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Persistence of seroconversion at 6 months following primary immunisation in patients with immune-mediated inflammatory diseases

Patients with immune-mediated inflammatory diseases (IMIDs) may have impaired initial humoral responses after SARS-CoV-2 vaccination depending on the type of immunosuppression (ISP) used.¹ It is largely unknown how antibody titres develop over time and whether it is needed to adjust timing of booster campaigns for patients with IMID.

This is a study on long-term persistence of seroconversion after vaccination in patients with IMID on ISP, patients with IMID not on ISP and healthy controls. This study is part of an ongoing national prospective multicentre cohort study in the Netherlands

(Target-to-B! study; trial ID NL8900). Participants were included from 2 February 2021 and 1 October 2021. Participants with seroconversion (ie, >4 AU/mL) after primary immunisation with either BNT162b2 or CX-024414 in whom serum samples were collected 28 days after primary immunisation and before the first additional vaccination were included. Patients with IMID on 'strongly antibody-impairing immunosuppressants' (ie, anti-CD20 therapies, sphingosine 1-phosphate receptor (S1PR) modulators and mycophenolate mofetil (MMF)) were offered a first additional vaccination 3 months after primary immunisation; others after 5–6 months. Participants with a SARS-CoV-2 breakthrough infection were excluded; inclusion and exclusion criteria for the overall study are described elsewhere.¹ Clinical and serological data collection is described in the supplement. We measured anti-RBD IgG responses using ELISA.² Serum samples used for this analyses were collected prior to the first additional vaccination. For analysis, patients with IMID with 'strongly antibody-impairing immunosuppressants' were separated from other ISPs (analysed as group and apart for the most frequently used other ISPs, ie, anti-TNF, methotrexate and purine antagonists).

A total of 877 patients with IMID with ISP (99 with 'strongly antibody-impairing immunosuppressants' and 778 other ISP) were compared with 356 controls (243 patients with IMID without ISP and 113 healthy controls; see online supplemental figure S1). Online supplemental table S1 shows demographics and humoral responses. Based on a Kaplan-Meier analysis, the estimated proportion of persistent seroconversion at 6 months after primary immunisation was 45% (95% CI 31% to 65%) for patients with IMID with 'strongly antibody-impairing immunosuppressants', 64% (95% CI 59% to 69%) for other ISPs and 88% (95% CI 84% to 92%) for controls ($p < 0.01$ for 'strongly antibody-impairing immunosuppressants' and other ISP when compared with controls; figure 1A). Of the frequently used other ISPs, anti-TNF was associated with the lowest proportion of persisting seroconversion (45%; 95% CI 38% to 55%; figure 1B and online supplemental figure S2 and S3). In the 'strongly antibody-impairing immunosuppressants', seroconversion at 6 months persisted in 21/46 (46%) patients with anti-CD20 therapies, in 9/19 (47%) S1PR and in 33/34 (97%) MMF

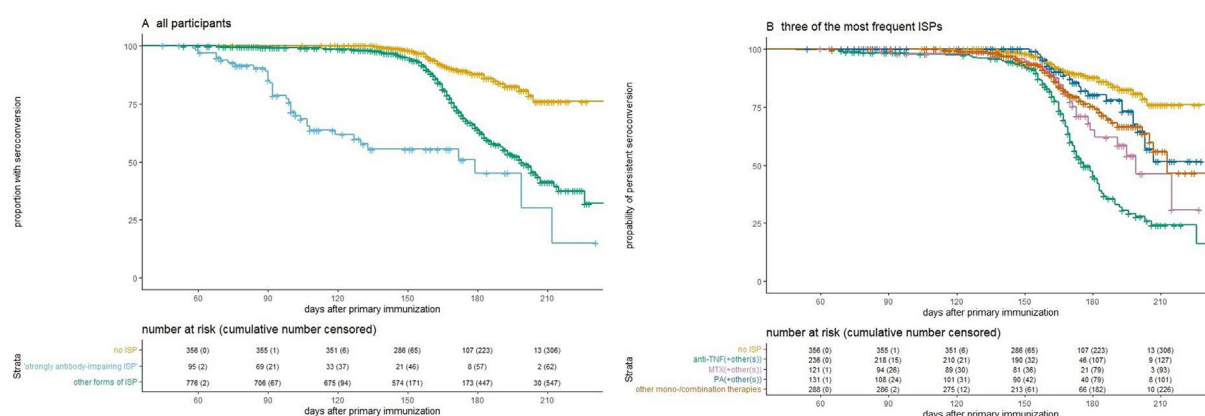


Figure 1 Changes in seroconversion after primary immunisation. Figure showing changes in seroconversion after primary immunisation, censored for measurements when taking place. (A) compares patients with immune-mediated inflammatory diseases (IMIDs) on 'strongly antibody-impairing immunosuppressants' (ie, anti-CD20 therapies, sphingosine 1-phosphate receptor modulators or mycophenolate mofetil), patients with IMID on other forms of ISP and controls (patients with IMIDs without immunosuppressants and healthy controls). (B) compares changes in seroconversion rates after primary immunisation for three of the most frequent immunosuppressants used in our cohort, that is, methotrexate (MTX), purine antagonists (PA) and anti-TNF therapy. Immunosuppressants in the 'other monotherapy/combination therapy group' are detailed in online supplemental table S1. ISP, immunosuppression.

(online supplemental table S1). Using a multivariate Cox model, the same ISP s together with SARS-CoV-2 infections prior to vaccination and higher anti-RBD titres 28 days after primary immunisation were identified as independent determinants for the persistence of seroconversion (online supplemental figure S4).

Use of ISP is associated with a greater decline in humoral responses 6 months after primary immunisation and this association was most pronounced in anti-CD20 therapies, S1PR and anti-TNF. Although lower initial titres may explain this in part, ISP use was an independent determinant. Moreover, differences in loss of seroconversion between ISPs did not correlate with initial titres. Most notably, anti-TNF showed a great decline while initial antibody titres are only moderately reduced.³ This suggests that some ISP, like anti-TNF, affect duration or quality of the germinal centre reactions and/or establishment of the long-lived plasma cell compartment.⁴

This report has some limitations. Patients on 'strongly antibody-impairing immunosuppressants' received their first additional vaccine earlier when compared with patients on other ISPs and controls because of differences in the design of the national vaccination campaign. This might have led to an underestimate of the loss of seroconversion at later time points in this group. Timing of the vaccination campaign was similar for patients treated with other ISPs and controls. We did not investigate a potential effect of the IMiD diagnosis itself, regardless of ISP use or the level of IMiD disease activity. Previously, we did not observe an association between short-term antibody responses and the type of IMiD.¹

Disease severity of current SARS-CoV-2 variants is mostly mild, despite a higher risk of SARS-CoV-2 breakthrough infections in patients with IMiD with impaired humoral responses, possibly as a result of unaffected cellular immunity and/or hybrid immunity.^{5,6} However, as long as the contribution of these factors to the protection against new variants is unknown, our results suggest that patients with IMiD with ISP should receive additional vaccinations earlier than 6 months after their last vaccination.

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