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SARS-CoV-2 Vaccine Seroconversion in Patients With Hidradenitis Suppurativa Receiving Anti-TNF Therapy

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Abstract

Background and Objectives: Tumour necrosis factor-α (TNF-α) inhibitors such as adalimumab and infliximab are commonly used in moderate-to-severe hidradenitis suppurativa (HS). While the impact of TNF-α inhibitors on outcomes after an active infection in patients with HS has been explored, their effect on the SARS-CoV-2 vaccine response remains unknown. We investigated the impact of TNF-α inhibitor therapy on the immunogenic response to the SARS-CoV-2 vaccine in patients with HS.
Methods: This is a single-centre retrospective chart review of 120 patients with recorded levels of anti-SARS-CoV-2 spike antibody. This cohort was characterized descriptively by demographics, antibody levels, vaccine brand, number of doses, and days elapsed from vaccination. These variables were then compared by usage of anti-TNF therapy. Secondary analyses included comparison by biologic type, time on biologic, and biologic dosage.
Results: We found no significant difference in seroconversion following SARS-CoV-2 vaccination while on anti-TNF therapy in HS patients; a finding that holds in comparisons between anti-TNF therapy type, time exposed to biologic, and anti-TNF dosage.
Conclusions: Patients with HS on anti-TNF therapy receiving the SARS-CoV-2 mRNA vaccine seroconvert similarly as those without anti-TNF therapy, indicating this population should receive the vaccine and expect a similar degree of protection against COVID-19 compared to HS patients who do not receive anti-TNF therapy.

Keywords

hidradenitis suppurativa, medical dermatology, clinical research, biologic therapy, COVID-19, vaccines, SARS-CoV-2

Introduction

Hidradenitis suppurativa (HS) is a chronic debilitating skin disorder of follicular biology, predominantly affecting axillary, inframammary, suprapubic, inguinal, upper inner thigh, perineum, and buttock areas. It manifests with painful pustules, nodules, abscesses, sinus tracts ("tunnels") and scarring that have a profound impact on quality of life and mental health.[1-3] Advanced refractory disease often requires a multimodal therapeutic approach, including topical, oral and intravenous antibiotics, anti-androgen therapy to regulate hormonal influences, and biologic response modifiers that target mediators of inflammation. Surgical interventions such as deroofing and excision are definitive modes of regional treatment also utilized to reduce disease burden.

Tumour necrosis factor-α (TNF-α) plays a well-established inflammatory role in the pathogenesis of HS.[4] This cytokine binds to various types of tumour necrosis factor receptors found throughout the body and on T cells that induce an inflammatory response and possibly play a role in both innate and acquired immunity.[5,6] Drugs that inhibit TNF-α, such as adalimumab and infliximab, attenuate this pathway in patients with HS.[7-9] Adalimumab is a recombinant, fully human, IgG1 monoclonal antibody that specifically binds soluble and transmembrane TNF-α.[9] It is one of two FDA-approved biologic treatments for HS.[10] Infliximab

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is a chimeric mouse/human IgG1 monoclonal antibody that also binds soluble and transmembrane TNF-α and is currently used as an off-label treatment for HS.[9]

We previously reported that treatment of HS patients with TNF-α inhibitors did not adversely affect outcomes of SARS-CoV-2 infection.[11] Other groups have reported similar findings.[12-14] However, several studies have suggested that the response to the SARS-CoV-2 vaccine may be truncated in patients receiving anti-TNF-α therapies, primarily for inflammatory bowel disease.[15-18] While the impact of TNF-α inhibitors on outcomes after an active infection in patients with HS has been explored, their effect on SARS-CoV-2 vaccine response is still unknown.[11] It is of particular importance for clinicians to know if vaccinated patients on these therapies are at higher risk of SARS-CoV-2 infection. Therefore, we sought to explore the impact of TNF-α inhibitor therapy on the immunogenic response to the SARS-CoV-2 vaccine in patients with hidradenitis suppurativa.

Materials and Methods

We performed an institutional review board-approved (Einstein IRB #2023-15589) retrospective chart review of 120 patients receiving care at the Montefiore/Einstein Hidradenitis Suppurativa Centre (HSC).

