

Skin disorders affecting the feet

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Skin disorders of the feet can affect the glabrous skin on the dorsal aspects, or the thick skin on the plantar aspects, thereof, or both. Some can affect one foot, and others both of them. These diseases can be inflammatory, genetically inherited, infectious and neoplastic in origin. It is important to identify them and to start treatment early. If not treated, some may lead to severe pain on walking, the inability to wear shoes, and amputation with serious disability.

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Introduction

Skin disorders on the feet can affect the glabrous skin on the dorsal aspects, or the thick skin on the plantar aspects, thereof, or both. Some can affect one foot, and others both of them. These diseases can be inflammatory, genetically inherited, infectious and neoplastic in origin. It is important to identify them and to start treatment early. If not treated, some may lead to severe pain on walking, the inability to wear shoes, and amputation with serious disability.

Inflammatory diseases

Inflammatory skin diseases which affect different areas of the body can affect the feet as well. Some of these diseases are briefly discussed.

Chronic eczema

Chronic eczema is one of the most common inflammatory skin diseases, and can affect the feet as well (Figure 1). Hand and foot eczema is just one example. It occurs in patients who tend

to sweat a lot on their palms and soles. *Tinea pedis* must be excluded in these patients.

Contact dermatitis

Contact dermatitis may occur specifically on the feet due to allergic reactions to various objects which are normally in contact with the skin of the feet, such as shoes and socks (Figure 2). Acute contact dermatitis may present with itching, erythema or blistering, with weeping lesions, leading to secondary bacterial infection. It is vital to eliminate the object causing the allergic reaction in contact dermatitis. Treatment with topical steroids helps.

Psoriasis and lichen planus

Psoriasis and *lichen planus* are common inflammatory skin diseases which can occur on the feet as part of a broader skin disease. Rarely, they are localised to the feet only. The treatment of inflammatory skin diseases generally involves the use of emollients and topical corticosteroids. Many other treatment modalities, including systemic therapy and phototherapy, can be considered for psoriasis.



Figure 1: Chronic eczema on the feet



Figure 2: Contact dermatitis due to leather shoes



Figure 3: Keratoderma blenorrhagicum in a patient with Reiter's syndrome

Reiter's syndrome

Reiter's syndrome is characterised by nonsuppurative polyarthritis, urethritis, cervicitis or enteric infections, particularly in young men carrying human leukocyte antigen B27.¹

Infections such as *Chlamydia*, *Ureaplasma*, *Shigella* and *Salmonella* spp. are triggering factors. Reiter's syndrome is characterised by a classic triad of arthritis, conjunctivitis and urethritis. Skin manifestations are common. Typically, keratoderma blenorrhagicum (Figure 3) appear on the soles. This usually appears 1–2 months after the onset of arthritis and conjunctivitis, but may accompany or rarely precede the initial manifestations.¹ Reiter's syndrome can also occur as a manifestation of immune reconstitution inflammatory syndrome in human immunodeficiency virus (HIV)-infected individuals, and may follow a severe clinical course.²

Palmoplantar keratoderma

Palmoplantar keratoderma is a group of diseases which mainly affect the thick skin of the soles, but the palms can also be involved. It may be genetically inherited or acquired.³ Many hereditary keratodermas have been found to be caused by abnormalities in the structural protein of the epidermal keratinocytes. Hereditary palmoplantar keratoderma can be diffuse, mutilating, punctate or focal, and is characterised by abnormal thickening and hardening of the thick skin of the palms and soles (Figure 4).

