Editor's key points

- An increasing prevalence of cutaneous presentations of severe acute respiratory syndrome coronavirus 2 infection has been reported globally. The authors review the literature on cutaneous diseases associated with the global coronavirus disease 2019 (COVID-19) pandemic and provide a general approach for family physicians to diagnose and manage changing dermatologic presentations associated with COVID-19.
- Various skin conditions might be directly related to COVID-19, or indirectly related because of behavioural changes, specifically with regard to use of personal protective equipment and frequent sanitization. Topical medications and preventive strategies are suggested.
- Psychiatric stressors contribute to additional dermatologic presentations and exacerbation of pre-existing skin disease.

The COVID-19 pandemic and its skin effects

Anthony Zara MSc Patrick Fleming MD MSc FRCPC
Kyle Lee BM BS CCFP Charles Lynde MD FRCPC

Abstract

Objective To review the current literature on cutaneous diseases associated with the global coronavirus disease 2019 (COVID-19) pandemic, and to provide a general overview for family physicians of dermatologic presentations associated with COVID-19.

Quality of evidence Google Scholar and PubMed searches were conducted using the terms *COVID-19, SARS-CoV-2, pandemic, dermatology, livedoid, chilblain, urticaria, maculopapular, Kawasaki's,* and *related synonyms.* Additional terms were personal protective equipment (PPE), hand hygiene, and psychosocial factors affecting skin diseases. Only English-language literature was reviewed. Evidence ranged from levels I to III.

Main message Coronavirus disease 2019 is associated with a range of cutaneous presentations through direct infection with severe acute respiratory syndrome coronavirus 2, such as maculopapular, vesicular, pseudo-chilblain, livedoid, necrotic, urticarial, and Kawasaki-like rashes. Indirect presentations secondary to behavioural modifications are associated with use of personal protective equipment and sanitization procedures. Furthermore, psychosocial factors and stress associated with the pandemic also exacerbate pre-existing skin conditions.

Conclusion The COVID-19 pandemic has increased rates of dermatologic conditions through direct infection, behavioural changes, and association with psychosocial factors. As the incidence of COVID-19 increases, family physicians should be well equipped to diagnose and manage dermatologic presentations as they change within the context of the pandemic.

La pandémie de la COVID-19 et ses effets dermatologiques

Anthony Zara MSc Patrick Fleming MD MSc FRCPC
Kyle Lee BM BS CCFP Charles Lynde MD FRCPC

Résumé

Objectif Passer en revue les ouvrages scientifiques récents sur les maladies cutanées liées à la pandémie mondiale de la maladie à coronavirus 2019 (COVID-19), et présenter aux médecins de famille un aperçu général des manifestations dermatologiques associées à la COVID-19.

Qualité des données Une recherche documentaire a été effectuée à l'aide de Google Scholar et de PubMed à l'aide des expressions en anglais *COVID-19, SARS-CoV-2, pandemic, dermatology, livedoid, chilblain, urticaria, maculopapular, Kawasaki* et de synonymes connexes. Parmi les autres expressions utilisées, on peut mentionner l'équipement de protection individuelle (EPI), l'hygiène des mains et les facteurs psychosociaux qui affectent les maladies cutanées. Seule la documentation en anglais a fait l'objet de la revue. La qualité des données probantes était de niveaux I à III.

Message principal La maladie à coronavirus 2019 est liée à diverses manifestations cutanées à la suite d'une infection directe au coronavirus 2 du syndrome respiratoire aigu sévère, comme des éruptions maculopapuleuses, vésiculaires, livedoïdes, nécrotiques, urticariennes, des pseudo-engelures et des éruptions de type Kawasaki. Des manifestations indirectes, secondaires à des modifications comportementales, sont associées à l'utilisation de l'équipement de protection individuelle et aux procédures de désinfection. En outre, des facteurs psychosociaux et le stress associé à la pandémie exacerbent aussi des problèmes dermatologiques préexistants.

Conclusion La pandémie de la COVID-19 a augmenté les taux de problèmes dermatologiques par l'entremise d'une infection directe, de changements comportementaux et d'une association avec des facteurs psychosociaux. Au moment où s'accroît l'incidence de la COVID-19, les médecins de famille devraient être bien préparés pour diagnostiquer et prendre en charge les manifestations dermatologiques à mesure qu'elles changent dans le contexte de la pandémie.

Points de repère du rédacteur

- Une prévalence croissante des manifestations cutanées à la suite d'une infection au coronavirus 2 du syndrome respiratoire aigu sévère a été signalée dans le monde entier. Les auteurs passent en revue les ouvrages scientifiques sur les maladies cutanées liées à la pandémie mondiale de la maladie à coronavirus 2019 (COVID-19), et proposent aux médecins de famille une approche générale pour diagnostiquer et prendre en charge les présentations dermatologiques associées à la COVID-19.
- Divers problèmes de peau peuvent être directement liés à la COVID-19, ou indirectement liés en raison de changements comportementaux, plus particulièrement en relation avec l'utilisation de l'équipement de protection individuelle et les désinfections fréquentes. Au nombre des interventions suggérées figurent des médicaments topiques et des stratégies de prévention.
- Des facteurs de stress d'ordre psychiatrique contribuent à des manifestations dermatologiques additionnelles et à l'exacerbation de maladies de la peau préexistantes.

