symptoms, while three patients required hospital admission and supplemental oxygen, and one patient was mechanically ventilated. At the time of transplantation, a median of 71 (56.6-135) days following initial COVID-19 diagnosis, all 10 patients tested had evidence of significant antibody titers > 1:80 to the SARS-CoV-2 spike-protein (3 patients did not undergo serological testing). Other baseline characteristics were similar between patients with prior COVID-19 and COVID-19 naïve controls (Table 1; categorical variables compared with Fisher's test of independence and continuous variables analyzed utilizing the Student's T test).

After a median follow-up of 3.6 months, patient and allograft survival were 92% in patients with prior COVID-19 and were not statistically different from COVID-19 negative patients (Table 1). One patient with previously mild COVID-19 and a functioning allograft died of a pulmonary embolism within one-month of transplant. However, no other thromboembolic events were observed in the COVID-19 patients, and the overall rate of venous thromboembolism was not different between COVID-19 positive and negative patients (7% vs. 4%;  $P = .61$ ). Hospital length of stay and readmission rate within 30 days were also similar between groups, but patients with previous COVID-19 did have a higher incidence of failed extubation post-transplant (15% vs. 1%;  $P = .02$ ). In all cases, the patients had required supplemental oxygen support during their initial COVID-19 infection. No cases of COVID-19 re-infection or biopsy-proven allograft rejection were observed among patients with prior COVID-19.

Based on our preliminary experience, transplanting selected patients with previous COVID-19 utilizing standard immunosuppression appears to be associated with similar short-term outcomes to COVID-19 naïve patients. We did observe a potential signal for an increased risk of perioperative respiratory complications, which may warrant additional monitoring, particularly in patients who required prior supplemental oxygen for COVID-19. Future studies in larger patient cohorts will be vital to provide ongoing guidance for transplant centers attempting to develop institutional protocols for managing these vulnerable patients.

**TABLE 1** Baseline characteristics and post-transplant outcomes among kidney transplant recipients with prior COVID-19

	COVID+ (n = 13)	COVID- (n = 68)	P-value
<b>Baseline Characteristics</b>			
Recipient Age, years	52.8 ± 13.0	53.6 ± 12.7	0.85
Gender			0.15
Male	11 (84.6%)	44 (64.7%)	
Female	2 (15.4%)	24 (35.3%)	
Recipient BMI, kg/m <sup>2</sup>	28.4 ± 6.3	25.6 ± 5.1	0.18
Ethnicity			
White/European	1 (7.7%)	19 (27.9%)	0.12
Black/African-American	4 (30.8%)	26 (38.2%)	0.62
Hispanic/Latino	7 (53.8%)	12 (17.6%)	<0.01
Asian/Pacific Islander	1 (7.7%)	11 (16.2%)	0.44
Etiology of ESKD			0.77
Hypertension	5 (38.5%)	22 (32.4%)	
Diabetes Mellitus	4 (30.8%)	14 (20.6%)	
Glomerulonephritis	3 (23.1%)	18 (26.5%)	
Polycystic Kidney Disease	0 (0.0%)	3 (4.4%)	
Other	1 (7.7%)	11 (16.2%)	
Median Duration of Dialysis, years	3 (1-10.5)	4.5 (1-8)	0.82
Prior Transplantation	2 (15.4%)	9 (13.2%)	0.83
Comorbidities			
Hypertension	13 (100.0%)	61 (89.7%)	0.23
Diabetes Mellitus	6 (46.2%)	23 (33.8%)	0.40
HIV	2 (15.4%)	10 (14.7%)	0.93
Donor Source			0.40
Living Donor	3 (23.1%)	24 (35.3%)	
Deceased Donor	10 (76.9%)	44 (64.7%)	
Median CIT, hours	14 (11.5-19)	11 (1-22)	0.42
Positive B-cell Crossmatch	0 (0.0%)	11 (16.2%)	0.12
<b>Post-Transplant Outcomes</b>			
Patient Survival <sup>a</sup>	12 (92.3%)	68 (100.0%)	0.16
Allograft Survival <sup>a</sup>	12 (92.3%)	67 (98.5%)	0.29
Serum Creatinine at 1-month	1.48 ± 0.44	1.49 ± 0.74	0.93
Urine Protein Dipstick > 100 mg/dL at 1-month	1 (7.7%)	3 (4.4%)	0.61
Surgical Complications			
Unplanned Re-operation	0 (0.0%)	3 (4.4%)	0.43
Failed Extubation in OR/PACU	2 (15.4%)	1 (1.5%)	0.02
Delayed Allograft Function	4 (30.8%)	15 (22.1%)	0.47
Median Index Hospital Length of Stay, days	5 (3.5-6.5)	4 (4-6)	0.74
Hospital Readmission within 30-days	3 (23.1%)	24 (35.3%)	0.39

<sup>a</sup>Median follow-up = 3.6 months

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#### CONFLICT OF INTEREST

None.


#### AUTHORS' CONTRIBUTION

1) Andrew Santeusano, PharmD, BCPS, Participated in research design, Involved with data collection, Author of the manuscript; 2) Arjun Bhansali, MD, Participated in research design, Assisted with editing manuscript; 3) Meenakshi Rana, MD, Participated in research design, Assisted with editing manuscript; 4) Susan Lerner, MD, Participated in research design, Assisted with editing manuscript;

5) Ron Shapiro, MD, Participated in research design, Assisted with editing manuscript.

#### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author (Andrew Santeusanio, PharmD; Andrew.Santeusanio@mountsinai.org). The data are not publicly available due to privacy or ethical restrictions.

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