SKIN

BRIEF ARTICLE

Photosensitivity Dermatitis associated with the Moderna Booster Vaccination

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ABSTRACT

Adverse reactions have been documented following administration of mRNA COVID vaccinations, including systemic and local cutaneous reactions. Cutaneous reactions have been reported more frequently and of greater severity when vaccinated with the Moderna vaccine compared to the Pfizer/BioNTech vaccine. While multiple studies have investigated cutaneous reactions following initial vaccinations, few have reported on the effects of booster vaccinations, specifically in individuals of darker skin color. Additionally, we have found no reported cases of photosensitive dermatitis following vaccination. Thus, we present a case of photosensitivity dermatitis likely secondary to a booster shot of the Moderna vaccination in a Fitzpatrick Type IV 81-year-old female patient.

INTRODUCTION

The SARS-CoV-2 disease is a highly contagious and deadly virus that has caused the ongoing, destructive COVID pandemic.[1] To combat this disease, a wide number of vaccinations were created, including the Moderna and Pfizer/BioNTech vaccinations.[2] These mRNA vaccinations can cause mild adverse effects after the first and/or second doses, most commonly including pain and redness at the injection site, fever, fatigue, headache, myalgia, nausea, and chills.[1,2,3] Increased rates of adverse reactions have been observed with the initial Moderna vaccination and subsequent booster shots, but the full range of potential effects following these vaccinations is not fully understood.[1,4]

Photosensitivity is an abnormal reaction of the skin to UV radiation.[5] In photosensitivity dermatitis, UV radiation functions as an allergen, and once the patient becomes sensitized, subsequent exposure to this allergen produces a hapten that binds to protein carriers in the skin, forming an antigen. Antigen-presenting cells then engulf the photoallergen and present it to T cells in the lymph nodes. Subsequent T cell activation leads to their proliferation and introduction into the initial site of exposure, causing an inflammatory skin reaction.[6] While sunlight in isolation can result in damaging cutaneous changes, such as sunburn and solar erythema, sun exposure may also act indirectly with exogenous agents, such as drugs and topical compounds, to cause phototoxic and photoallergic reactions.[7]

While many studies have investigated the spectrum of adverse systemic and cutaneous reactions associated with mRNA

vaccinations, like the Moderna vaccination, we have found no reported cases of photosensitivity reactions associated with the Moderna booster vaccination. Additionally, there are no documented cases of photosensitivity reactions following a Moderna booster in a person of darker skin color. We present a case of photosensitivity dermatitis likely secondary to a booster shot of the Moderna vaccination in an individual with skin of color.

CASE REPORT

Our case presents an 81-year-old Fitzpatrick Type IV female with a past medical history of type 2 diabetes mellitus, hypertension, and hypercholesterolemia who developed an erythematous rash in a sun-exposed distribution after receiving a Moderna booster vaccination for COVID. This was the third Moderna vaccination she had received, approximately 18 months after her two initial Moderna vaccinations. The patient had a pronounced local injection site reaction following her first Moderna vaccination accompanied by generalized fever and chills, but she experienced no cutaneous or systemic symptoms following her second vaccination 30 days later. Following her third vaccination, the patient returned home and spent approximately 15 minutes outdoors, sitting on her patio exposed to the sun. She frequently spends time in the sun without sun protection and tans after sun exposure but rarely experiences sunburn. Two days following the COVID booster, she developed an erythroderma reaction of her sun-exposed skin, including the bilateral cheeks, upper chest, and bilateral dorsal hands **(Figure 1)**. Additionally, she reported experiencing mild myalgias and fever later in the day following her vaccination. She reported no changes in medications, soaps, detergents, or skin products and denied any recent sick contacts or exposures. She visited urgent care and was diagnosed with dermatitis and prescribed a topical steroid. Further assessment of her symptoms and distribution of the rash by her dermatology team revealed a photosensitive pattern. She was counseled to use sun protection, moisturize appropriately, and apply topical steroids until the dermatitis resolved. Approximately two weeks following her outbreak, her rash had significantly improved with only some residual erythema of the cheeks **(Figure 2)**.

DISCUSSION

This case demonstrates a unique, cutaneous adverse reaction to the Moderna booster vaccination. The chronological relationship between the timing of the booster vaccination and subsequent sun exposure, supports a causative relationship with the Moderna vaccination. A review of the literature found that cutaneous adverse reactions following COVID vaccinations occur commonly but are less frequent compared to other side effects.[4] Additionally, these adverse cutaneous reactions have been found to occur with even less frequency with booster vaccinations. Between December 2020 and January 2022, 1000 cases of cutaneous reactions to COVID-19 vaccinations were recorded, of which 36 included reactions following a booster vaccination, primarily secondary to Moderna. Among the 36 individuals with reactions to the booster vaccination, 93 distinct cutaneous reactions were identified. From most common to least common, the morphologies included urticaria, redness, swelling and pain, a large local reaction, erythromelalgia, and vesicular reactions.[4] While Moderna more commonly causes cutaneous reactions compared to Pfizer's vaccine, photosensitivity dermatitis has yet to be described with either vaccination type in the literature.

Figure 1. Erythematous rash on the patient's right cheek two days after receiving the Moderna booster vaccination.

Figure 2. The patient's rash one week after the initial breakout.

