Persistent Immunogenicity of the mRNA COVID-19 Vaccine in Patients Vaccinated Before Kidney Transplant

Stephanie G. Yi, MD, MPH,[1,2] Todd Eagar, PhD,[3] Linda Moore, PhD,[1] Howard J. Huang, MD,[2,4] Hassan Ibrahim, MD, MS,[2,5] Mark J. Hobeika, MD,[1,2] Robert McMillan, MD, MPH,[1,2] Hemangshu Podder, MD, PhD,[1,2] R. Mark Ghobrial, MD, PhD,[1,2] A. Osama Gaber, MD,[1,2] and Richard J. Knight, MD[1,2]

There is growing evidence that solid organ transplant recipients have a weak antibody response following administration of the mRNA coronavirus 19 (COVID-19) vaccine.[1-4] We previously showed that <50% of kidney transplant recipients (KTRs) mount an antibody response following 1 or 2 doses of either the Pfizer-BioNTech or Moderna mRNA-1273 vaccine when given after transplant compared with 100% of nonimmunosuppressed patients on the kidney transplant waitlist.[1] It is likely that the difference in antibody response between these 2 groups is due to the use of immunosuppression, such as T-cell–depleting therapy[1] or antimetabolites (ie, mycophenolate mofetil).[3] In this report, we sought to determine whether the immunogenicity of the mRNA COVID-19 vaccine in KTRs who received the vaccine before transplantation persisted posttransplantation.

In an IRB-approved retrospective study at the Houston Methodist Hospital J.C. Walter Jr Transplant Center, we identified 8 KTRs who received 2 doses of either the Pfizer-BioNTech or Moderna mRNA-1273 vaccine before transplantation. Patients received the specific vaccine type based on availability between January 2021 and March 2021. Vaccine antibody response was defined as the development of anti-severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) immunoglobulin (Ig) G, total antibody, or antispike IgG titer levels >1:50 postvaccination. Those with a positive COVID-19 polymerase chain reaction test or had anti-SARS-CoV-2 antibodies at the time of their first vaccine were excluded from this report. Anti-SARS-CoV-2 antibody testing used clinically validated assays and was performed in a Clinical Laboratory Improvement Amendments certified laboratory at Houston Methodist Hospital. Qualitative anti-SARS-CoV-2 Spike total Ig and Anti-SARS-CoV-2 IgG-specific assays (Ortho Clinical Diagnostics, Markham, ON) were performed on the VITROS 3600 automated immunoassay analyzer according to the manufacturer's protocol. A laboratory developed semiquantitative test to detect

TABLE 1.

Anti–SARS-CoV-2 antibodies before and after transplant in prevaccinated kidney transplant recipients

	Antibody response pretransplant (N = 8)	Antibody response posttransplant (N = 8)
Anti–SARS-CoV-2 total antibody, n (%)	8 (100)	8 (100)
Anti–SARS-CoV-2 IgG, n (%)	8 (100)	8 (100)
COVID-19 antispike antibody titer (n = 7), n (%)		
<1:50	0	0
1:50	1 (14.2)	1 (14.2)
1:150	2 (28.6)	2 (28.6)
1:450	2 (28.6)	3 (42.9)
≥1:1350	2 (28.6)	1 (28.6)
Age, median (IQR), y	48.5 (39.5–53)	
Time to transplant after second vaccine dose, median (IQR), d	25 (10–36.5)	
Time of posttransplant antibody surveillance, median (IQR), d	27 (17.5–41)	
Vaccine type, n (%)		
Pfizer-BioNTech	4 (50)	
Induction immunosuppression, n (%)		
Antithymocyte globulin	5 (62.5)	

COVID-19, coronavirus disease 2019; IgG, immunoglobulin G; IQR, interquartile range; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

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[1] Department of Surgery, Houston Methodist Hospital, Houston, TX.

[2] J.C. Walter Jr. Center for Transplantation, Houston Methodist Hospital, Houston, TX.

[3] Department of Pathology and Genomic Medicine, Houston Methodist Hospital, Houston, TX.

[4] Division of Pulmonology, Department of Internal Medicine, Houston Methodist Hospital, Houston, TX.

[5] Division of Nephrology, Department of Internal Medicine, Houston Methodist Hospital, Houston, TX.

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Correspondence: Stephanie G. Yi, MD, MPH, J.C. Walter Jr. Center for Transplantation, Department of Surgery, Houston Methodist Hospital, 6565 Fannin St., SM 1661, Houston, TX 77030. (sgyi@houstonmethodist.org).

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anti-SARS-CoV-2 Spike protein IgG-specific ELISA test was performed on a Tecan Freedom EVO instrument.

Of the 8 KTRs identified, 100% (n = 8) had pretransplant reactive anti-SARS-CoV-2 immunoglobulin IgG, total antibody, and antispike IgG titer levels >1:50 (range, 1:50–>1:1350) following 2 doses of the COVID-19 vaccine. All KTRs continued to have reactive antibodies with titers >1:50 following transplant. One patient did not have antispike IgG titers reported. The median time to transplant following the second vaccine dose was 25 d (interquartile range [IQR], 10–36.5). More than half of the patients (62.5%, n = 5) were induced with a T-cell–depleting agent (ie, antithymocyte globulin) at the time of transplant, and all patients were maintained on a calcineurin inhibitor, antimetabolite, and steroids following transplant. The median time of antibody surveillance following transplant was 27 d (IQR, 17.5–41). To date, none of these recipients have tested positive for COVID-19 postoperatively. These data are summarized in Table 1.

Based on these preliminary findings, KTRs will maintain an antibody response to the COVID-19 vaccine if vaccinated before transplantation. Maintenance of anti-SARS-CoV-2 immunity in the early posttransplant period is seen regardless of the induction therapy. This is in stark contrast to prior observations that KTRs who are vaccinated after transplant are unable to mount an antibody response. Although the half-life of immunoglobulins is estimated to be 30–60 d, longer follow-up is needed to support our findings that the humoral mechanism responsible for the persistence of vaccine-associated antibody response may not be affected by immunosuppression. Additionally, these findings emphasize the benefit of vaccination for patients before transplantation. Ongoing studies include continued antibody surveillance and further evaluation of vaccination outcomes in posttransplant patients.

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