Patients

ATLAS®, a proprietary web-based data query platform based on an open-source technology (developed by the Observational Health Data Sciences and Informatics coalition and implemented by the Centre for Health Data Innovations at Montefiore Einstein), was used to identify eligible participants. All patients with an ICD-10 diagnostic code of L73.2 (HS) receiving care at the Montefiore Einstein HSC between March 1, 2020, and December 1, 2021, that were SARS-CoV-2 vaccinated with Moderna bivalent (Cambridge, MA, USA) or Pfizer-BioNTech (Cambridge, MA, USA) vaccines (at least 1 dose) and had a SARS-CoV-2 vaccine spike antibody level following vaccination were included in this study.

Laboratory Tests

The AdviseDx SARS-CoV2 IgG II assay using the Abbott Architect (Abbott Park, IL, USA) was used to assess spike antibody levels generated in response to a SARS-CoV-2 vaccination.

Data Collection

Medical record numbers obtained from ATLAS were used to extract relevant clinical data from the electronic health record. Data collected included age, sex, race, ethnicity, BMI, and active biologic therapies. COVID-19-related data collected included SARS-CoV-2 spike antibody results, history of SARS-CoV-2 vaccination, SARS-CoV-2 vaccine brand, number of SARS-CoV-2 vaccination doses, and days elapsed between SARS-CoV-2 vaccination and nucleocapsid/spike antibody testing. Patients with any incomplete data were excluded from this study.

Statistical Methods

The primary objective of this retrospective cohort study was a statistical analysis of the SARS-CoV-2 vaccine response in the setting of anti-TNF therapy. Secondary objectives included the impact of anti-TNF dosage on vaccine response, differences between vaccine brands, and the effect of 2 or more vaccine doses.

Descriptive statistics for demographics and collected variables of interest were generated for all patients. Independent samples were compared using Pearson's chi-squared, 2-sided Fisher's exact, and 2-sided Student's *t* tests where appropriate to assess differences in characteristics stratified by whether HS patients received biologics. Pearson's r correlation was performed to assess antibody levels in relation to last vaccination date. All statistical analyses were conducted using IBM (Armonk, NY) SPSS version 29.0 for Mac and GraphPad Prism (Boston, MA) version 10.1.1 for Mac.

Ethical Approval Statement

This study was approved by the Einstein Institutional Review Board (IRB #2023-15589) and was conducted according to the principles expressed in the Declaration of Helsinki.

Results

Of the 120 patients included in this study, the average age was 36 ± 14 years. Ninety-seven (80.8%) had received 2 vaccination doses at the time of spike antibody lab collection. Sex, race, ethnicity, BMI, active biologics, and anti-SARS-CoV-2 spike antibody levels and vaccination characteristics are detailed in Supplemental Table 1.

Patients were stratified by current biologic status (Supplemental Table 2). Seventy-six (63.3%) patients were on either adalimumab or infliximab at the time of antibody lab collection, while 44 (36.7%) were not on any form of biologic medication. No independent differences were found between collected variables of interest, including spike antibody level (Figure 1A).

No difference in anti-SARS-CoV-2 antibody titer level was noted when compared by TNF-α inhibitors adalimumab and infliximab (Figure 1B). In patients on biologics, one-way ANOVA analyses revealed no differences in antibody titer levels between time elapsed on biologic at the time of the lab draw (<3, 3-6, 6-12, >12 months) or biologic dosage (Figure 2).

For patients that received at least 2 vaccination doses, there was no correlation of antibody titer levels and days