An increasing prevalence of cutaneous presentations of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection has been reported globally.[1-3] Cutaneous presentations have also been associated with behavioural changes such as use of personal protective equipment (PPE) and following hand hygiene recommendations.[4-7] Finally, acute exacerbations of chronic skin conditions have been associated with psychosocial stressors secondary to the pandemic.[8]

Data on the cutaneous presentations of SARS-CoV-2 continue to evolve.[9] The objective of this article is to review the current literature on cutaneous diseases associated with the global coronavirus disease 2019 (COVID-19) pandemic, and to provide a general approach for family physicians to diagnose and manage changing dermatologic presentations associated with COVID-19.

Quality of evidence

A literature search was conducted using Google Scholar and PubMed on the effects of COVID-19 specifically related to skin disease and dermatology. Terms searched include permutations of *COVID-19, SARS-CoV-2, pandemic, dermatology, livedoid, chilblain, urticaria, maculopapular, Kawasaki's,* and related synonyms. Additional searches involved *skin conditions related to personal protective equipment (PPE), hand hygiene,* and *psychosocial factors affecting skin diseases.* Only English-language literature was reviewed. Evidence ranged from levels I to III.

Main message

Direct cutaneous effects of SARS-CoV-2 infection. A survey of 375 Spanish patients with COVID-19 with cutaneous presentations led to 5 main clinical patterns: maculopapular eruption, vesicular eruption, pseudo-chilblain, livedo or necrosis, and urticarial lesions[10] (**Box 1**).[10-26] Later cases have involved purpuric flexural lesions, herpes zoster co-infections, and Kawasaki-like syndrome.[10,25,26] These clinical features have been included in the diagnosis of SARS-CoV-2.[27] Galván Casas et al have proposed that differences within the SARS-CoV-2 virus itself, as well as host-dependent factors, contribute to the range of cutaneous presentations.[10] Furthermore, some of the distribution patterns suggest co-infection with parvovirus[28] and herpes zoster.[29,30] A prospective study found that more than 7% of patients testing positive for COVID-19 developed COVID-19–related skin manifestations—primarily erythematous rash and diffuse urticaria.[31] A recent systematic review reported the prevalence of cutaneous presentations to vary from 0.19% to 20.45%.[32] The relatively low prevalence of cutaneous presentations contributes to challenges in diagnosis.

Box 1. Cutaneous presentations in patients with coronavirus disease 2019

Skin condition
- Maculopapular eruption
  - -Pityriasis rosea–like[11,12]
  - -Perifollicular eruption[10]
  - -Erythema multiforme–like[13]
  - -Purpuric eruptions[14]
  - -Morbilliform eruptions[15,16]
  - -Palmar erythema[17]
- Vesicular eruption[18]
- Pseudo-chilblains[19-21]
- Livedoid or necrotic lesions[22]
- Urticarial lesions[23,24]
- Kawasaki-like syndrome[25,26]

Maculopapular eruption. In the Spanish study, almost half of COVID-19 patients with cutaneous findings presented with maculopapular eruptions.[10] It is unclear whether this maculopapular rash is associated with severity of disease.[10,27,33] The differential diagnoses include measles, Epstein-Barr virus, drug-induced exanthema, and graft-versus-host disease.[33] Biopsy results showed histologic features consistent with viral infection, with patterns uncharacteristic of a single virus.[34,35] Additional investigation on skin biopsies with polymerase chain reaction (PCR) has been suggested to further differentiate these presentations.[34] Specific subtypes of these maculopapular rashes are listed in **Box 1**.[10-26]

Vesicular eruption. Vesicular eruptions occurred most commonly before the onset of other COVID-19 symptoms and were associated with moderate disease severity.[10] Distribution might be truncal with or without pruritus.[36] Typical lesions present as varicella-like and hemorrhagic vesicles.[3,10] Differential diagnoses include varicella zoster virus infection and generalized exanthematic pustulosis.[33] Tzanck test, viral culture or PCR, or skin biopsy might be required to rule out other viral infections or co-infection.[37]

Pseudo-chilblain. Coronavirus disease 2019 contributes to vascular disease leading to abnormal clotting and increased vasoconstriction.[38,39] Pseudo-chilblain lesions ("COVID-toes") might be a result of this vasoconstriction, with acral ischemia leading to swollen, erythematous, and painful digits[40] (**Figure 1**). The differential diagnoses include chilblain and chilblain lupus erythematosus.[33] Pseudo-chilblain lesions occur later in the COVID-19 disease course and have been associated with milder disease. Pseudo-chilblain lesions improve without scarring on average 2 weeks from initial onset.[10] While more common in younger patients—a preliminary study[41] of 63 patients reported the median age of patients with pseudo-chilblain to be 14—individual cases in older patients up to age 91 have also been reported.[42] More than 90% of patients with pseudo-chilblain in a French study had negative results on either reverse transcriptase PCR or serology for SARS-CoV-2.[43] In a

Figure 1. Clinical presentation of pseudo-chilblain lesions in a 19-year-old male patient

different study of 318 patients with pseudo-chilblain, 7% (23 of 318) had positive COVID-19 test results.[44] Delays with laboratory confirmatory testing might have affected the prevalence of patients with COVID-19 who had pseudo-chilblain lesions.

