REVIEW

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Dermoscopy in superficial fungal infection

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ABSTRACT

Superficial fungal infections are one of the most common skin infection infections. It is caused by fungal pathogens and is limited to the outer layer of the skin, hair, and nails. Superficial fungal infections include dermatophytosis, superficial candidiasis, and diseases caused by *Malassezia spp*. Most physicians diagnose and treat superficial fungal infections based solely on clinical appearance. But unfortunately, there are many other infectious and non-infectious diseases with a similar clinical appearance.

Dermoscopy is a practical and noninvasive imaging method that allows magnifying clinical surface images that are normally invisible under a magnifying lens. In diagnosing superficial mycosis, dermoscopy was more sensitive and specificity than potassium chloride (KOH) and fungal culture.

More understanding is needed about the use of dermoscopy in diagnosing superficial fungal infections in the hope of providing an overview of superficial fungal infections and dermoscopy, as well as dermoscopy features in some superficial fungal infections. This article describes dermoscopic findings in various superficial fungal infections on the skin, hair, and nails.

Keywords: superficial fungal infections, dermoscopy, dermatoscopy, magnification.
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INTRODUCTION

Superficial fungal infections are infections caused by fungal pathogens and are limited to the outer layer of skin, hair, and nails. Most physicians diagnose and treat superficial fungal infections based solely on clinical appearance. But unfortunately, there are many other infectious and non-infectious diseases with a similar clinical appearance.[1,2]

Dermoscopy or dermatoscopy is a practical and non-invasive imaging method that allows in vivo evaluation of pigmented and non-pigmented skin lesions.[3] In superficial mycosis, dermoscopy shows a sensitivity of 94-95% and a specificity of 83%. In other investigations such as potassium hydroxide (KOH) 73% and 45%, and fungal culture 41%, and 77% respectively.[3,4] This aimed to improve the knowledge about usage dermoscopy in superficial fungal infection.

Epidemiology

Superficial fungal infections vary by age, sex, and ethnicity. Dermatophytosis (tinea or ringworm), pityriasis versicolor, and candidiasis were the most common superficial fungal infections.[1] Among the types of dermatophytosis, the most common was tinea corporis (30.63%), followed by tinea cruris (23.62%), tinea pedis (16.21%), tinea unguium (20.72%) and tinea capitis (6.30%). It predominantly affects the age group 50 years and above.[5] Tinea pedis is estimated to occur in about 15% of the healthy population, and fungal nail disease occurs in more than 15%, depending on age.[9] Research at primary health centers in the city of Toukh shows the prevalence of fungal infections is 18.6%, with a higher prevalence of dermatophytes than non-dermatophytes (51.2% vs. 37.2%).[6]

Classification

Superficial fungal infections include 1) dermatophytosis (ringworm or tinea); 2) superficial (cutaneous, oropharyngeal, vaginal) candidiasis; 3) disease caused by *Malassezia spp.* (pityriasis versicolor, seborrheic dermatitis). Dermatophyte infections are classified based on the location of the infection, namely facial tinea, tinea manum, tinea corporis, tinea cruris, tinea pedis, tinea capitis, tinea unguium. Infections involving more than one integument location are rare.[2] Transmission can be via indirect transmission from the desquamated epidermis or hair or through direct transmission by body contact.[6-8]

Diagnosis

The diagnosis of fungal infection can be made based on suspicion from the history and clinical examination results. However, because many conditions mimic a yeast infection, it is recommended to investigate to confirm the diagnosis.[9] Examination of the lesion can be assisted using Wood's lamp, which utilizes ultraviolet (UV) wave radiation and produces color changes in some fungal infections. Other methods include microscopic confirmation and fungal culture, which is the gold standard technique for diagnosing dermatophytosis. Culture is rarely needed except in tinea capitis and onychomycosis cases because of the timeframe (7-14 days) and expensive cost.[1,4]

