Supplementary Material

Methods

Measurements of IgG antibodies

IgG antibodies against the S1 domain of the spike protein of SARS-CoV-2 were tested by the CE version (April 2020) of the commercial ELISA from Euroimmun (Lübeck, Germany) using the EUROIMMUN Analyzer I platform and according to the manufacturers protocol. All analyses were done in duplicates. Optical density (OD) was determined at 450 nm with reference wavelength at 630 nm. A cut-off of ≥1.1 (OD 450 nm) was considered as positive.

Neutralization activity test

To assess neutralization activity of the antibodies, a CE-In Vitro Diagnostics (CE-IVD)-certified SARS-CoV-2 surrogate virus neutralization assay (cPASS, Medac,Wedel, Germany) was used. This assay measures the potential of antibodies to inhibit the binding of a labeled SARS-CoV-2 receptor-binding domain (RBD) to coated angiotensin-converting enzyme-2 (ACE2). A cut-off of 30% inhibition was considered as positive, according to the manufacture's protocol.

SARS-CoV-2 specific T-cell assessment

The detection of SARS-CoV-2 specific T-cells was conducted via a IFN- γ ELISpot Assay (T-SPOT.COVID, Oxford Immunotec). Isolation of peripheral blood mononuclear cells (PBMCs) was carried out via density gradient centrifugation. Leucosep™tubes (Greiner Bio One GmbH, Frickenhausen, Germany) were filled with 15ml Lymphoflot (Bio-Rad Laboratories GmbH, Feldkirchen, Germany) and centrifuged briefly to collect the fluid under the membrane. A maximum of 30ml citrate blood was transferred to the tube and filled up to 50ml with RPMI 1640 medium (Gibco, Carlsbad, California, United States) pre-warmed to 37°C. Cells were centrifuged at 760xg for 20min and the upper layer containing PBMCs was transferred to 50ml tubes and centrifuged at 610xg for 10min. The cell pellet was then washed with 30ml 37°C-warm RPMI 1640 medium at 610xg for 10min prior to re-suspension at a concentration of 2.5x106/ml in AIM-V medium (Gibco, Carlsbad, California, United States) pre-warmed to 37°C. 50µl of either AIM-V medium, Panel A, Panel B or Positive Control were added to the wells of the pre-coated multititer ELISpot plate (Oxford Immunotec). 100µl of the cell suspension was added to each well and carefully mixed by pipetting. After an incubation period at 37°C and 7% CO2 for 16-20h, the wells were washed four times with 200µl PBS (Gibco, Carlsbad, California, United States). The conjugate reagent was diluted 1:200 in PBS and 50µl of this dilution was added to each well. Following a 60min incubation period at 4°C, the wells were washed four times with 200µl PBS. 50µl substrate solution was added to each well and incubated for 7min. The plate was washed three times with H2O and then air-dried. The spots were

counted and analyzed using an ELISpot reader (AID, Strassberg, Germany). Results are reported as SFUs (Spot forming units) per 2.5x105 cells. According to the manufacturer's guidelines, a response was considered positive when the number of spots in the respective panel was ≥ 8 SFUs above the negative control. Samples with negative controls > 10 SFUs were considered invalid.

Supplementary Table 1.

Association between baseline T cell response and seroconversion in non-responding IMID patients

	SARS-CoV-2 T cell response before re-vaccination	**IgG seroconversion after re-vaccination**	
Non-RTX		Negative	Positive
	Negative (N)	2	10
	Positive (N)	2	8
RTX		Negative	Positive
	Negative (N)	6	4
	Positive (N)	20	2

Supplementary Table 2

Humoral and cellular response after homologous and heterologous re-vaccination

	Overall		**Homologous Re-vaccination**		**Heterologous Re-vaccination**	
	N=66		N=26		N=40	
	Before	After	Before	After	Before	After
Seroconversion (anti-Spike S1 IgG)						
Negative, N (%)	66 (100%)	33 (50.8%)	26 (100%)	15 (60.0%)	40 (100%)	18 (45.0%)
Positive, N (%)	0 (0%)	32 (49.2)	0 (0%)	10 (40.0%)	0 (0%)	22 (55.0%)
Neutralizing capacity						
Negative, N (%)	50 (89.3%)	31 (50.0%)	19 (95.0%)	15 (60.0%)	31 (86.1%)	16 (43.2%)
Positive, N (%)	6 (10.7%)	31 (50.0%)	1 (5.0%)	10 (40.0%)	5 (13.9%)	21 (56.8%)
Anti-Spike S1 IFN-Gamma						
Negative, N (%)	22 (40.7%)	16 (26.7%)	9 (47.4%)	8 (34.8%)	13 (37.1%)	8 (21.6%)
Positive, N (%)	32 (59.3%)	44 (73.3%)	10 (52.6%)	15 (65.2%)	22 (62.8%)	29 (78.4%)

Supplementary Table 3.

Safety of re-vaccination in non-responding IMID patients

	All	**Non-RTX**	**RTX**
N	66	33	33
Injection site pain, N (%)	15 (22.7)	8 (24.2)	7 (21.2)
Local reddening, N (%)	2 (3.0)	1 (3.0)	1 (3.0)
Local swelling, N (%)	1 (1.5)	0 (0.0)	1 (3.0)
Fatigue, N (%)	17 (25.8)	10 (30.3)	7 (21.2)
Headache, N (%)	7 (10.6)	4 (12.1)	3 (9.1)
Arthralgia, N (%)	3 (4.5)	3 (9.1)	0 (0.0)
Myalgia, N (%)	6 (9.1)	2 (6.1)	4 (12.1)
Chills, N (%)	3 (4.5)	2 (6.1)	1 (3.0)
Fever >38°C, N (%)	1 (1.5)	1 (3.0)	0 (0.0)
Nausea/vomiting, N (%)	0 (0.0)	0 (0.0)	0 (0.0)
Diarrhea, N (%)	0 (0.0)	0 (0.0)	0 (0.0)
Lymphadenopathy, N (%)	0 (0.0)	0 (0.0)	0 (0.0)
Neurologic, N (%)	0 (0.0)	0 (0.0)	0 (0.0)
Other side effects, N (%)	0 (0.0)	0 (0.0)	0 (0.0)