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CASE STUDY

Pityriasis rubra pilaris following administration of SARS-CoV-2 vaccine

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Pityriasis rubra pilaris (PRP) is a rare, chronic, inflammatory dermatosis characterized by follicular, hyperkeratotic papules and palmoplantar keratoderma at any age. The exact etiology of the disease remains unknown, but it can be triggered by multiple factors and genetic backgrounds. Here, we describe a case of PRP occurring after SARS-CoV-2 vaccination. While the vaccination is generally safe, it should be kept in mind that PRP may be evoked by SARS-CoV-2 vaccination for early recognition of the cause and prognosis of the patients.

KEYWORD
adverse drug eruptions

Pityriasis rubra pilaris (PRP) is a rare, chronic, inflammatory dermatosis characterized by follicular, hyperkeratotic papules and palmoplantar keratoderma at any age.[1] The exact etiology of the disease remains unknown, but it can be triggered by multiple factors and genetic backgrounds.[1] Here, we describe a case of PRP occurring after SARS-CoV-2 vaccination.

A 64-year-old Japanese man presented to our department with a widespread, scaly, papulosquamous eruption following the administration of BNT162b2 COVID-19 vaccine (Pfizer-BioNTech). He noticed an asymptomatic rash on his lower limbs within a week after the second dose. The eruption remained thereafter at a low level, but 7 months later, when he received the third dose of the same vaccination, it extended to the trunk in a few days. On examination, the patient had a papulosquamous eruption on the lower legs (Figure 1A) and forearms. Hyperkeratosis was accentuated with follicular papules (Figure 1B). The same papules were also observed on the trunk (Figure 1C), and palmoplantar hyperkeratosis was not found. Routine laboratory parameters were within normal limits. Histological examination of skin biopsy revealed hyperkeratosis with alternating parakeratosis and orthokeratosis, follicular plugging, and perivascular inflammatory infiltrates in the upper dermis (Figure 1D). By immunostaining, $CD4^+$ T cells (Figure 1E) outnumbered $CD8^+$ T cells. Thus, the diagnosis of PRP was made. There was no personal or family history of skin disorders. The patient was treated with etretinate, 25 mg daily, followed by topical calcipotriol. His lesions were partially improved with the therapies in 2 months.

The patient's clinical course strongly suggested the association of PRP with the vaccination. Nine cases of PRP occurring after SARS-CoV-2 vaccination, including our case, have been documented to date[2–7] (Table 1). They were aged 51–82 years, and the vaccine types administered were various. In 6 out of 9 cases, PRP occurred following the first vaccination, but 5 patients developed PRP or showed its deterioration upon injection of the second dose.[2–7] The time to the onset of PRP ranges from 3 days to 4 weeks.[2–7] PRP was improved with acitretin,[2,7] topical and/or oral corticosteroids,[2,4–7] and methotrexate.[5] Our patient was partially relieved with etretinate. According to these PRP cases, there are no clear clinical differences between the vaccination-triggered PRP and conventional PRP. However, lack of palmoplantar hyperkeratosis may be a characteristic feature in vaccination-associated PRP as seen in some of the reported cases including ours.