Acquired palmoplantar keratodermas may be due to inflammatory dermatoses, like eczema and psoriasis. There have been reports of it occurring as a cutaneous adverse effect of some drugs. According to a recent report, it is likely that palmoplantar keratoderma with pachyonychia is induced by imatinib mesylate. This drug is a tyrosine kinase inhibitor used to treat chronic myeloid leukaemia and gastrointestinal stromal



Figure 4: Severe disabling palmoplantar keratoderma



Figure 5: Palmoplantar keratoderma in a patient with pachyonychia congenita

tumours.⁴ Imatinib mesylate interacts with the downstream molecules of the epidermal growth factor receptor pathways, leading to cutaneous epithelial proliferation.⁴

Pachyonychia congenita is a genetically inherited disease characterised by localised areas of hyperkeratosis on the palms and soles, with grossly thickened, wedge-shaped nails.⁵

It is a progressive disease. Plantar hyperkeratosis causes pain when walking (Figure 5). Treatment with retinoids and keratinolytics may reduce the hyperkeratosis.⁵

Ainhum

Ainhum is a word from the Yoruba dialect meaning "to saw". It is a specific type of a painful constriction of the base of a digit, most commonly the fifth toe, with eventual spontaneous digital amputation. It begins with the formation of a fibrous band on the medial aspect of the toe, which progresses to encircle it. This results in arterial narrowing, bone resorption, swelling of the digit, and eventual autoamputation.⁶ It is thought to be due to an abnormal blood supply to the foot in some patients as an attenuated posterior tibial artery, and an absent plantar arch

and its branches, have been shown on arteriography in different patients.⁷ Surgical amputation may be required to avoid ongoing pain.

Infections

Tinea pedis

Tinea pedis is commonly called athlete's foot. This is infection of the feet or toes with a dermatophyte fungus. Throughout the world, the vast majority of cases are caused by three anthropophilic species, *Trichophyton rubrum*, *T. mentagrophytes* and *Epidermophyton floccosum*.⁸

Wearing tight shoes and the resultant maceration of the toe cleft skin predisposes to this condition; initially a web space infection in most cases (Figure 6). Lesions can spread to the plantar aspects and the dorsa of the feet. Itching is a common complaint in warm weather, mimicking foot eczema.

Treatment with topical antifungal agents, like clotrimazole or terbinafine, is effective. Oral terbinafine may be necessary in severe or recurrent infections.

Onychomycosis

Onychomycosis refers to fungal infection of the nail plate. It may affect the toe- or fingernails. The involvement of the proximal and lateral nail folds is called chronic paronychia. Pulse therapy with itraconazole 200 mg orally, twice a day, for seven days a month, is recommended for onychomycosis and chronic paronychia. Mild cases can be treated with topical amorolfine nail lacquer.

Plantar warts

Plantar warts are caused by various serotypes of human papillomavirus (HPV). There may be a single or multiple lesions (Figure 7). It starts as a small shiny papule, and grows to form a sharply defined rounded lesion with a rough hyperkeratotic surface, surrounded by a thickened horny ring.⁹

Note the pinpoint bleeding in the plantar warts

If pared with a scapel, the protective horny ring becomes more obvious. Like all warts, they bleed easily if pared too deep. Many small plantar warts may be grouped together to form a mosaic wart. They can be painful on walking and disabling in some patients. Cryotherapy and topical salicylic acid are first-line therapies. Second-line therapies include intralesional bleomycin, imiquimod and 5-fluorouracil.¹⁰

Recently, there was a case report of recalcitrant plantar warts associated with statin use. Rapid clearance of the warts followed a patient-initiated decision to discontinue the statin medication.¹⁰ It is suggested that statins inhibit cholesterol synthesis in keratinocytes, which may lead to impairment in the barrier function and enable HPV to proliferate within the skin.¹¹

Eumycetoma (Madura foot) and actinomycetoma

Eumycetoma is a chronic, granulomatous infection of the skin, subcutaneous tissue, fascia and bone, caused by true fungi.¹²



Figure 6: *Tinea pedis*, with maceration in the web spaces



Figure 7: Plantar warts



Figure 8: Eumycetoma of the left foot, with black granules being drained by the sinuses

Commonly reported causative fungi include *Madurella mycetomatis*, *M. grisea* and *Cephalosporium recifei*. Organisms are present in the soil and decaying plant matter. Infection is acquired by traumatic inoculation into the skin or subcutaneous tissue. Recently, a case of eumycetoma caused by *Paecilomyces lilacinus* was reported.¹² Clinically, there is unilateral swelling of the foot. Black granules are drained by the sinuses (Figure 8). Many cases of eumycetoma eventually result in amputation, especially if there is bone involvement, which often results in pathological fractures and the failure of medical treatment.

