Dear Editor,

We have observed two patients who developed painful pernio-like plaques on fingers and/or toes after vaccination against severe acute respiratory corona virus type 2 (SARS-CoV-2), resembling corona virus disease (COVID) toes or fingers.

The first patient was a 78-year-old woman with no history of rheumatic disease, Raynaud syndrome, or perniones, who presented with painful erythematous plaques on the distal part of all her fingers 4 days after booster vaccination (third shot) with the mRNA BONT162b2 vaccine (BioNTech–Pfizer). She presented with nail involvement on the second right digit. There was an interruption of the production of the nail plate. The nails of other affected digits remained normal. The cutaneous lesions persisted for between 2 and 8 weeks after vaccination (Fig. 1a).

The second patient—a 67-year-old woman—presented with erythematous plaques on the distal phalanx of the toes (Digits I–IV). She had had a COVID-19 disease in early summer of the previous year and got vaccinated later with the mRNA BONT162b2 vaccine (BioNTech–Pfizer) in September. With a delay of 4 weeks after the second shot, these painful lesions developed (Fig. 1b). She had no history of rheumatic disease or Raynaud syndrome. The lesions persisted for about 4 weeks. Skin biopsy was rejected by both patients.

These patients had no history of microembolism, thrombosis, or vascular disease. Antinuclear antibodies were negative as well. They had no systemic complaints in association with the pernio-like eruptions and no clinical signs of an active SARS-CoV-2 infection. Serologic antibody tests and real-time polymerase chain reaction (PCR) remained negative at the time of first presentation. The negative antibody test might indicate a lack of appropriate immune response to vaccination. Whether an impaired immune response is crucial for development of post-vaccination COVID toes and fingers requires further investigation. One should keep in mind that many patients with COVID toes and fingers without vaccination were negative as well.

Both patients were treated twice daily with topical corticosteroids (mometasone or prednicarbate ointment) with limited effect within 2 weeks. After consultation, the first patient used an occlusive dressing to increase efficacy, which resulted in a partial remission after 5 weeks. The second patient stopped topical corticosteroids after 3 weeks but reported a spontaneous improvement after 8 weeks.

Discussion

COVID toes and fingers, also known as pernio-like lesions or acute pseudoperniones, have been observed in patients infected with SARS-CoV-2 and in especially young patients without positive serology. It has been discussed that the underlying alterations of small cu-

Fig. 1 COVID-like finger (a) and toes (b).
Table 1  COVID toes and fingers after vaccination against SARS-CoV-2

| Patient               | Vaccination | Time frame | Treatment                        | Outcome            | Ref |
|-----------------------|-------------|------------|----------------------------------|--------------------|-----|
| 82-year-old woman     | BNT162b2, 1st shot | 24h        | n. d.                            | n. d.              | [5] |
| 76-year-old man       | mRNA1273, 2nd shot | 1 week     | Aspirin 81 mg/d                  | CR after 6 weeks   | [6] |
| 41-year-old woman     | BNT162b2, 1st shot | 4 days     | Apixaban, low-dose aspirin       | CR after 150 days  | [7] |
| 60-year-old woman     | BNT162b2, 2nd shot | 14 days    | None                             | CR after 2 days    | [8] |
| 46-year-old woman     | BNT162b2, 2nd shot | 14 days    | Clobetasol                       | PR                 | [9] |
| 56-year-old woman     | AZD1222, 1st shot | 14 days    | Systemic corticosteroids         | CR                 | [10]|
| 64-year-old woman     | BNT1612b2, 2nd shot | 3 days     | Clobetasol                       | Stable disease     | [11]|
| 75-year-old woman     | BNT1612b2, 1st shot | 5 days     | n. d.                            | n. d.              | [12]|
| 42-year-old male      | BNT162b2, 1st shot | 12 days    | n. d.                            | n. d.              | [13]|
| 3 patients            | BNT162b2, 1st shot | n. d.      | n. d.                            | n. d.              | [4] |
| 2 patients            | BNT162b2, 2nd shot | n. d.      | n. d.                            | n. d.              | [4] |
| 3 patients            | AZD1222, 1st shot | n. d.      | n. d.                            | n. d.              | [4] |
| 78-year-old woman     | BNT162b2, 3rd shot | 4 days     | Mometasone                       | PR after 5 weeks   | present study |
| 67-year-old woman     | BNT162b2, 2nd shot | 4 weeks    | Prednicarbate                     | CR after 8 weeks   | present study |