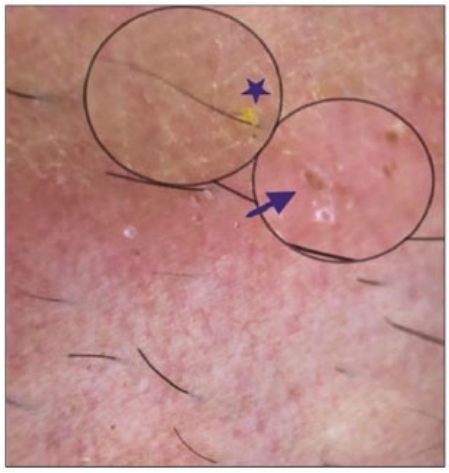

Figure 1. Dermoscopy of tinea corporis showing fungal invasion of hair follicles, such as micropustules (blue stars) and brown spots surrounded by white-yellowish halos (blue arrows) (x10).[12]

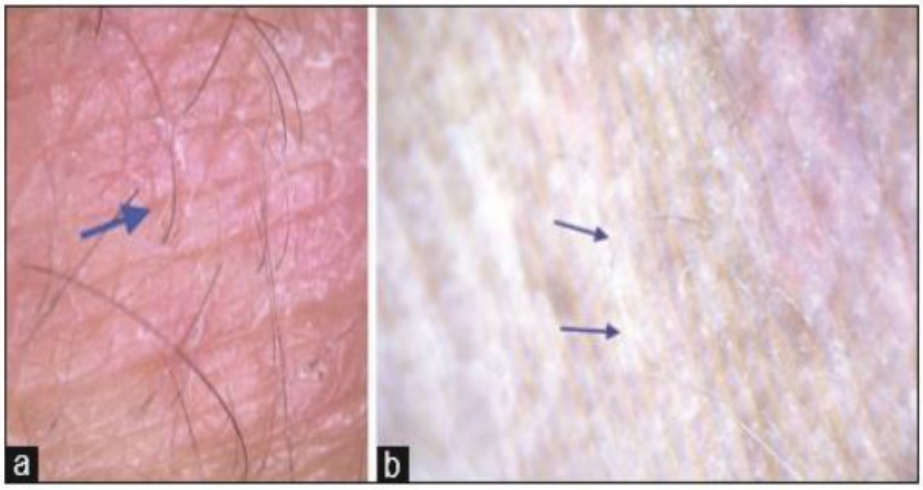

Figure 2. **(a)** Tinea incognito: translucent hair that looks weak and appears curved (blue arrow). **(b)** translucent hair that is easily deformed against the background of post-inflammatory pigmentation in tinea incognito (x30).[12]

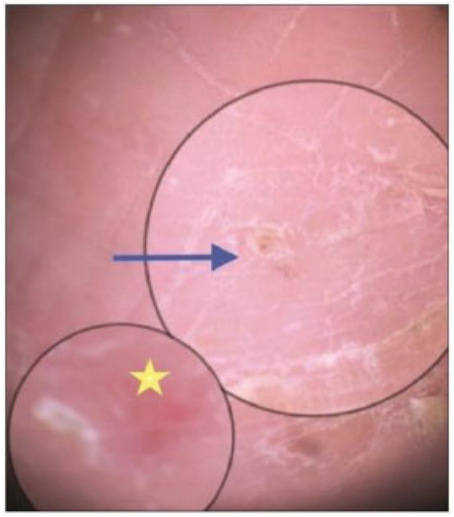

Figure 3. Tinea manum: palmar crease scale, brown scale showing dry vesicles (blue arrows), areas of intense erythema due to patchy veins (yellow stars) (x20).[12]

Figure 4. Dermoscopy features in pityriasis versicolor.[14]

Dermoscopy

Dermoscopy or dermatoscopy works by enlarging the image of a smoother clinical surface that is normally not visible with a magnifying lens.[10] Dermoscopy has various names depending on the etiology and the location of the examination, such as trichoscopy, onychoscopy, inflammoscopy and entomoscopy.[11]

The basic principle of dermoscopy is the illumination (and transillumination) of the lesions with different light sources and studying them with a high magnifying lens, which one can or cannot connect with a camera or computer.[10]

Dermoscopy in Superficial Fungal Infection of the Skin

Tinea Corporis

Dermoscopic findings for tinea corporis include diffuse, intense erythema, unlike regular patches; follicular micropustule; and brown patches surrounded by a yellowish-white halo, indicating hair follicle invasion. Follicular micropustules are predominantly visible in vellus hairs, and inflammation can cause vellus hair loss with post-inflammatory hyperpigmentation in the form of brown patches and hypopigmentation or even light scarring that promotes the formation of a white halo (Figure 1).[12]