Eumycetoma must be differentiated from actinomycetoma, in which yellowish granules are drained by the sinuses (Figure 9). This is caused by Gram-positive filamentous bacteria.

Actinomycetoma usually responds well to treatment, in comparison with eumycetoma.

Pitted keratolysis

Pitted keratolysis is a superficial infection of the soles caused by a species of *Corynebacteria*, producing circular erosions thereon (Figure 10). It is common in athletes and individuals who regularly use occlusive footwear. Patients experience hyperhidrosis, foot odour and sometimes itching or burning while walking.¹³ The odour is due to the production of sulphur compounds by the bacteria. Typical lesions are multifocal, cerebriform, and maceration and crateriform pitting, with superficial erosions.¹³ The pitting is accentuated when the affected skin is water soaked. Pitted keratolysis predominantly affects the pressure-bearing areas of the plantar surface of the feet, and is rarely seen on the non-pressure-bearing areas.¹⁴

Treatment includes topical erythromycin, topical clindamycin, fucidic acid or mupirocin. Hyperhidrosis should be treated with aluminium tetrahydrochloride solution. Regular changing of footwear and socks is essential.

Cutaneous larva migrans

Cutaneous *larva migrans*, also called “creeping eruption” or “sandworm”, is a clinical term for a distinctive cutaneous eruption characterised by creeping or migrating lesions due to the presence of a moving parasite in the skin.¹⁵ Causative parasites include *Ancylostoma brasiliensis* and *A. caninum*. These are dog or cat hookworms which can penetrate human skin. Infection is acquired by walking barefoot on infected soil, such as the beach.¹⁶ It is commonly seen in warm climates such as the south-eastern parts of the USA, South America, Africa, and other tropical areas.¹⁷

Clinically, the larvae cause a non-specific dermatitis at the site of penetration. The larvae may lie quiet for weeks or months, or immediately begin creeping, producing wandering, bizarre, serpentine patterns (Figure 11). Sometimes the lesions are less typical. They can be patchy excoriations secondary to scratching. They sometimes resemble scabies, bacterial skin infections and fungal infections.¹⁶ Treatment with albendazole 400 mg orally per day, for three days, is effective. Other treatment modalities include cryotherapy, as well as smearing a thick layer of petroleum jelly on the lesion. This suffocates the parasite and kills it.

Neoplastic disorders

Malignant melanoma

The subject of melanomas is clearly beyond the scope of this article. Melanomas are malignant tumours arising from melanocytes.¹⁸

The highest incidence rates in the world are found in Caucasians living in Queensland, Australia and New Zealand, with an annual incidence of approximately 40 cases per 100 000 population. The acral lentiginous type typically occurs on the hands or feet, especially on the palms or soles. It is the most common type



Figure 9: Actinomycetoma of the right foot, with yellowish granules being drained by the sinuses



Figure 10: Pitted keratolysis



Figure 11: Cutaneous *larva migrans*
Note the wandering, serpentine pattern



Figure 12: Acral lentiginous melanoma on the sole of foot



Figure 13: Extensive Kaposi's sarcoma, with lymphoedema and multiple nodules

of melanoma in black people. Melanomas are characterised by extensive lentiginous change in the epidermis around the focus of invasive primary melanoma (Figure 12).

Any pigmented lesion suspected of being a melanoma must be referred to a dermatologist as early diagnosis and treatment may improve the prognosis.

Kaposi's sarcoma

Kaposi's sarcoma is another neoplastic disease which is often seen on the limbs, although it can occur anywhere in the body. There are four clinical types, i.e. classic Kaposi's sarcoma, African-endemic Kaposi's sarcoma, Kaposi's sarcoma associated with other forms of immunosuppression other than HIV, and finally the HIV-associated type. The HIV-associated type is the most common and most aggressive in South Africa. Early lesions may appear as bluish macules and plaques. Late lesions present with massive lymphoedema and multiple nodules (Figure 13).