Livedoid or necrotic lesions. Similar to pseudo-chilblain phenomena, it is hypothesized that livedo reticularis is the result of the effects of COVID-19 on cutaneous microvasculature, with thromboses effectively reducing blood flow.[22] Differential diagnosis of livedoid lesions includes all forms of livedoid vasculopathy and vasculitis.[23] Although other viruses have been reported as secondary causes of livedo reticularis,[45] it is unclear whether livedoid lesions might be primary to SARS-CoV-2 infection, or if they could reflect other vascular occlusion complications of COVID-19.[23] These livedoid lesions were unilateral, nonpruritic, blanching, and transient in nature.[46] Necrotic lesions were more common in adults with a severe course of COVID-19, indicating such lesions might be useful as a prognostic indicator.[10,22]

Urticarial lesions. Urticarial rash presented before or concurrently with other typical COVID-19 symptoms, and improved when treated with oral antihistamines.[10,24,47] Urticarial lesions were associated with severe disease and were pruritic in almost all patients in one study.[10] Acute idiopathic urticaria and urticarial drug-induced rash are among the differential diagnoses.[33]

Kawasaki-like syndrome. Pediatric cases of COVID-19 have been noted,[48,49] with up to 2.0% prevalence in a study based in the United Kingdom.[50] Kawasaki-like syndrome in this population has been associated with COVID-19.[51,52] While the exact cause of Kawasaki disease is unclear, evidence suggests an immune cascade triggered by an infectious agent.[53] There is some evidence to support the role of human coronaviruses as a causative infectious agent in Kawasaki disease.[54] The immune cascade triggered produces an acute vasculitis of medium-calibre vessels causing a polymorphous exanthem, oral mucosal changes, and perineal accentuation.[55,56] Clinical and laboratory features in patients with COVID-19 differed slightly from those of typical Kawasaki disease, therefore the term *Kawasaki-like* has been used to distinguish these patients.[52]

Indirect cutaneous findings due to behavioural changes. Indirect effects of the COVID-19 pandemic are precipitated through behavioural changes—specifically with regard to PPE use and frequent sanitization (**Table 1**).[57-60] A large proportion of both health care workers and the general population reported adverse skin reactions,[6,61,62] such as hand dermatitis secondary to hand hygiene recommendations.[60,63] Increased use of masks and goggles has been associated with pressure injury, facial dermatitis, xerosis, and aggravation of pre-existing skin conditions.[64] The use of hand emollients or detergents with moisturizing ingredients immediately after hand hygiene, appropriately fitted gloves and masks, as well as appropriate nasal and oral mucosa protection, are beneficial.[64] Contact dermatitis can be treated with topical corticosteroids and emollients.

Worsening of pre-existing skin conditions. The association between cutaneous disease and psychiatric conditions such as acute stress, depression, and anxiety has been discussed[65] (**Box 2**).[33,66-76] Health care workers are an especially at-risk population during the COVID-19 pandemic.[77] Chronic psychosocial stressors secondary to restrictive measures of the pandemic might be associated with stress-responsive skin conditions such as alopecia, psoriasis, urticaria, chronic urticaria, and atopic dermatitis[78]; however, further studies are required to clarify the complex neuroendocrine and inflammatory mechanisms.[78,79] Counseling for patients on immunomodulatory medications (such as biologics for psoriasis and atopic dermatitis) is important to prevent abrupt discontinuation of treatment and acute exacerbation of disease, especially as there is some limited evidence that patients taking these medications are not more susceptible to COVID-19.[80,81] Chronic skin disease follow-up and education is essential to prevent disease progression or exacerbation.[8]

Conclusion

Patients with COVID-19 can present with myriad clinical features or secondarily owing to adverse drug reaction or co-infection. Other public health measures such as PPE, hand hygiene, and psychiatric stressors contribute to additional dermatologic presentations and exacerbation of pre-existing skin disease. Patient education on prevention and further research into dermatologic presentations of SARS-CoV-2 are recommended.