A review of the literature identified a limited number of cases in which COVID-19 vaccinations have been followed by adverse side effects, including an injection site rash and urticaria.[8] A review of symptoms and antibody response following the Pfizer and Moderna vaccinations found that more patients experienced adverse reactions when vaccinated with Moderna than Pfizer/BioNTech.[9] A study examining adverse events with COVID vaccinations from December 2020 to February 2021 recorded 414 cutaneous reactions in total with 83% of those occurring after Moderna vaccination and 17% occurring after Pfizer vaccination.[10] Another study conducted from January 1st to March 30th of 2021 found that 67.4% of 20,296 individuals who received the Moderna vaccination experienced an adverse reaction compared to 46.9% of 20,180 individuals who received the Pfizer vaccination. Serious adverse reactions were seen at higher rates with the Moderna vaccination, as 2.4% of those who experienced an adverse event were hospitalized and 5.2% died compared to 2.6% that were hospitalized and 2.7% that died following administration of the Pfizer vaccination.[11] These numbers demonstrate a greater frequency of adverse reactions to the Moderna vaccination as well as an increased severity of reactions compared to the Pfizer vaccination.

Several case reports have described rare cutaneous manifestations associated with COVID vaccinations, yet no articles have reported photosensitivity dermatitis associated with the Moderna booster vaccination. Furthermore, this finding of photosensitivity dermatitis in a person of color, who previously had a limited history of experiencing sunburns, was novel. While the pathogenesis of the response is unclear, we hypothesize that an antigen in the Moderna booster vaccination may subject the recipient to a predisposition to experience a photosensitivity dermatitis.

This case presents a novel photosensitivity dermatitis from a Moderna booster vaccination in an individual of a darker skin color. Given this finding, clinicians should consider advising patients of all skin colors to employ appropriate sun protection following COVID vaccination. While this reaction was not demonstrated with the Pfizer vaccine, it is plausible that a similar pathogenesis could potentially occur in patients receiving this vaccination. Although uncomfortable, the rash is largely benign and may be avoidable. As we further separate from the COVID pandemic, and the number of individuals receiving COVID vaccinations and boosters, more will be elucidated regarding the acute and chronic symptoms associated with vaccination.

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References:

1. RefsMeo SA, Bukhari IA, Akram J, Meo AS, Klonoff DC. COVID-19 vaccines: comparison of biological, pharmacological characteristics and adverse effects of Pfizer/BioNTech and Moderna Vaccines. European Review for Medical & Pharmacological Sciences. 2021; 25(3): 1663-1669.
2. Remmel A. COVID vaccines and safety: what the research says. Nature. 2021; 590(7847): 538-40.
3. Shabu A, Nishtala PS. Safety outcomes associated with the moderna COVID-19 vaccine (mRNA-1273): a literature review. Expert review of vaccines. 2023; 22(1): 393-409. doi:10.1080/14760584.2023.2209177
4. Prasad S, McMahon DE, Tyagi A, Ali R, Singh R, Rosenbach M, Lim HW, Fox LP,

Blumenthal K, Hruza GJ, French LE. Cutaneous reactions following booster dose administration of COVID-19 mRNA vaccine: A first look from the American Academy of Dermatology/International League of Dermatologic Societies registry. JAAD international. 2022; 8:49-51. doi:10.1016/j.jdin.2022.04.004

5. Kurz B, Ivanova I, Bäumler W, Berneburg M. Turn the light on photosensitivity. Journal of Photochemistry and Photobiology. 2021; 8:100071. doi:10.1016/j.jpap.2021.100071
6. Lugović Mihić, L., Bulat, V., Šitum, M., Čavka, V. and Krolo, I. Allergic hypersensitivity skin reactions following sun exposure. Collegium antropologicum. 2008; 32(2): 153-157.
7. Lugović L, Šitum M, Ožanić-Bulić S, Sjerobabski-Masnec I. Phototoxic and photoallergic skin reactions. Collegium antropologicum. 2007; 31(1): 63-7.
8. Meo SA, Bukhari IA, Akram J, Meo AS, Klonoff DC. COVID-19 vaccines: comparison of biological, pharmacological characteristics and adverse effects of Pfizer/BioNTech and Moderna Vaccines. European Review for Medical & Pharmacological Sciences. 2021; 25(3). doi:10.1016/j.jdcr.2021.02.014
9. Kelliher MT, Levy JJ, Nerenz RD, Poore B, Johnston AA, Rogers AR, Stella ME, Snow SE, Cervinski MA, Hubbard JA. Comparison of symptoms and antibody response following administration of Moderna or Pfizer SARS-CoV-2 vaccines. Archives of Pathology & Laboratory Medicine. 2022; 146(6): 677-85. doi:10.5858/arpa.2021-0607-SA
10. McMahon DE, Amerson E, Rosenbach M, Lipoff JB, Moustafa D, Tyagi A, Desai SR, French LE, Lim HW, Thiers BH, Hruza GJ. Cutaneous reactions reported after Moderna and Pfizer COVID-19 vaccination: a registry-based study of 414 cases. Journal of the American Academy of Dermatology. 2021; 85(1): 46-55. doi: 10.1016/j.jaad.2021.03.092
11. Schumaker R, Veronin M, Rohm T, Dixit R, Aljawarneh S, Lara J. An Analysis of Covid-19 Vaccine Allergic Reactions. Journal of International Technology and Information Management. 2021; 30(4): 24-40. doi: 10.58729/1941-6679.1521