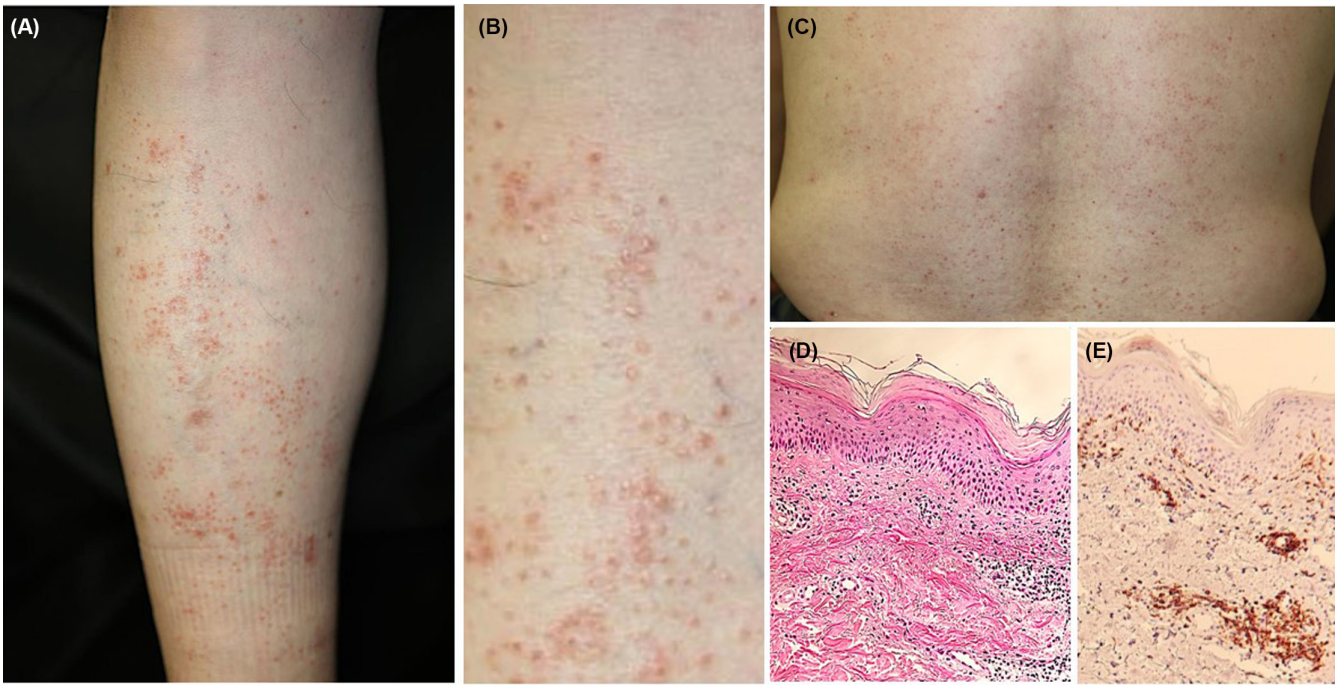

FIGURE 1 Clinical and histopathological features. Appearance of PRP on the lower leg (A), its close inspection (B), and on the back (C). Histopathology, showing hyperkeratosis with alternating parakeratosis and orthokeratosis, follicular plugging and perivascular inflammatory infiltrates in the upper dermis (D, HE staining, original magnification ×100). Immunostaining for CD4 (E, ×100).

TABLE 1 Reported patients with PRP following SARS-Cov-2 vaccination.

Reported case	Age/sex	Vaccine type	Dose and time to onset	Therapies and outcome	Palmoplantar hyperkeratosis
Hunjan et al.[2]	51 years/M	mRNA vaccine (BNT162b2, Pfizer-BioNTech)	1st (2nd deteriorated), 3 days	Improved with oral retinoid and topical corticosteroid	−
Lladó et al.[3]	63 years/F	Recombinant adenoviral vector (Vaxzevria, AstraZeneca)	1st, 9 days	Worsened with oral retinoid	+
Sehni et al.[4]	72 years/F	Recombinant adenoviral vector (Vaxzevria, AstraZeneca)	1st (2nd recurred), 3 weeks	Totally cleared with topical corticosteroid and emollient	+
Sechi et al.[5]	62 years/F	mRNA vaccine (BNT162b2, Pfizer-BioNTech)	1st, 5 days	Improved with oral and corticosteroids	−
Sechi et al.[5]	82 years/F	mRNA vaccine (mRNA-1273, Moderna)	1st, 7 days	Improved with methotrexate	+
Fernández et al.[6]	59 years/M	Inactivated virus vaccine (CoronaVac, Sinovac Life Science)	2nd, 4 days	Improved with topical corticosteroid	+
Fernández et al.[6]	56 years/M	Inactivated virus vaccine (CoronaVac, Sinovac Life Science)	2nd, 4 weeks	Totally cleared with topical corticosteroid	+
Wada et al.[7]	65 years/M	Recombinant adenoviral vector (Vaxzevria, AstraZeneca)	1st, 2 days	Improved with oral retinoid	+
Our case	64 years/M	mRNA vaccine (BNT162b2, Pfizer-BioNTech)	2nd (3rd deteriorated), within a week	Partially improved with oral retinoid	−

The mechanism underlying the development of PRP in individuals receiving SARS-CoV-2 vaccination remains unelucidated. Given that PRP shares the pathogenesis with psoriasis and is mediated by Th17 cells,[8] it is an issue whether the vaccination can induce Th17 activation. Interestingly, it has been reported that Th17 cells enhance immune reactions in both coronavirus

infection and vaccination.[9] Accordingly, a considerable number of patients with psoriasis showing SARS-CoV-2 vaccine-exacerbated psoriatic lesions have been documented.[10] While the vaccination is generally safe even in biologics-treated psoriasis patients, it should be kept in mind that PRP may be evoked by the vaccination for early recognition of the cause and prognosis of the patients.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed.

ETHICS STATEMENT

Approval of the research protocol: N/A.
Informed Consent: N/A.
Registry and the Registration No.: N/A.
Animal Studies: N/A.

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