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# New-onset cutaneous lupus erythematosus after the COVID-19 vaccine

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## Abstract

Vaccine development for COVID-19 has progressed expeditiously. To date, the Food and Drug Administration (FDA) has authorized the Moderna/mRNA-1273, Pfizer-BioNTech (BNT162b2), and Johnson & Johnson's Janssen (JNJ-78436735) vaccines for use in the United States. Immediate side effects have included myalgia, fatigue, chills, fever, and headache. We report an elderly patient with a history of lung cancer and no prior history of autoimmune disease who developed cutaneous lupus erythematosus two and a half months after the second dose of the Pfizer-BioNTech COVID-19 vaccine.

*Keywords: COVID-19 vaccine reaction, cutaneous lupus erythematosus*

## Introduction

The most common immediate side effects of the COVID-19 vaccines have included myalgia, fatigue, chills, fever, and headache [1]. As far as cutaneous adverse events, delayed large local reactions, injection site reactions, urticarial eruptions, and morbilliform eruptions have been the most common [2]. Herein, we discuss a case of new-onset cutaneous lupus erythematosus that occurred after administration of the Pfizer-BioNTech (BNT162b2) vaccine.

## Case Synopsis

Our patient was a male in his 70s with a history of lung cancer who presented with violaceous plaques



**Figure 1.** Subacute cutaneous lupus erythematosus. Violaceous plaques with central hypopigmentation, surrounding erythema, and peripheral scaling on the back.

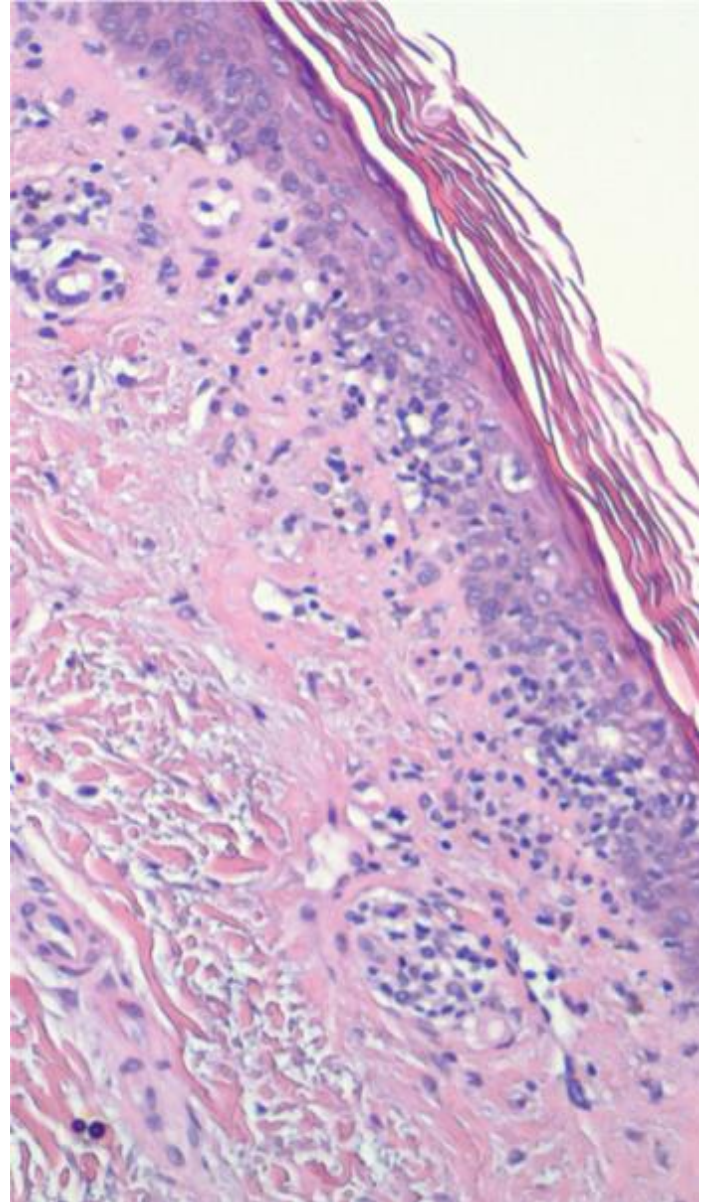
with central hypopigmentation, surrounding erythema, and peripheral scaling on the abdomen, back, and bilateral upper extremities (**Figures 1, 2**). He had no history of a similar eruption and no history of autoimmune disease. He denied any family history of autoimmune diseases. The patient did not report the use of any medications and was not recently exposed to a significant amount of sunlight. Two and a half months prior to the development



**Figure 2.** Subacute cutaneous lupus erythematosus. Violaceous plaques with central hypopigmentation, surrounding erythema, and peripheral scaling on the arm and abdomen.

of the rash, he had received his second dose of the Pfizer-BioNTech (BNT162b2) COVID-19 vaccine.