Table 1. Indirect cutaneous effects of the COVID-19 pandemic

SKIN CONDITION	FIRST-LINE TOPICAL THERAPIES	METHODS OF PROTECTION
PPE use[57-59]		
• Acne	BPO, retinoids, active-ingredient wash	• Ensure proper mask fit • Barrier creams* • Protective coatings • PPE breaks
• Rosacea	Ivermectin, metronidazole	
• Facial pressure injuries	Mild TCS, TCI	
• Atopic dermatitis	Mild TCS, TCI, PDE4i	
• Seborrheic dermatitis	Antifungals, mild TCS	
Frequent hand-washing or use of alcohol-based sanitizer[60]		
• Irritant contact dermatitis	Mild TCS, TCI, PDE4i	• Barrier creams* • Emollients*

BPO—benzoyl peroxide, COVID-19—coronavirus disease 2019, PDE4i—phosphodiesterase-4 inhibitor, PPE—personal protective equipment, TCI—topical calcineurin inhibitor, TCS—topical corticosteroid.
*Creams and emollients suited for protection against these conditions are noncomedogenic, pH balanced, and fragrance free.

Box 2. Skin conditions associated with psychosocial factors

Hair loss
- Telogen effluvium[66]
- Trichotillomania[67]
- Androgenic alopecia[33,68-70]
- Alopecia areata[71,72]

Psoriasis
- Drug-induced flare[73]
- Cessation of systemic therapy[74]

Dermatitis
- Hand eczema[75]
- Atopic dermatitis[76]
- Generalized pruritus

Anthony Zara is Clinical Research Coordinator at Lynde Dermatology in Markham, Ont. **Dr Patrick Fleming** is a dermatologist at Lynde Dermatology and Assistant Professor in the Division of Dermatology at the University of Toronto in Ontario. **Dr Kyle Lee** is a family physician in the Department of Family and Community Medicine at St Michael's Hospital in Toronto. **Dr Charles Lynde** is the founder of Lynde Dermatology and Associate Professor in the Division of Dermatology at the University of Toronto.

Contributors

Anthony Zara contributed to conceptualization, reviewing the literature, manuscript preparation, and editing. **Drs Patrick Fleming, Kyle Lee,** and **Charles Lynde** contributed to conceptualization and editing. All authors approved the final submission.

Competing interests

Anthony Zara has no competing interests to declare. **Dr Kyle Lee** has received honoraria, consulting fees, or advisory board fees from Bausch Health, Eli Lilly, Elvium, Eisai, and Pfizer. **Dr Patrick Fleming** has received honoraria or consulting, advisory board, or speaking fees from AbbVie, Altius, Aralez, Bausch Health, Cipher, Galderma, Eli Lilly, UCB, Janssen, Novartis, Pfizer, and Sanofi Genzyme. **Dr Charles Lynde** has been a speaker, consultant, or private investigator for AbbVie, Allergan, Amgen, Aralez, Arcutis, Bausch Health, Bayer, Boehringer Ingelheim, Celgene, Cipher, Dermavant, Eli Lilly, Galderma, Genentech, Glenmark, GlaxoSmithKline, Innovaderm, Janssen, Kyowa, L'Oréal, LEO Pharma, Merck, Medexus, Mylan, Novartis, Pediapharm, Pfizer, Procter and Gamble, Roche, Sandoz, Sanofi Aventis, Sanofi Genzyme, Stiefel, Teva, and Valeant.