n. d. no data available, CR complete remission, PR partial remission

*Present study

The lesions develop between 3 days to 4 weeks after vaccination. Pernio-like lesions persist for up to 8 weeks. Pain is not always present [11]. Histologic data demonstrated a dense lymphocytic perivascular infiltrate and some prominent endothelial cells, and interface dermatitis [5, 6]. If the adverse event was noted after the first shot, a second shot could be tolerated without a relapse, as reported by some authors [13]. Knowledge of such adverse events after COVID-19 vaccination is important. Since most cases demonstrate complete clearance, some even without any treatment, the prognosis is excellent.

Declarations
Conflict of interest  U. Wollina declares that he has no competing interests.

Ethical standards All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. The patients gave their informed consent prior to their inclusion in the study.

References
1. Wollina U, Chiriac A, Kocic H, et al. Cutaneous and hypersensitivity reactions associated with COVID-19 vaccination-a narrative review. Wien Med Wochenschr. 2022;172(3–4):63–9.
2. Ganatra B, Amarnani R, Alfallouji Y, et al. Patient characteristics in tardive COVID-19 pseudoperniosis: a case series of 16 patients. Clin Exp Dermatol. 2022;47(2):399–403.
3. Molae H, Emadi SN, Imunya MJMN, et al. Chilblain or perniosis-like skin lesions in children during the COVID-19 pandemic: a systematic review of articles. Dermatol Ther. 2022;35(3):e15298.
4. McMahon DE, Amerson E, Rosenbach M, et al. Cutaneous reactions reported after Moderna and Pfizer COVID-19 vaccination: a registry-based study of 414 cases. J Am Acad Dermatol. 2021;85(1):46–55.
5. Lesort C, Kanitakis J, Donzier L, Jullien D. Chilblain-like lesions after BNT162b2 mRNA COVID-19 vaccine: a case report suggesting that ‘COVID toes’ are due to the immune reaction to SARS-CoV-2. J Eur Acad Dermatol Venereol. 2021;35(10):e630–2.
6. Kelso JM, Coda AB, Keating RM, Vaccari DM. “COVID toes” after mRNA COVID-19 vaccines. J Allergy Clin Immunol Pract. 2021;9(8):3196–7.
7. Davido B, Mascitti H, Fortier-Beaulieu M, et al. ‘Blue toes’ following vaccination with the BNT162b2 mRNA COVID-19 vaccine. J Travel Med. 2021;28(4):taa24.
8. Cameli N, Silvestri M, Mariano M, et al. Pernio-like skin lesions after the second dose of Pfizer-BioNTech COVID-19 vaccine. J Eur Acad Dermatol Venereol. 2021;35(11):e725–e7.
9. Qiao JW, Dan Y, Wolf ME, et al. Post-vaccination COVID toes (chilblains) exacerbated by [1093] rituximab infusion suggests interferon activation as mechanism. Mil Med. 2021; https://doi.org/10.1093/milmed/usab314.
10. Van Loon A, Mortelmans D, Siozopoulou V, et al. A first case of ‘Covid toes’ from a viral vector-based COVID-19 vaccine. J Eur Acad Dermatol Venereol. 2022; https://doi.org/10.1111/jdv.17948.
11. López S, Vakharia P, Vandergriff T, et al. Pernio after COVID-19 vaccination. Br J Dermatol. 2021;185(2):445–7.
12. Pérez-López J, Gil-Villalba A, Ruiz-Villaverde R. Perniosis-like lesions after vaccination with mRNA against COVID-19. Med Clin (Barc). 2022;158(4):189–90.
13. Pileri A, Guglielmo A, Raone B, Patrizi A. Chilblain lesions after COVID-19 mRNA vaccine. Br J Dermatol. 2021;185(1):e3.

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