LETTER TO THE EDITOR

Erythrodermic pityriasis rubra pilaris after SARS-CoV-2 vaccination with concomitant COVID-19 infection

Editor

With great interest, we read in this journal the article by Lladó *et al.*[1] reporting the first case of COVID-19 vaccine-induced pityriasis rubra pilaris (PRP). Here, we would like to contribute a case of severe erythrodermic PRP following COVID-19 vaccination with concomitant COVID-19 infection.

An otherwise healthy 51-year-old male with no history of skin disorders presented with scaly erythroderma covering almost 100% of his integument, also strongly affecting the palms, soles and face. Areas of sparing (*nappes claires*) were observed on the trunk and legs (Fig. 1). This rash developed 10 days after the third COVID-19 vaccination with Spikevax/Moderna (first Vaxzevria/AstraZeneca, second Comirnaty/BioNTech). One day later, routine PCR detected an asymptomatic COVID-19 infection (Ct-value 20.7). Histological examination of two skin biopsies revealed hyperkeratosis with alternating parakeratosis and orthokeratosis, acanthosis, broadened rete ridges, hypergranulosis in some areas and mild perivascular inflammatory infiltrates in the dermis, compatible with a diagnosis of PRP (Fig. 2). C-reactive protein was slightly elevated with 12 mg/L (<5). Other routine laboratory parameters including neutrophils were within normal limits. Serology for human immunodeficiency virus and hepatitis B and C was negative. Four weeks after the diagnosis of COVID-19 infection, a SARS-CoV-2 antibody test revealed highly elevated SARS-CoV-2 IgG titres. Together, these findings point to a post-vaccination/infection aetiology of the diagnosed PRP. Prior to obtaining histology results, the patient was initially treated with high-dose systemic corticosteroids which proved ineffective. Prompted by a recently published case report on PRP, we initiated a standard psoriasis regimen using guselkumab (100 mg s.c.).[2] However, due to the absence of significant treatment response after a few weeks, the patient decided to discontinue guselkumab and got lost on follow-up.

PRP is a rare psoriasiform condition with unclear aetiology, although mutations in the *CARD14* gene are independently associated with psoriasis and both familial and sporadic PRP, providing a pathophysiologic link between these disorders. Similar to generalized pustular psoriasis, PRP is now considered an autoinflammatory keratinization disease.[3,4] Indeed, erythrodermic psoriasis presents an important differential diagnosis of PRP and was also considered in the present case. However, the patient's history, normal neutrophil counts, failure to respond to corticosteroids and the overall clinical and histological findings favoured a diagnosis of PRP. Previously observed

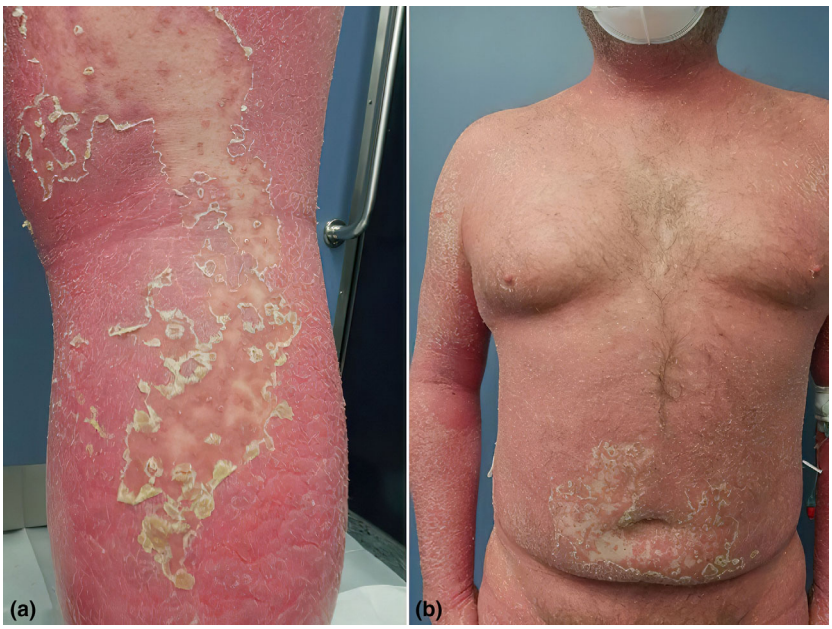

Figure 1 Acute onset of pityriasis rubra pilaris 10 days after COVID-19 vaccination with a concomitant breakthrough infection. (a) Keratotic follicular papules coalescing into scaly reddish-pinkish plaques with characteristic islands of sparing. (b) Erythroderma almost completely covering the entire integument with fine powdery to coarser scaling.