Correspondence

Dr Charles Lynde; e-mail **derma@lynderma.com**

References

1. Lai CC, Ko WC, Lee PI, Jean SS, Hsueh PR. Extra-respiratory manifestations of COVID-19. *Int J Antimicrob Agents* 2020;56(2):106024. Epub 2020 May 22.
2. Freeman EE, McMahon DE, Lipoff JB, Rosenbach M, Kovarik C, Desai SR, et al. The spectrum of COVID-19-associated dermatologic manifestations: an international registry of 716 patients from 31 countries. *J Am Acad Dermatol* 2020;83(4):1118-29. Epub 2020 Jul 2.
3. Recalcati S. Cutaneous manifestations in COVID-19: a first perspective. *J Eur Acad Dermatol Venereol* 2020;34(5):e212-3.
4. Harper CA, Satchell LP, Fido D, Latzman RD. Functional fear predicts public health compliance in the COVID-19 pandemic. *Int J Ment Health Addict* 2020 Apr 27. Epub ahead of print.
5. Gössling S, Scott D, Hall CM. Pandemics, tourism and global change: a rapid assessment of COVID-19. *J Sustain Tour* 2020 Apr 27. Epub ahead of print.
6. Lan J, Song Z, Miao X, Li H, Li Y, Dong L, et al. Skin damage among health care workers managing coronavirus disease-2019. *J Am Acad Dermatol* 2020;82(5):1215-6. Epub 2020 Mar 18.
7. Kantor J. Behavioral considerations and impact on personal protective equipment use: early lessons from the coronavirus (COVID-19) pandemic. *J Am Acad Dermatol* 2020;82(5):1087-8. Epub 2020 Mar 18.
8. Villani A, Scalvenzi M, Fabbrocini G. Teledermatology: a useful tool to fight COVID-19. *J Dermatolog Treat* 2020;31(4):325. Epub 2020 Apr 13.
9. Young S, Fernandez AP. Skin manifestations of COVID-19. *Cleve Clin J Med* 2020 May 14. Epub ahead of print.
10. Galván Casas C, Català A, Carretero Hernández G, Rodríguez-Jiménez P, Fernández-Nieto D, Rodríguez-Villa Lario A, et al. Classification of the cutaneous manifestations of COVID-19: a rapid prospective nationwide consensus study in Spain with 375 cases. *Br J Dermatol* 2020;183(1):71-7. Epub 2020 Jun 10.
11. Ehsani AH, Nasimi M, Bigdelo Z. Pityriasis rosea as a cutaneous manifestation of COVID-19 infection. *J Eur Acad Dermatol Venereol* 2020;34(9):e436-7. Epub 2020 Jun 11.
12. Labé P, Ly A, Sin C, Nasser M, Chapelon-Fromont E, Ben Saïd P, et al. Erythema multiforme and Kawasaki disease associated with COVID–19 infection in children. *J Eur Acad Dermatol Venereol* 2020;34(10):e539-41. Epub 2020 Jul 6.
13. Jimenez-Cauhe J, Ortega-Quijano D, Carretero-Barrio I, Suarez-Valle A, Saceda-Corralo D, Moreno-Garcia Del Real C, et al. Erythema multiforme-like eruption in patients with COVID-19 infection: clinical and histological findings. *Clin Exp Dermatol* 2020;45(7):892-5. Epub 2020 Jun 25.
14. Caputo V, Schroeder J, Rongioletti F. A generalized purpuric eruption with histopathologic features of leucocytoclastic vasculitis in a patient severely ill with COVID–19. *J Eur Acad Dermatol Venereol* 2020;34(10):e579-81. Epub 2020 Jul 2.
15. Sachdeva M, Gianotti R, Shah M, Bradanini L, Tosi D, Veraldi S, et al. Cutaneous manifestations of COVID-19: report of three cases and a review of literature. *J Dermatol Sci* 2020;98(2):75-81. Epub 2020 Apr 29.
16. Najarian DJ. Morbilliform exanthem associated with COVID-19. *JAAD Case Rep* 2020;6(6):493-4. Epub 2020 Apr 20.
17. Sokolovsky S, Soni P, Hoffman T, Kahn P, Scheers-Masters J. COVID-19 associated Kawasaki-like multisystem inflammatory disease in an adult. *Am J Emerg Med* 2021;39:253.e1-2. Epub 2020 Jun 25.
18. Fernandez-Nieto D, Ortega-Quijano D, Jimenez-Cauhe J, Burgos-Blasco P, de Perosanz-Lobo D, Suarez-Valle A, et al. Clinical and histological characterization of vesicular COVID-19 rashes: a prospective study in a tertiary care hospital. *Clin Exp Dermatol* 2020;45(7):872-5. Epub 2020 Jun 22.
19. Andina D, Noguera-Morel L, Bascuas-Arribas M, Gaitero-Tristán J, Alonso-Cadenas JA, Escalada-Pellitero S, et al. Chilblains in children in the setting of COVID-19 pandemic. *Pediatr Dermatol* 2020;37(3):406-11. Epub 2020 May 22.
20. Recalcati S, Barbagallo T, Frasin LA, Prestinari F, Cogliardi A, Provero MC, et al. Acral cutaneous lesions in the time of COVID-19. *J Eur Acad Dermatol Venereol* 2020;34(8):e346-7. Epub 2020 May 27.
21. Kanitakis J, Lesort C, Danset M, Jullien D. Chilblain-like acral lesions during the COVID-19 pandemic ("COVID toes"): histologic, immunofluorescence, and immunohistochemical study of 17 cases. *J Am Acad Dermatol* 2020;83(3):870-5. Epub 2020 Jun 2.