A punch biopsy (**Figure 3**) of the right arm was performed. The biopsy showed an interface lymphocytic infiltrate with vacuolar changes of the basal cells. The epidermis demonstrated focal hyperkeratosis and few necrotic keratinocytes were noted. There was a perivascular lymphohistiocytic infiltrate with scattered melanophages. After initial review of the H&E-stained section, periodic acid-Schiff stain was performed with adequate controls. Fungal organisms were not observed. The serum antinuclear antibody (ANA) titer was 1:540 and the patient was positive for anti-SSA/Ro antibodies. The pathology report stated that the findings could be consistent with the clinical impression of a drug reaction and that the differential diagnosis also included a connective tissue process such as lupus erythematosus. Clinically, the patient was diagnosed with subacute cutaneous lupus erythematosus. The patient was prescribed class I topical steroids and instructed to follow up in one month. At the patient's return visit, his skin exhibited significantly less erythema and scaling. Unfortunately, the patient was



**Figure 3.** Interface lymphocytic infiltrate with vacuolar changes of the basal cells. The epidermis demonstrates focal hyperkeratosis, and few necrotic keratinocytes are noted. There is a perivascular lymphohistiocytic infiltrate with scattered melanophages.

lost to subsequent follow up after expiring from lung cancer.

## Discussion

The role of an infectious agent or vaccine in triggering an immune-mediated disease (IMD) is well recognized. However, few vaccines have been reported to lead to cutaneous manifestations of lupus erythematosus. One study evaluated 27

patients with new-onset or flares of IMDs after administration of the COVID-19 vaccine [3]. Of those patients, three individuals demonstrated a flare of systemic lupus erythematosus (SLE). One of the three patients had a history of a positive ANA with no clinical features and developed generalized acute cutaneous lupus erythematosus two days after the first dose of the Pfizer COVID-19 vaccine. The other two patients developed a lupus erythematosus flare four and 14 days after the Astra Zenica (ChAdOx1) COVID-19 vaccine. Another study reviewing 414 cases of cutaneous reactions after either the Moderna or Pfizer vaccines did not mention any lupus erythematosus-like reactions [2]. Even among non-COVID-19 vaccines, only one case report demonstrated a positive ANA and diffuse proliferative glomerulonephritis in an individual who had received one dose of the hepatitis B vaccine (Engerix-B) two weeks prior [4]. However, there were no cutaneous manifestations of SLE.

Though COVID-19 has been shown to cause or exacerbate IMDs, it was not previously known whether the COVID-19 vaccine could also trigger an IMD. A recent study showed that the SARS-CoV-2 spike protein antibody was also reactive against nuclear antigen and other tissue proteins [5]. Furthermore, ANA has been reported during the course of the COVID-19 infection [6]. This finding is supportive of molecular mimicry that may lead to autoimmune manifestations in COVID-19 patients [7]. However, whether molecular mimicry exists between the COVID-19 vaccine and nuclear antigen is unknown.

Vaccines commonly contain adjuvants, which are substances that enhance the vaccine's ability to stimulate the innate immune system through the detection of pattern recognition receptors (PRR) [7].

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It is also hypothesized that the mRNA delivered by the vaccine may interact with RNA binding proteins, which affect post-translational transcription of proteins and lead to inflammatory dysregulation [8]. The COVID-19 vaccine has also been shown to stimulate the innate immune system through nucleic acid receptors like Toll-like receptors (TLRs) 3, 7, 8, and 9, and the inflammasome. In a similar manner, certain immune-mediated diseases have also demonstrated the ability to stimulate TLR-7 and -9 in humans. Stimulation of these TLRs is associated with increased type-I interferon responses, which may be responsible for many of the cutaneous side effects of the COVID-19 vaccine [3].

## Conclusion

Many studies have elucidated the similarities in pathophysiology between the COVID-19 infection and an immune-mediated disease, and it has been demonstrated that the vaccine may unmask an immune-mediated disease in a previously susceptible individual. However, few studies have uncovered a similar relationship between the COVID-19 vaccine and an IMD. To date, there have only been a handful of individuals who have experienced a cutaneous lupus erythematosus-like reaction shortly after receiving the COVID-19 vaccine. Further research may be able to identify shared features between the spike protein and nuclear antigen or identify specific components of the adjuvants used that will explain the cutaneous manifestations seen in our patient.

## Potential conflicts of interest

The authors declare no conflicts of interest.

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