Dermatologic Conditions of the Foot

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Introduction

Orthopaedic surgeons may be the first medical professionals to encounter a skin lesion on a patient's foot. Early identification of the condition causing such a lesion is crucial for initiating its treatment or referring the patient to a dermatologist for further management.

To achieve the correct diagnosis of a dermatologic condition of the foot, it may be necessary to evaluate the entire cutaneous surface of the foot and integrate the objective findings with the patient's relevant medical history. Four basic features of skin lesions must be noted and considered during the physical examination of a patient: (1) color, (2) morphology, (3) configuration, and (4) distribution. In addition, a basic conceptual framework of the nature and causation of various skin lesions is helpful in their identification and treatment. Table 1 provides a practical scheme for the classification of dermatologic disorders of the foot into the three main categories of: (1) infectious, (2) neoplastic (benign and malignant), and (3) inflammatory disorders.

This article is intended to provide an overview of the clinical presentation, pathogenesis, diagnostic evaluation, and strategies for the general management of common dermatologic conditions of the foot, and dilemmas in the diagnosis of such conditions.

Table 1: Classification of Dermatologic Conditions of the Foot

Infectious	Neoplastic		Inflammatory
	Benign	*Malignant*	
Acute paronychia	Warts and clavi	Melanoma	Cutaneous manifestations of diabetes
Tinea pedis	Pyogenic granuloma	Kaposi sarcoma	Pernio
Onychomycosis	Fibroma		Rheumatoid papules
Chromoblastomycosis and mycetoma	Mucous cyst		Palmoplantar psoriasis
	Glomus tumor		Reactive arthritis
	Longitudinal melanonychia		Acquired palmoplantar keratodermas

Infections

Paronychia

Acute paronychia of the foot is caused by the bacterial pathogens *Staphylococcus aureus* and *Streptococcus pyogenes*, usually following trauma to the nail folds of the toes. With paronychia, the proximal nail fold is often painful, erythematous, and swollen, and these symptoms may be associated with a purulent discharge or abscess formation in the nail folds, or both (Figure 1). Recurrent episodes of paronychia should raise the suspicion of herpes simplex virus (HSV)

infection.[1] If diagnosed at an early stage in its development, acute paronychia without an abscess can be treated with topical antibiotics alone. If an abscess has developed, it should be incised and drained. Chronic paronychia is usually caused by *Candida albicans* and treated with topical imidazoles and corticosteroids.[2]

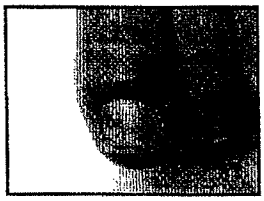

Fig. 1

Acute paronychia. The proximal nail fold of the big toe is erythematous and swollen, with loss of the cuticle.

Courtesy of the Department of Dermatology at the University of Alabama, Birmingham, School of Medicine.

Tinea Pedis

Tinea pedis, also known as athlete's foot and ringworm of the foot, is the most common dermatophytic infection of the foot. The feet are particularly prone to dermatophytic invasion and growth because they lack sebaceous glands, exist much of the time in a moist environment created by occlusive shoes, and often experience damage or trauma to their skin barrier.

Four subtypes of tinea pedis affect the foot: (1) the moccasin subtype, characterized by plantar erythematous plaques covered by hyperkeratotic scales and involving the entire plantar surface of the foot (Figure 2); (2) the vesiculobullous subtype, characterized by vesicles and bullae; (3) the interdigital subtype, characterized by scaling and fissures in the toe webs, often with maceration; and (4) the ulcerative subtype, marked by ulcers and erosions. The subtle dorsal patch on the foot with a collarette of scale is a characteristic finding and clue to the diagnosis of tinea pedis.[3] Technically, infection of the dorsal aspect of the foot is considered tinea corporis. The diagnosis of tinea pedis can be made with skin scrapings treated with potassium hydroxide and subjected to direct microscopic examination and with fungal culture. Topical treatment with antifungal agents for about 1 month is the mainstay of treatment of tinea pedis.[4]

Fig. 2

Tinea pedis (moccasin type). Scaly erythematous plaques with sharply defined scalloped borders are present on the bottom of the foot. Inset: Collarette of scale on a plaque.

Courtesy of the Department of Dermatology at the University of Alabama, Birmingham, School of Medicine.