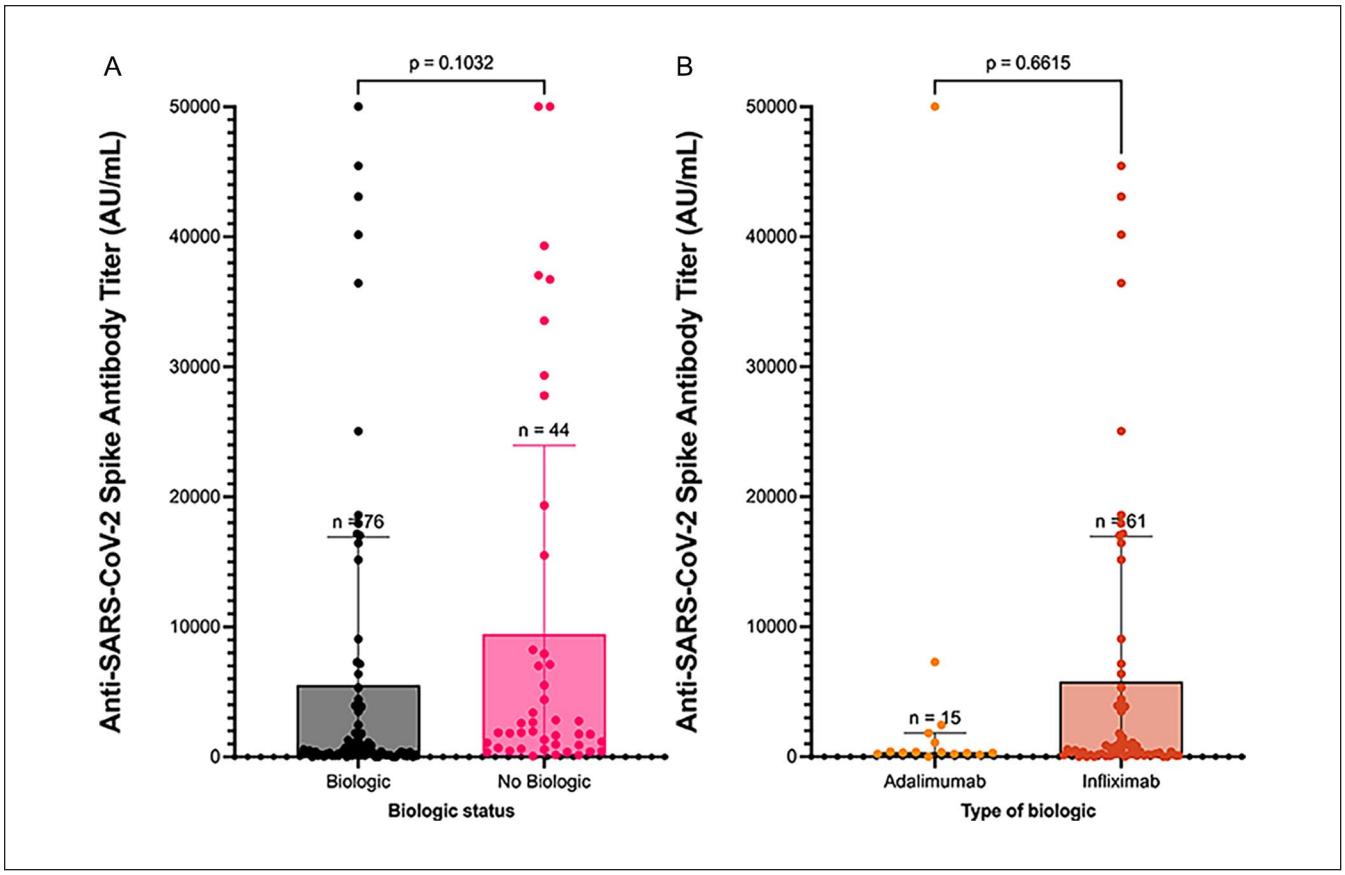

Figure 1. SARS-CoV-2 antibody titers by biologic (median, 95% confidence interval). (A) Comparison by biologic status. (B) Comparison by biologic type.

