Immune Response Post–SARS-CoV-2 mRNA Vaccination in Kidney Transplant Recipients Receiving Belatacept

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The prevalence of seroconversion postvaccination to severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is weaker in recipients of a solid-organ transplant compared with healthy individuals. The impact of different immunosuppressive therapies on SARS-CoV-2 mRNA vaccines in kidney transplant recipients (KTx) is still ill-defined.

We assessed the specific humoral immune response after SARS-CoV-2 mRNA vaccination in KTx receiving belatacept compared to KTx receiving tacrolimus.

Between February 2021 and April 2021, we included patients who had received consecutive KTx (at least 1-y posttransplantation) from our outpatient clinic and had received 2 doses of SARS-CoV-2 mRNA vaccine (BNT162b2 or Moderna COVID-19). Maintenance immunosuppression was based on either belatacept (every 4 wk) or tacrolimus, in addition to mycophenolic acid. At the time of the first vaccination, patients had a negative SARS-CoV-2 serology. For those receiving belatacept, the SARS-CoV-2 mRNA vaccination was performed at day 21 post–belatacept infusion (to reduce impact on immunogenicity). Blood samples were collected at the time of the first vaccination, 1 mo after the first, and the third vaccination. Humoral immune response was assessed using an enzyme immunoassay against the S1 domain of the SARS-CoV-2 spike protein (Wantai Biological Pharmacy Enterprise Co., Beijing, China).

Fifty-seven patients were recruited: mean age was 62 ± 13 y. Immunosuppression was belatacept for 41 patients (72%) and tacrolimus for 16 patients (28%). Eighteen (31.5%) patients were female. Mean time from kidney transplantation was 122 ± 81 mo in the belatacept group and 174 ± 346 mo in the tacrolimus groups ($P = 0.56$).

Overall, 21 patients (36%) had a positive immune response post–SARS-CoV-2 vaccination (after the third dose). Of these, after the second dose, 7 (17%) belatacept-treated patients and 9 (56%) tacrolimus-treated patients were tested positive for anti–SARS-CoV-2 antibodies ($P = 0.003$). After the third vaccination, 20 belatacept patients were assessed: 4 patients were positive (20%). Of these, 1 was positive after the second dose, and 3 were negative. Two positive patients after the second dose of vaccine have lost their immunity after the third dose.

The anti–SARS-CoV-2 antibody titer increased significantly with the number of vaccinations (Figure 1), that is, 1.1 ± 4.7 after the first, 2.2 ± 5.7 after the second, and 3.3 ± 8 after the third SARS-CoV-2 mRNA vaccination.

The immune response to SARS-CoV-2 vaccination is lower in KTx recipients compared with healthy populations.1 Herein, we confirm a low immune response (36%) after SARS-CoV-2 vaccination in KTx. In addition, KTx receiving belatacept had a significantly lower antibody response versus tacrolimus.

This trend was also found by Chavarot et al (2021), who reported an antibody positivity of 5.7% in KTx receiving belatacept.2 However, in that study, the SARS-CoV-2 vaccination was given at the same time as belatacept infusion, which possibly minimized vaccine immunogenicity. Ou et al (2021) reported on 609 KTx. Of these, 19 had received belatacept-based immunosuppression, but only 5% of these patients had anti–SARS-CoV-2 antibodies.3 In our study, all patients received a vaccination at 21 d after belatacept infusion. This may explain the improved response to vaccination (ie, 17%) after the second vaccination. The serological Wantai assay is correlated to virus-neutralizing antibodies and is one with the higher sensitivity, which means that our results are not underestimated.4,5

In conclusion, belatacept significantly reduced the immune response to SARS-CoV-2 mRNA vaccination;
however, delaying SARS-CoV-2 vaccination until 21 d after a belatacept infusion may improve immunogenicity.

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