22. Manalo IF, Smith MK, Cheeley J, Jacobs R. A dermatologic manifestation of COVID-19: transient livedo reticularis. *J Am Acad Dermatol* 2020;83(2):700. Epub 2020 Apr 10.
23. Gisondi P, Plaserico S, Bordin C, Alaibac M, Girolomoni G, Naldi L. Cutaneous manifestations of SARS-CoV-2 infection: a clinical update. *J Eur Acad Dermatology Venereol* 2020;34(11):2499-504. Epub 2020 Jul 20.
24. Henry D, Ackerman M, Sancelme E, Finon A, Esteve E. Urticarial eruption in COVID-19 infection. *J Eur Acad Dermatology Venereol* 2020;34(6):e244-5.
25. Jones VG, Mills M, Suarez D, Hogan CA, Yeh D, Segal JB, et al. COVID-19 and Kawasaki disease: novel virus and novel case. *Hosp Pediatr* 2020;10(6):537-40. Epub 2020 Apr 7.
26. Toubiana J, Poirault C, Corsia A, Bajolle F, Fourgeaud J, Angoulvant F, et al. Kawasaki-like multisystem inflammatory syndrome in children during the COVID-19 pandemic in Paris, France: prospective observational study. *BMJ* 2020;369:m2094.
27. Gupta S, Gupta N, Gupta N. Classification and pathophysiology of cutaneous manifestations of COVID-19. *Int J Res Dermatol* 2020;6(4):1-5.
28. Mahé A, Birckel E, Krieger S, Merklen C, Bottlaender L. A distinctive skin rash associated with coronavirus disease 2019? *J Eur Acad Dermatol Venereol* 2020;34(6):e246-7. Epub 2020 Jun 8.
29. Elsaie ML, Youssef EA, Nada HA. Herpes zoster might be an indicator for latent COVID 19 infection. *Dermatol Ther* 2020;33(4):e13666. Epub 2020 Jun 11.
30. Tartari F, Spadotto A, Zengarini C, Zanoni R, Guglielmo A, Adorno A, et al. Herpes zoster in COVID-19-positive patients. *Int J Dermatol* 2020;59(8):1028-9. Epub 2020 Jun 12.
31. De Giorgi V, Recalcati S, Jia Z, Chong W, Ding R, Deng Y, et al. Cutaneous manifestations related to coronavirus disease 2019 (COVID-19): a prospective study from China and Italy. *J Am Acad Dermatol* 2020;83(2):674-5. Epub 2020 May 19.
32. Jia JL, Kamceva M, Rao SA, Linos E. Cutaneous manifestations of COVID-19: a preliminary review. *J Am Acad Dermatol* 2020;83(2):687-90. Epub 2020 May 16.
33. Wollina U, Karadağ AS, Rowland-Payne C, Chiriac A, Lotti T. Cutaneous signs in COVID–19 patients: a review. *Dermatol Ther* 2020;33(5):e13549. Epub 2020 May 29.
34. Gianotti R, Zerbi P, Dodiuk-Gad RP. Clinical and histopathological study of skin dermatoses in patients affected by COVID-19 infection in the Northern part of Italy. *J Dermatol Sci* 2020;98(2):141-3. Epub 2020 Apr 30.
35. Kosann MK, Fogelman JP, Stern RL. Kaposi's varicelliform eruption in a patient with Grover's disease. *J Am Acad Dermatol* 2003;49(5):914-5.
36. Marzano AV, Genovese G, Fabbrocini G, Pigatto P, Monfrecola G, Piraccini BM, et al. Varicella-like exanthem as a specific COVID-19–associated skin manifestation: multicenter case series of 22 patients. *J Am Acad Dermatol* 2020;83(1):280-5. Epub 2020 Apr 16.
37. Llamas-Velasco M, Rodríguez-Jiménez P, Chicharro P, De Argila D, Muñoz-Hernández P, Daudén E. Reply to "Varicella-like exanthem as a specific COVID-19-associated skin manifestation: multicenter case series of 22 patients": to consider varicella-like exanthem associated with COVID-19, virus varicella zoster and virus herpes simplex must be ruled out. *J Am Acad Dermatol* 2020;83(3):E253-4. Epub 2020 May 19.
38. Helms J, Tacquard C, Severac F, Leonard-Lorant I, Ohana M, Delabranche X, et al. High risk of thrombosis in patients with severe SARS-CoV-2 infection: a multicenter prospective cohort study. *Intensive Care Med* 2020;46(6):1089-98. Epub 2020 May 4.
39. Klok FA, Kruip MJHA, van der Meer NJM, Arbous MS, Gommers DAMPJ, Kant KM, et al. Incidence of thrombotic complications in critically ill ICU patients with COVID-19. *Thromb Res* 2020;191:145-7. Epub 2020 Apr 10.
40. Freeman EE, McMahon DE, Fitzgerald ME, Fox LP, Rosenbach M, Takeshita J, et al. The American Academy of Dermatology COVID-19 registry: crowdsourcing dermatology in the age of COVID-19. *J Am Acad Dermatol* 2020;83(2):509-10. Epub 2020 Apr 17.
41. Piccolo V, Neri I, Filippeschi C, Oranges T, Argenziano G, Battarra VC, et al. Chilblain-like lesions during COVID-19 epidemic: a preliminary study on 63 patients. *J Eur Acad Dermatol Venereol* 2020;34(7):e291-3. Epub 2020 May 15.