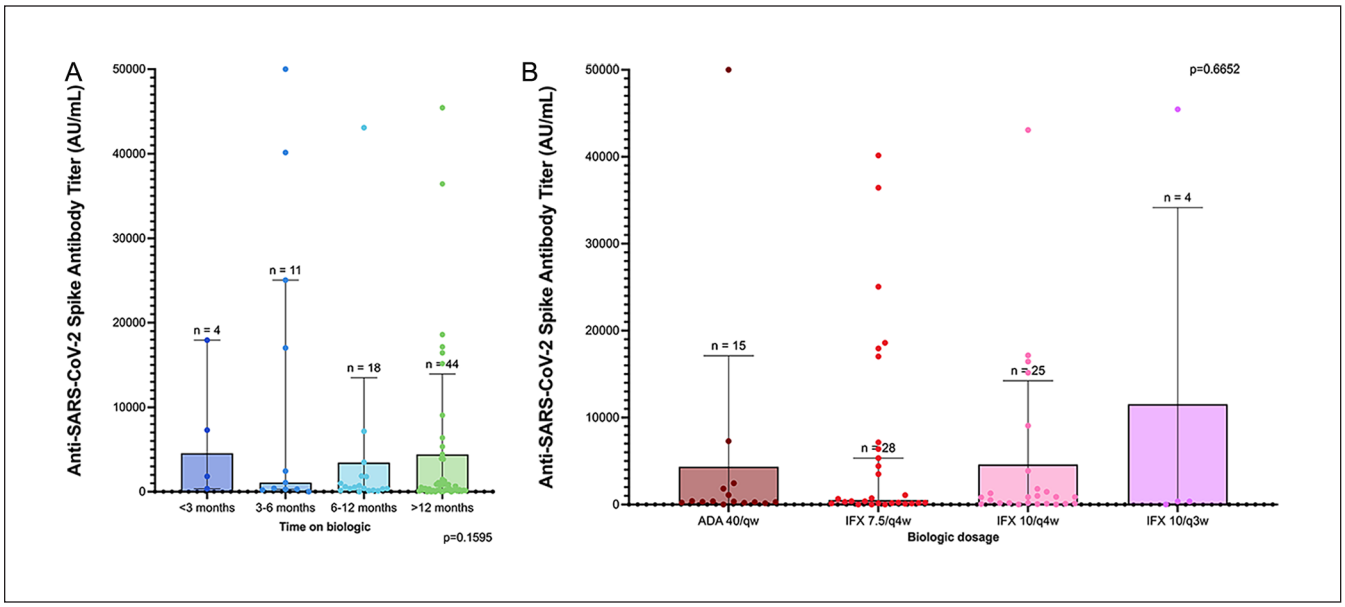

Figure 2. SARS-CoV-2 antibody titers by biologic usage (median, 95% confidence interval). (A) Comparison by time on biologic. (B) Comparison by biologic dosage (ADA = adalimumab, IFX = infliximab), 12.5 g dose excluded.

