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COVID-19 SPECIAL FORUM - LETTER TO THE EDITOR

Dynamics of humoral and cellular immunity elicited by the BNT162b2 mRNA vaccine in psoriatic patients under targeted immunosuppression: A longitudinal cohort study

Dear Editor,

Vaccines against SARS-CoV-2 have been an invaluable weapon to help combat the pandemic, and their use has been recommended by dermatologic societies even in patients under treatment with targeted immunosuppressors (TI)[1]; however, data regarding the effect of TI on the long-term immune response to the vaccines are still lacking.

A longitudinal cohort study was performed, involving a total of 105 SARS-CoV-2-naïve subjects (39 patients under TI and 66 controls, see Table 1).

We measured the immunogenicity the BNT162b2 vaccine (Pfizer-BioNTech) in terms of antibody titres (Trimeric S IgG and neutralizing antibodies, NA) and cell-mediated immunity (spike-specific IFN-γ-producing T cells) both before and after the first vaccination cycle and the booster dose of the vaccine. The antibody response was determined via quantitative characterization of anti-Spike IgG antibody at each time point by a chemiluminescent assay (Roche Elecsys Anti-SARS-CoV-2 S immunoassay at baseline, DiaSorin Liaison SARS-CoV-2 Trimeric S), according to the manufacturer's instructions. NA and T-cell immunity have been measured following the protocol described by Cassaniti et al.[2,3]

Continuous variables are described with the median and interquartile range and comparisons between groups are performed with the Mann–Whitney *U* test. Categorical data are described as counts and percent and compared with the Fisher exact test. A 2-sided *p*-value <0.05 was considered statistically significant. Positivity estimates are reported together with their 95% confidence intervals.

The data are summarized in Table 2.

All subjects in both groups showed evidence of seroconversion after the first vaccination cycle and there was no difference in the proportion of patients with positive titre of NA ($p = 0.138$). The TI group showed a lower titre of NA ($p < 0.005$) and spike-specific T-cell immunity, both in the proportion of responders ($p < 0.001$) and in the magnitude of the response ($p < 0.001$).

Both groups showed a significant decline in immunity across all measures in the months leading up to the booster dose. A significantly higher proportion of subjects in the TI group presented with a negative Trimeric S IgG assay ($p = 0.005$), NA titre ($p = 0.0014$) and no detectable T-cell response ($p < 0.001$).

The booster dose resulted in a robust humoral response in both groups, but the TI group still lagged in terms of T-cell immunity, both in the proportion of responders and in terms of magnitude of the response ($p = 0.005$). Notably, a subset of patients under TI (8/26, 30.8%) was unable to mount a detectable spike-specific T-cell response (Table 2).

TABLE 1 Demographic and clinical characteristics of the two cohorts.

	Controls ($n = 66$)	Psoriatic patients ($n = 39$)	*p*
Age	51.91 (SD 10.17)	55.54 (SD 11.13)	0.08
Sex			
Female	37 (56.1%)	11 (28.2%)	
Male	29 (43.9%)	28 (77.8%)	0.005
Comorbidities	n/a		
Hypertension		12 (30.8%)	
Diabetes		1 (2.6%)	
Cardiovascular		3 (7.7%)	
Cerebrovascular		0 (0%)	
Neoplastic		0 (0%)	
COPD		1 (2.6%)	
CKD		0 (0%)	
Obesity (BMI >30)		8 (20.5%)	
Dyslipidaemia		4 (10.3%)	
Class of immunomodulating agent			
Anti-TNFα	n/a		
Anti-IL17		16 (41%)	
Anti-IL12/23 or anti-IL23 (*n*, %)		14 (35.9%)	
		9 (23.1%)	
Duration of therapy at the time of vaccination (median, IQR)	n/a	48, 10–70	

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TABLE 2 Comparison of humoral and cellular immunity at the various time points of the study.

	Controls	Psoriatic patients	*p*
Trimeric IgG positivity rate, (*n*, %)			
T1	66/66 (100%)	39/39 (100%)	1
T2	62/65 (95.4%)	30/36 (83.3%)	0.05
T3	42/44 (95.4%)	24/26 (92.3%)	0.06
Trimeric IgG, BAU/ml (median, IQR)			
T1	2080 (1630–2080)	2080 (1555–2080)	0.95
T2	309 (170–658)	233 (87–612)	0.28
T3	2080 (2080–2080)	2080 (1730–2080)	0.06
NT Ab responders (*n*, %)			
T1	65/65 (100%)	37/39 (94.9%)	0.138
T2	47/58 (81%)	13/28 (46.4%)	0.001
T3	46/46 (100%)	21/21 (100%)	1
Titre of NT Ab (median, IQR)			
T1	1:320 (1:320–1:640)	1:160 (1:40–1:640)	0.005
T2	1:40 (1:20–1:80)	1:10 (1:10–1:40)	0.001
T3	1:640 (1:320–1:640)	1:640 (1:320–1:640)	0.15
Subjects with a positive T-cell spike response (*n*, %)			
T1	64/66 (97%)	23/33 (69.7%)	<0.001
T2	44/55 (80%)	11/28 (39.3%)	<0.001
T3	40/42 (95.2%)	18/26 (69.2%)	0.005
Average magnitude of T-cell response, SFC-IFN-γ-producing cell (median, IQR)			
T1	100 (60–170)	25 (10–70)	<0.001
T2	30 (15–65)	7.5 (5–20)	0.001
T3	105 (55–180)	22.5 (10–60)	<0.001

The data of this study confirm previous reports[4,5] that TI for psoriasis do not significantly influence the seroconversion rate after vaccination with the BNT162b2 vaccine, but we found evidence of a less intense T-cell response and a lower titre of NA which led to a higher proportion of patients under TI losing immunity before the booster dose.

The clinical significance of this diminished immune response has yet to be fully elucidated, but it is worthwhile to monitor these patients and the dynamics of their immune response to the vaccine to better inform them of the risks and benefits of SARS-CoV-2 vaccine booster doses.

We suggest that psoriatic patients under TI might need a tighter vaccination schedule to maintain competent immunity to SARS-CoV-2.

Limits of this study include the presence of a gender imbalance between the groups and the fact that and the control group included only patients without comorbidities.

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CONFLICT OF INTEREST

None to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

IRB APPROVAL STATUS

The study was approved by the Ethics Committee of Fondazione Policlinico San Matteo IRCCS Pavia (P-20210006076).

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