42. Landa N, Mendieta-Eckert M, Fonda-Pascual P, Aguirre T. Chilblain-like lesions on feet and hands during the COVID-19 pandemic. *Int J Dermatol* 2020;59(6):739-43. Epub 2020 Apr 24.
43. Le Cleach L, Dousset L, Assier H, Fourati S, Barbarot S, Boulard C, et al. Most chilblains observed during the COVID-19 outbreak occur in patients who are negative for COVID-19 on polymerase chain reaction and serology testing. *Br J Dermatol* 2020;183(5):866-74. Epub 2020 Aug 9.
44. Freeman EE, McMahon DE, Lipoff JB, Rosenbach M, Kovarik C, Takeshita J, et al. Pernio-like skin lesions associated with COVID-19: a case series of 318 patients from 8 countries. *J Am Acad Dermatol* 2020;83(2):486-92. Epub 2020 May 30.
45. Arslan F, Batirel A, Mert A, Ozer S. Cytomegalovirus (CMV)-related cutaneous necrotizing vasculitis: case report and literature review. *Braz J Infect Dis* 2012;16(5):482-5. Epub 2012 Sep 11.
46. Thomas C. Reply to: "A dermatologic manifestation of COVID-19: transient livedo reticularis." *J Am Acad Dermatol* 2020;83(2):e155-6. Epub 2020 May 7.
47. Fernandez-Nieto D, Ortega-Quijano D, Segurado-Miravalles G, Pindado-Ortega C, Prieto-Barrios M, Jimenez-Cauhe J. Comment on: Cutaneous manifestations in COVID-19: a first perspective. Safety concerns of clinical images and skin biopsies. *J Eur Acad Dermatol Venereol* 2020;34(6):e252-4. Epub 2020 Jun 4.
48. Yonker LM, Shen K, Kinane TB. Lessons unfolding from pediatric cases of COVID-19 disease caused by SARS-CoV-2 infection. *Pediatr Pulmonol* 2020;55(5):1085-6. Epub 2020 Apr 3.
49. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, et al. Epidemiology of COVID-19 among children in China. *Pediatrics* 2020;145(6):e20200702. Epub 2020 Mar 16.
50. Docherty AB, Harrison EM, Green CA, Hardwick H, Pius R, Norman L, et al. Features of 16,749 hospitalised UK patients with COVID-19 using the ISARIC WHO Clinical Characterisation Protocol. *medRxiv* 2020 Apr 28. Epub ahead of print.
51. Viner RM, Whittaker E. Kawasaki-like disease: emerging complication during the COVID-19 pandemic. *Lancet* 2020;395(10239):1741-3. Epub 2020 May 13.
52. Verdoni L, Mazza A, Gervasoni A, Martelli M, Ruggeri M, Ciuffreda M, et al. An outbreak of severe Kawasaki-like disease at the Italian epicentre of the SARS-CoV-2 epidemic: an observational cohort study. *Lancet* 2020;395(10239):1771-8.
53. Rowley AH. Is Kawasaki disease an infectious disorder? *Int J Rheum Dis Int* 2018;21(1):20-5.
54. McIntosh K. Coronaviruses in the limelight. *J Infect Dis* 2005;191(4):489-91. Epub 2005 Jan 14.
55. Newburger JW, Takahashi M, Gerber MA, Gewitz MH, Tani LY, Burns JC, et al. Diagnosis, treatment, and long-term management of Kawasaki disease: a statement for health professionals from the Committee on Rheumatic Fever, Endocarditis and Kawasaki Disease, Council on Cardiovascular Disease in the Young, American Heart Association. *Circulation* 2004;110(17):2747-71.
56. Bolognia JL, Jorizzo JL, Rapini RP. *Dermatology*. 1st ed. Maryland Heights, MO: Mosby; 2003.
57. Wang Y, Fang R, Zhang H, Tang K, Sun Q. Contributions of dermatologists to COVID–19 research: a brief systematic review. *Dermatol Ther* 2020;33(4):e13713. Epub 2020 Jul 2.
58. Lin P, Zhu S, Huang Y, Li L, Tao J, Lei T, et al. Adverse skin reactions among healthcare workers during the coronavirus disease 2019 outbreak: a survey in Wuhan and its surrounding regions. *Br J Dermatol* 2020;183(1):190-2. Epub 2020 May 10.
59. Han C, Shi J, Chen Y, Zhang Z. Increased flare of acne caused by long-time mask wearing during COVID-19 pandemic among general population. *Dermatol Ther* 2020;33(4):e13704. Epub 2020 Jul 2.
60. Stutz N, Becker D, Jappe U, John SM, Ladwig A, Spornraft-Ragaller P, et al. Nurses' perceptions of the benefits and adverse effects of hand disinfection: alcohol-based hand rubs vs. hygienic handwashing: a multicentre questionnaire study with additional patch testing by the German Contact Dermatitis Research Group. *Br J Dermatol* 2009;160(3):565-72. Epub 2008 Nov 25.
61. Darlenski R, Tsankov N. COVID-19 pandemic and the skin: what should dermatologists know? *Clin Dermatol* 2020;38(6):785-7. Epub 2020 Mar 24.