Tinea Incognito

Dermoscopy of tinea incognito showed the presence of Morse code hair on the vellus hair, follicular micropustules and erythema in the form of concentric separated by squama. A new dermoscopic appearance, consisting of translucent and deformable hair that looks weak and transparent and breaks easily, possibly due to fungal invasion of the entire body of hair (Figure 2).[12]

Tinea Manum and Tinea Pedis

Tinea manum is a dermatophyte infection of the palms, while tinea pedis is an infection of the soles of the feet, where both often occur together. The clinical appearance of tinea manum is in the form of squama lesions on the palmar surface.[13] Dermoscopy shows white scales that are distributed in a certain pattern, mainly localized to the physiological palmar crease (Figure 3).[14,15]

Pitiriasis Versicolor

Dermoscopic features of pityriasis versicolor are hypopigmented or hyperpigmented lesions with fine white scales (often localized in skin wrinkles) associated with pigmentation webs

composed of lines. Diffuse brown stripes or brown pigmentation (Fig. 4).[14,16] The ability of dermoscopy to describe fine scales can distinguish it from other disorders presenting hypopigmentation or hyperpigmentation. It can also determine the severity of the disease and therapy.[16]

Candidiasis Cutis

In cutaneous candidiasis, the dermoscopic image shows fine-scale with desquamation inward and outward and linear blood vessels in the center (Fig. 5).[17,18]

Superficial Fungal Infection of the Head

Trichoscopy is used to rapidly diagnose tinea capitis and helps differentiate it from other similar conditions, such as alopecia areata and trichotillomania.[11] The use of trichoscopy can reduce the need for a scalp biopsy, is acceptable to patients and is useful for monitoring therapy and follow-up.[13,19-21]

In recent years trichoscopy findings regarding tinea capitis have been described. At low magnification (x30), comma hair, corkscrew hair, zigzag hair, pigtail hair and morse code hair are usually seen (Figure 6a). In both inflammatory and non-inflammatory tinea capitis, trichoscopy results always show inflammatory features of the affected skin, such as erythema, scale, and pigmentation.[17]

Most trichoscopy of tinea capitis show two typical forms, comma and corkscrew hair. Slightly curled hair and body hair fracture were described as trichoscopy markers for tinea capitis in white children with *M. canis* infection (Figure 6b). Another report states that corkscrew hair is an additional feature in children with Trichophyton or Microsporum infection. It is also a specific finding in dermatophytosis of the black skin of the scalp.[4] Dermoscopic findings vary according to the causative organism and the patient's skin type.[20]

Figure 5. Dermoscopy of cutis candidiasis.[18]

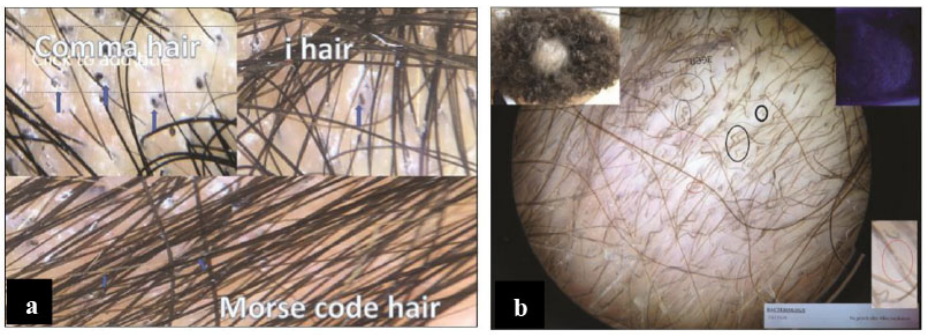

Figure 6. **(a).** Trichoscopy shows the presence of scaling, black dots, comma hair, I hair, and morse code hair.[11] **(b).** Trichoscopy shows comma hairs (thick circles), zigzag hairs (medium circles), and corkscrew hairs (thin circles), and possibly bar code hair (red circles).[19]