References

1. Graham RM. Reiter's disease. Rook/Wilkinson/ Ebling textbook of dermatology. 6th ed. In: Champion RH, Burton JL, Burns DA, et al, editors. Oxford: Blackwell Science, 1998; p. 2759–2771.

2. Shankari J, Sudha V, Manoharan K. Reiter's syndrome as a manifestations of immune reconstitution inflammatory syndrome in an HIV infected individual. BMC Infect Dis. 2014;14(Suppl 3):E17.
3. Griffiths WAD, Judge MR, Leigh IM. Disorders of keratinization. Rook/Wilkinson/Ebling textbook of dermatology. 6th ed. In: Champion RH, Burton JL, Burns DA, et al, editors. Oxford: Blackwell Science, 1998; p. 1483–1588.
4. Kim HO, Lee BI, Lee JY, et al. Plantar keratoderma with pachyonychia likely induced by imatinib mesylate. Ann Dermatol. 2013;25(4):526–527.
5. Motswaledi MH, Mayayise MC. Nail changes in systemic diseases. S Afr Fam Pract. 2010;52(5):409–413.
6. Forest R, Benson C, Waseem M, et al. Aihum leading to fifth-digit amputation. J Emerg Med. 2015;48(2):209–210.
7. Burton JL, Lovell CR. Disorders of connective tissue. Rook/Wilkinson/Ebling textbook of dermatology. 6th ed. In: Champion RH, Burton JL, Burns DA, et al, editors. Oxford: Blackwell Science, 1998; p. 2003–2071.
8. Hay RJ, Moore M. Mycology. Rook/Wilkinson/Ebling textbook of dermatology. 6th ed. In: Champion RH, Burton JL, Burns DA, et al, editors. Oxford: Blackwell Science, 1998; p. 1277–1376.
9. Sterling JC, Kurtz JB. Viral infections. Rook/Wilkinson/Ebling textbook of dermatology. 6th ed. In: Champion RH, Burton JL, Burns DA, et al, editors. Oxford: Blackwell Science, 1998; p. 995–1095.
10. Wernham AG, Vilangi SS. A case of recalcitrant plantar warts associated with statin use. Case Rep Dermatol Med. 2015;2015:320620.
11. Feingold KR. The role of epidermal lipids in cutaneous permeability barrier homeostasis. J Lipid Res. 2007;48(12):2531–2546.
12. Motswaledi MH, Mathekg K, Sein PP, et al. *Paecilomyces lilacinus eumycetoma*. Int J Dermatol. 2009;48(8):858–861.
13. Fernandez-Crehuet P, Ruiz-Villaverde R. Pitted keratolysis: an infective cause of foot odour. CMAJ. 2015;187(7):519.
14. Pranteda G, Carlesimo M, Pranteda G, et al. Pitted keratolysis, erythromycin and hyperhidrosis. Dermatol Ther. 2014;27(2):101–104.
15. Bryceson AD, Hay RJ. Parasitic worms and protozoa. Rook/Wilkinson/Ebling textbook of dermatology. 6th ed. In: Champion RH, Burton JL, Burns DA, et al, editors. Oxford: Blackwell Science, 1998; p. 1377–1422.
16. Krishna MR. Cutaneous larva migrans. Indian Paediatr. 2015;52:177.
17. Shahmoradi Z, Abtahi-Nacini B, Pourazizi M, et al. Creeping eruption of the hand in an Iranian patient: cutaneous larva migrans. Adv Biomed Res. 2014;3:263.
18. MacKie RM. Melanocytic naevi and malignant melanoma. Rook/Wilkinson/Ebling textbook of dermatology. 6th ed. In: Champion RH, Burton JL, Burns DA, et al, editors. Oxford: Blackwell Science, 1998; p. 1717–1752.