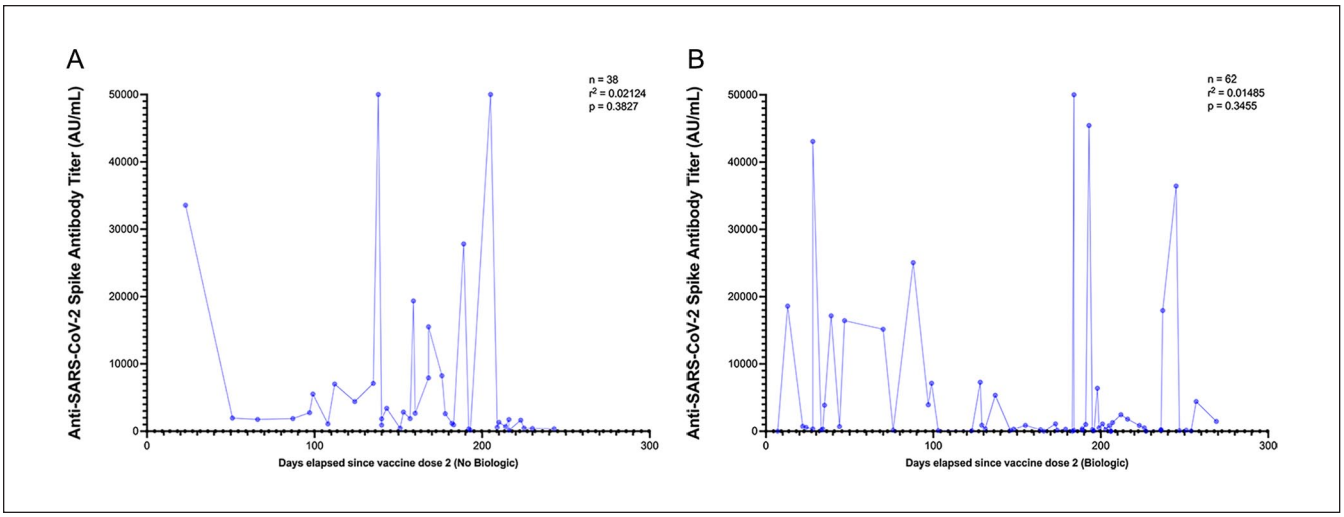

Figure 3. Correlation of days elapsed since vaccination dose 2 at time of measurement and anti-SARS-CoV-2 IgG levels. (A) Antibody titer levels among patients with HS that are not on a biologic. (B) Antibody titer levels among patiens with HS that are receiving a biologic.

elapsed since the second vaccination in no biologic and biologic patients [n=38, r^2=.02124, P=.3827; n=62, r^2=.01485, P=.3455 (Figure 3)].

Discussion

In this study, we show that TNF-α inhibitor biologic therapy does not significantly affect SARS-CoV-2 vaccine seroconversion in a diverse cohort of patients with HS. This finding is similar to what has been described in the inflammatory bowel disease (IBD) literature, another disease that has widespread anti-TNF use.[16,19,20] It has also been described in the setting of psoriasis.[21] However, some IBD studies have found an attenuated response to the vaccine with anti-TNF therapy.[22-25] Therefore, the effect of these therapies requires further exploration.

A recent study affirmed our previous findings of no difference in outcomes in COVID-19 infection in HS patients on anti-TNF therapy in a combined cohort of psoriasis and HS patients.[11,26] While there is a paucity of data in the HS literature regarding COVID-19 outcomes, there is currently no reported data on vaccine seroconversion rates. For vaccinated patients with HS on anti-TNF therapies, it is of clinical importance to be able to provide reassurance that vaccine efficacy, from what we know to date, does not appear to be reduced while on anti-TNF therapy. This may lead to increased vaccine acceptance and improved adherence to current treatment regimens.

Previous studies have shown that the Tdap, pneumococcal, and influenza vaccine are safe and immunogenic in patients receiving anti-TNF therapy.[27-29] However, the SARS-CoV-2 vaccine is the first vaccine with widespread adoption that is based on mRNA technology. Therefore, its mechanism of generating an immune response differs from prior vaccine technologies by stimulating both cellular and humoral immunity, further strengthening the importance of our study. Since future vaccines may utilize mRNA technology, especially in the setting of an emergent pandemic, data to support their use in this population may be valuable; albeit generalizing these results should be approached with caution.

Despite a small cohort size and the retrospective nature of this study, our results suggest that there is no difference in seroconversion following SARS-CoV-2 mRNA vaccine while on anti-TNF therapy in patients with HS. Moreover, this finding holds in comparisons between anti-TNF therapy type, time exposed to biologic, and anti-TNF dosage. Equally important, our findings suggest that immunity does not wane over time regardless of biologic anti-TNF therapy. These findings provide strong evidence that HS patients on anti-TNF therapy receiving the SARS-CoV-2 mRNA vaccine produce a similar immunogenic response as those who have not received anti-TNF therapy. This population should receive the SARS-CoV-2 vaccine and expect a similar degree of protection against COVID-19 as compared to HS patients that are not receiving anti-TNF therapy. Further studies are still needed in this population to assess breakthrough infections despite an adequate antibody response and effects of past COVID-19 infection on the robustness of seroconversion.

Author Contributions

AN, MET, KLC, and SRC were responsible for the conception of the study and study design. AN, MET, MT, and ZI were responsible for data collection and interpretation. PYC was responsible for study design, data interpretation and analysis, and drafting the manuscript. SRC had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors reviewed and approved the manuscript prior to submission.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethics Statement

This study involves human subjects and was approved by the Einstein Institutional Review Board (#2023-15589).

Patient Consent

Consent for the publication of recognizable patient photographs or other identifiable material was obtained by the authors and included at the time of article submission to the journal stating that all patients gave consent with the understanding that this information may be publicly available.

IRB Approval Status

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Data Availability Statement

The data underlying this article will be shared on reasonable request to the corresponding author.

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Supplemental Material

Supplemental material for this article is available online.

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