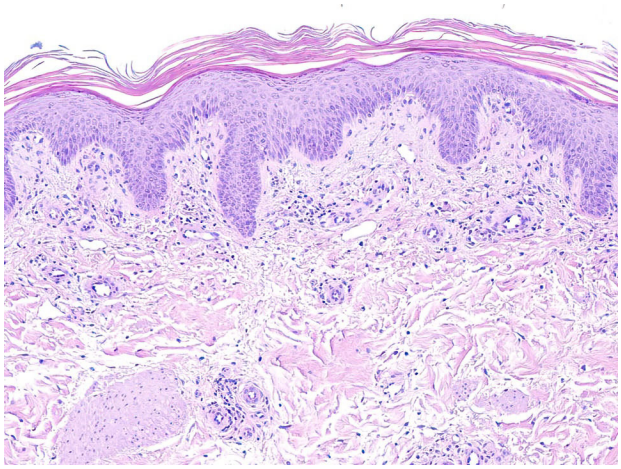

Figure 2 Histological examination of a skin biopsy: hyperkeratosis alternating with parakeratosis and orthokeratosis, acanthosis with broad rete ridges, areas of hypergranulosis and mild perivascular inflammatory infiltrates in the dermis.

associations with PRP include viral diseases and various drugs. Cases of post-vaccination PRP following inoculation with traditional viral vector vaccines have been reported.[4] Indeed, following Lladó *et al.*,[1] five COVID-19 vaccine-induced (Covishield, Vaxzevria, Comirnaty and Spikevax) PRP and PRP-like cases have been described.[5] Regarding post-COVID-19 infection-induced PRP, we identified two previously reported cases.[6] Given the existing literature and close temporal association with COVID-19 vaccination/infection, we suggest a causal relationship in the present case.[5–7] Moreover, PRP presents an exceedingly rare condition arguing against a chance association. Interestingly, the breakthrough COVID-19 infection observed here occurred very shortly after booster vaccination. Consequently, we can only speculate that an immune response of massively increased magnitude was the cause for the dramatic clinical picture observed in the present patient, possibly with a genetic predispostion for PRP.

The pathophysiologic link between psoriasis and PRP suggests that interleukin 23 (IL-23)-directed treatment regimens, which are very successfully used for psoriasis patients, might be beneficial for patients with PRP as well. Indeed, NF-κB signalling has been shown to be upregulated in the skin of patients with PRP and *CARD14* mutations. Thus, elevated NF-κB activity leads to the production of IL-23 by dendritic cells which contribute to the maintenance of the chronic inflammatory loop in psoriasiform diseases such as PRP.[8–10] Conclusively, we report the first case of severe and recalcitrant PRP in close association with COVID-19 booster vaccination and concomitant breakthrough COVID-19 infection.

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Conflict of interest

None declared.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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References

1 Lladó I, Butrón B, Sampedro-Ruiz R, Fraga J, de Argila D. Pityriasis rubra pilaris after Vaxzevria® COVID-19 vaccine. *J Eur Acad Dermatol Venereol* 2021; **35**: e833–e835.
2 Nagai H, Jimbo H, Matsuura S, Tatsuoka S, Shiraki E, Nishigori C. Successful treatment of pityriasis rubra pilaris with guselkumab: serum CCL20 as a potential marker for the disease activity. *Dermatol Ther* 2020; **33**: e14403.
3 Craiglow BG, Boyden LM, Hu R, Virtanen M *et al.* CARD14-associated papulosquamous eruption: a spectrum including features of psoriasis and pityriasis rubra pilaris. *J Am Acad Dermatol* 2018; **79**: 487–494.
4 Wang D, Chong VC, Chong WS, Oon HH. A review on pityriasis rubra pilaris. *Am J Clin Dermatol* 2018; **19**: 377–390.
5 Hunjan MK, Roberts C, Karim S, Hague J. Pityriasis rubra pilaris-like eruption following administration of the BNT163b2 (Pfizer-BioNTech) mRNA COVID-19 vaccine. *Clin Exp Dermatol* 2022; **47**: 188–190.
6 Aguilar-Gamboa FR, Cubas-Alarcon D, Villegas-Chiroque M, Failoc-Rojas VE. Pityriasis rubra pilaris post-infection due COVID-19: case report. *Colomb Med (Cali)* 2021; **52**: e7014577.
7 Gambichler T, Boms S, Susok L *et al.* Cutaneous findings following COVID-19 vaccination: review of world literature and own experience. *J Eur Acad Dermatol Venereol* 2022;**36**:172–180.
8 Israel L, Mellett M. Clinical and genetic heterogeneity of CARD14 mutations in psoriatic skin disease. *Front Immunol* 2018; **9**: 2239.
9 Tan SW, Tam YC, Oh CC. Skin manifestations of COVID-19: a worldwide review. *JAAD Int* 2021; **2**: 119–133.
10 Langley RG, Tsai TF, Flavin S *et al.* Efficacy and safety of guselkumab in patients with psoriasis who have an inadequate response to ustekinumab: results of the randomized, double-blind, phase III NAVIGATE trial. *Br J Dermatol* 2018; **178**: 114–123.

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