Onychomycosis

Onychomycosis is the fungal infection of a fingernail or toenail caused by dermatophytes, nondermatophyte molds, or yeasts. The absence of effective cell-mediated immunity at the nail, a diminished host immune response, and an abnormal nail unit contribute to fungal invasion of the nail. Onychomycosis commonly begins as tinea pedis before extending to the nail bed, where its eradication is more difficult. The latter site serves as a reservoir for local recurrence or for spread of the infection to other areas.[5]

Clinically, four types of onychomycosis are distinguished: (1) distal lateral subungual onychomycosis (Figure 3), with invasion via the hyponychium; (2) proximal subungual onychomycosis, with invasion under the proximal nail fold (common in immunocompromised hosts); (3) white superficial onychomycosis, with direct invasion of the dorsal nail plate; and (4)

total dystrophic onychomycosis, which results from the progression of any of the other subtypes or a combination of two or more of them. All of the subtypes of onychomycosis may cause an "abnormal nail" with white-to-yellow discoloration, onycholysis, crumbling, and thickening; however, only half of abnormal nails have onychomycosis. Psoriasis, lichen planus, trauma, and runner's toe are included in the differential diagnosis of onychomycosis. The diagnosis of onychomycosis is confirmed with the KOH (potassium hydroxide) test and microscopic examination, or by culture, or both.[6]

Fig. 3

Left, Distolateral subungual onychomycosis. Yellow discoloration of the distal nail plate of the big toe with onycholysis. **Right,** White superficial onychomycosis caused by infection with *Fusarium spp.* The distal nail plate shows chalky white discoloration.

Courtesy of the Department of Dermatology at the University of Alabama, Birmingham, School of Medicine.

Oral antifungal agents are the standard of care for this condition, but may have adverse systemic effects. Topical antifungal agents (10% efinaconazole, 8% ciclopirox, and others), as well as laser-based therapies, are promising solutions for the treatment of onychomycosis, although their long-term efficacy remains to be determined.[7,8]

Chromoblastomycosis and Mycetoma

Chromoblastomycosis and mycetoma are chronic fungal infections of the skin and subcutaneous tissues. Both conditions are caused by a variety of fungi found in soil, plants, and wood. Infection may begin with inoculation by contaminated debris. Although the causative fungi are found frequently in tropical countries in South America, they are occasionally seen in the United States.[9]

Mycetomas can be caused by fungi (eumycetomas), aerobic actinomycetes, or filamentous bacteria (actinomycetomas), which enter the skin by direct inoculation. Mycetomas present clinically with swelling, nodules, and sinus tracts and a pustular drainage that contains grains consisting of fungal colonies (Figure 4). As the infection progresses, adjacent fascia and bony structures may become involved, resulting in osteomyelitis. Mycetomas are indolent and disfiguring, progressing slowly over periods of years. Histopathologic examination and culture are necessary to ensure that the etiologic agent is a mold and not an actinomycete.[10]

Fig. 4

Chromoblastomycosis, marked by a dark red granulomatous nodule over an erythematous base.

Courtesy of the Department of Dermatology at the University of Alabama, Birmingham, School of Medicine.

The typical lesion of chromoblastomycosis is a papule or nodule that progresses over months to a verrucous or granulomatous plaque (Figure 5). At an early stage the lesion may resemble a wart, but does not respond to traditional therapy. It may later develop an annular appearance as the central portion resolves with scarring. The diagnosis is established by histopathologic identification of the causative organism. The treatment of chromoblastomycosis and mycetoma involves surgical excision followed by systemic antifungal therapy.[10]

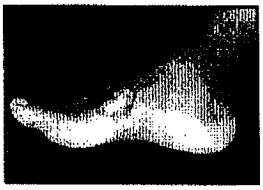

Fig. 5

Mycetoma, consisting of a large plantar nodule with pustular drainage and yellow grains.

Courtesy of the Department of Dermatology at the University of Alabama, Birmingham, School of Medicine.

Benign Neoplasms

Warts and Clavi

Warts (or verrucae vulgaris) are common cutaneous neoplasms caused by the human papilloma virus (HPV). Infection by the virus occurs through minor abrasions, is promoted by maceration, and is acquired by skin-to-skin contact or from contaminated surfaces and objects (eg, swimming pools, gymnasium equipment). Autoinoculation of the virus from an infected site into adjacent skin is frequently observed. Warts present as verrucous, hyperkeratotic, flat-topped papules (Figure 6). Shaving of the surface of a wart reveals a central core of keratinized debris, punctate bleeding points (black dots), and dermatoglyphic disruption, and these lesions are often painful when squeezed from the sides. Clavi (or corns) are well-circumscribed, horny, white-gray or yellow-brown papules that are painful when compressed and may display a clear center without "black dots" when shaved. A clavus results from an underlying skeletal anatomic defect or repeated trauma and pressure over a bony prominence from an ill-fitting shoe or bone malalignment.[11]

Fig. 6

Plantar wart, characterized by a verrucous, hyperkeratotic, flat-topped yellowish papule.