62. Elston DM. Occupational skin disease among health care workers during the coronavirus (COVID-19) epidemic. *J Am Acad Dermatol* 2020;82(5):1085-6. Epub 2020 Mar 18.
63. Gupta MK, Lipner SR. Personal protective equipment recommendations based on COVID-19 route of transmission. *J Am Acad Dermatol* 2020;83(1):e45-6. Epub 2020 Apr 21.
64. Yan Y, Chen H, Chen L, Cheng B, Diao P, Dong L, et al. Consensus of Chinese experts on protection of skin and mucous membrane barrier for health-care workers fighting against coronavirus disease 2019. *Dermatol Ther* 2020;33(4):e13310. Epub 2020 Mar 29.
65. Koo J, Lebwohl A. Psychodermatology: the mind and skin connection. *Am Fam Physician* 2001;64(11):1873-8.
66. Rivetti N, Barruscotti S. Management of telogen effluvium during the COVID-19 emergency: psychological implications. *Dermatol Ther* 2020;33(4):e13648. Epub 2020 Jun 5.
67. Harth W, Blume-Peytavi U. Psychotrichology: psychosomatic aspects of hair diseases. *J Dtsch Dermatol Ges* 2013;11(2):125-35. Epub 2012 Nov 26.
68. Goren A, McCoy J, Wambier CG, Vano-Galvan S, Shapiro J, Dhurat R, et al. What does androgenetic alopecia have to do with COVID-19? An insight into a potential new therapy. *Dermatol Ther* 2020;33(4):e13365. Epub 2020 Apr 8.
69. Goren A, Vaño-Galván S, Wambier CG, McCoy J, Gomez-Zubiaur A, Moreno-Arrones OM, et al. A preliminary observation: male pattern hair loss among hospitalized COVID-19 patients in Spain—a potential clue to the role of androgens in COVID-19 severity. *J Cosmet Dermatol* 2020;19(7):1545-7. Epub 2020 Apr 23.
70. Wambier CG, Vaño-Galván S, McCoy J, Gomez-Zubiaur A, Herrera S, Hermosa-Gelbard Á, et al. Androgenetic alopecia present in the majority of patients hospitalized with COVID-19: the "Gabrin sign." *J Am Acad Dermatol* 2020;83(2):680-2. Epub 2020 May 22.
71. Manolache L, Benea V. Stress in patients with alopecia areata and vitiligo. *J Eur Acad Dermatol Venereol* 2007;21(7):921-8.
72. Brajac I, Tkalčić M, Dragojević DM, Gruber F. Roles of stress, stress perception and trait-anxiety in the onset and course of alopecia areata. *J Dermatol* 2003;30(12):871-8.
73. Kutlu Ö, Metin A. A case of exacerbation of psoriasis after oseltamivir and hydroxychloroquine in a patient with COVID-19: will cases of psoriasis increase after COVID-19 pandemic? *Dermatol Ther* 2020;33(4):e13383. Epub 2020 Apr 24.
74. Georgakopoulos J, Mufti A, Vender R, Yeung J. Treatment discontinuation and rate of disease transmission in psoriasis patients receiving biologic therapy during the COVID-19 pandemic: a Canadian multicenter retrospective study. *J Am Acad Dermatol* 2020;83(4):1212-4. Epub 2020 Jul 15.
75. Böhm D, Stock Gissendanner S, Finkeldey F, John SM, Werfel T, Diepgen TL, et al. Severe occupational hand eczema, job stress and cumulative sickness absence. *Occup Med* (Lond) 2014;64(7):509-15. Epub 2014 Jul 2.
76. Klokk M, Gotestam KG, Mykletun A. Factors accounting for the association between anxiety and depression, and eczema: the Hordaland health study (HUSK). *BMC Dermatol* 2010;10(3). Epub 2010 Apr 22.
77. Huremović D, editor. *Psychiatry of pandemics. A mental health response to infection outbreak.* Berlin, Germany: Springer; 2019.
78. Garcovich S, Bersani FS, Chiricozzi A, De Simone C. Mass quarantine measures in the time of COVID-19 pandemic: psychosocial implications for chronic skin conditions and a call for qualitative studies. *J Eur Acad Dermatol Venereol* 2020;34(7):e293-4. Epub 2020 May 15.
79. Gupta MA, Gupta AK. A practical approach to the assessment of psychosocial and psychiatric comorbidity in the dermatology patient. *Clin Dermatol* 2013;31(1):57-61.
80. Magnano M, Balestri R, Bardazzi F, Mazzatenta C, Girardelli CR, Rech G. Psoriasis, COVID–19, and acute respiratory distress syndrome: focusing on the risk of concomitant biological treatment. *Dermatol Ther* 2020;33(4):e13706. Epub 2020 Jun 19.
81. Farabi B, Bhargava S, Goldust M, Atak MF. Comment on "Psoriasis, COVID-19, and acute respiratory distress syndrome: focusing on the risk of concomitant biological treatment." *Dermatol Ther* 2020;33(6):e13840. Epub 2020 Jul 6.

This article has been peer reviewed.
Cet article a fait l'objet d'une révision par des pairs.
Can Fam Physician 2021;67:582-7. DOI: 10.46747/cfp.6708582