Courtesy of the Department of Dermatology at the University of Alabama, Birmingham, School of Medicine.

The diagnosis of a wart or clavus is established clinically. Most warts in immunocompetent patients will regress spontaneously within 1 to 2 years and without any treatment. If a wart takes a longer time to regress, or has multiple recurrences, immunosuppression or an amelanotic melanoma should be suspected. The most effective methods for treating any type of wart are cryotherapy with liquid nitrogen, the topical application of salicylic acid, or the use of an immunomodulator such as imiquimod.[12] The treatment goal for symptomatic corns is to provide pressure relief. Diverse methods have been described, including the use of wider shoes, padding, shaving the lesion, topical application of salicylic acid, and condylectomy.[13,14]

Pyogenic Granuloma (Botryomycoma)

Pyogenic granulomas are bleeding, friable, soft, red papulonodules (Figure 7) that grow rapidly over the course of several weeks. In the feet, they appear, in decreasing order of frequency, within the nail unit (periungually or subungually), on the toes, or elsewhere. Predisposing factors include penetrating trauma, systemic drug therapy (eg, retinoids, inhibitors of epidermal growth factor receptor), pregnancy, peripheral nerve damage, ingrown toenails, and frictional onycholysis.[15] The most common treatment of a pyogenic granuloma is surgical excision; case reports have shown response to topical timolol[16] and 5% imiquimod.[17]

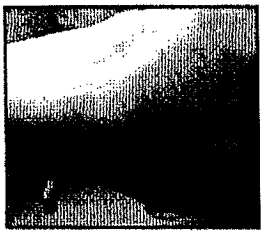

Fig. 7

Pyogenic granuloma on the sole of the foot, marked by a friable, soft, red nodule.

Courtesy of the Department of Dermatology at the University of Alabama, Birmingham, School of Medicine.

Fibroma

Fibromas present as asymptomatic, smooth, dome-shaped, pink-to-skin-colored nodules on the dorsolateral aspects of the fingers and toes (Figure 8). Periungual and subungual fibromas are usually isolated lesions, but multiple fibromas occur in 50% to 80% of patients with tuberous sclerosis.[18] Periungual fibromas may compress the nail matrix and produce a longitudinal groove in the nail plate. Subungual fibromas that grow beneath the nail plate cause longitudinal erythronychia or onycholysis. Fibromas follow a benign course and can be removed by surgical excision with or without phenolization.[19]

Fig. 8

Fibroma, occurring as a smooth, dome-shaped, pink periungual nodule. Note the longitudinal groove in the nail.

Courtesy of the Department of Dermatology at the University of Alabama, Birmingham, School of Medicine.

Mucous Cyst (Myxoid Cyst)

Mucous cysts are the most common tumors of the nails, often occurring in middle-aged women. Their etiology is controversial, with some authors maintaining that they are of degenerative origin and others suggesting that they extend from the distal interphalangeal joint space. The cysts are soft, skin-colored nodules that develop on the dorsal aspect of the distal phalanx of a digit, and may drain a viscous, jelly-like fluid (Figure 9). Some mucous cysts are subungual; if compression of the nail matrix occurs, it produces nail-plate depression and a longitudinal groove in the nail.[20] Subungual cysts are connected to the distal interphalangeal joint by a tract, and osteoarthritis of the distal joint is frequently associated with these lesions.[20] Treatment options for mucous cysts include sclerotherapy, cryosurgery, and the intralesional injection of corticosteroids.[21] Surgical excision with joint débridement has been reported as a successful treatment option for mucous cysts, with minimal recurrences.[22]

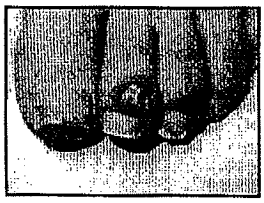

Fig. 9

A mucous cyst, seen as a soft, skin-colored nodule with scale over the distal interphalangeal joint of the second toe.

Courtesy of the Department of Dermatology at the University of Alabama, Birmingham, School of Medicine.

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