Superficial Fungal Infection of Nails

The term onychomycosis refers to nail infections due to dermatophytes or non-dermatophytes. One study shows that the diagnosis of onychomycosis has moved from using time-consuming, falsely negative clinicopathologic tools in up to 35% of cases towards a diagnosis of clinicoimaging. Dermoscopy can provide fast and accurate information for diagnosing onychomycosis because of its simple operation and high sensitivity (72-81%).[8]

Distal Subungal Onychomycosis

Fungal colonization on distal subungual onychomycosis continues through the longitudinal rete ridge of the nail bed and plate, which shows a jagged appearance, whereas, in proximal subungual onychomycosis, the invasion spreads to the lower part of the nail plate and extends to the distal so that it shows a distinguishable linear edge on dermoscopy.[8,22,23] Spikes, streaks and patches are the dermoscopic signs seen in distal subungual onychomycosis. The spikes, streaks, and patches have a longitudinal arrangement (Figure 7a-b).[8,21]

Proximal Subungal Onychomycosis

The typical clinical manifestation of proximal subungual onychomycosis is a white patch visible through a transparent nail plate. Because it affects the deeper part of the nail plate, the surface of the nail plate appears normal, and leukonychia is the main clinical sign (Figure 7c).[8,22,23]

Dystrophic Total Onychomycosis

Dystrophic total onychomycosis is the most severe stage of onychomycosis and can result from prolonged proximal or distal subungual onychomycosis. The nail plate experiences thickening, brittleness, and diffuse yellow discoloration in this condition. Multi-colored pigmentation and subungual hyperkeratosis can be found. Typical features are subungual hyperkeratosis, longitudinal streaks, and patches extending proximal to the nail

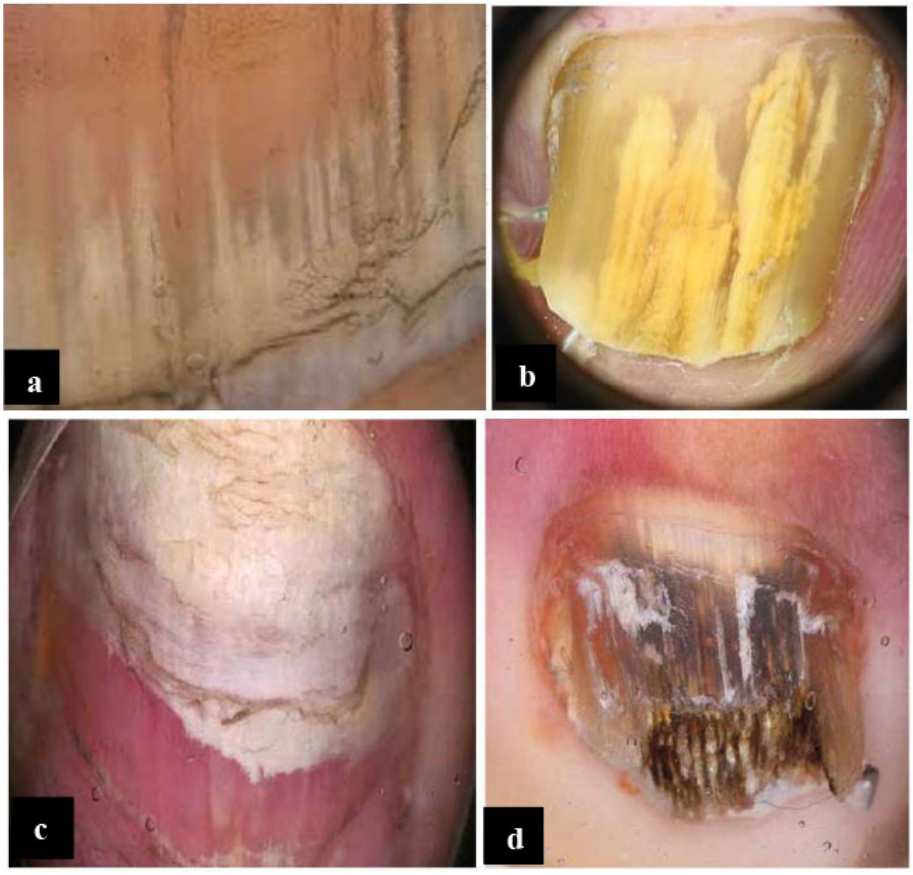

Figure 7. **(a)** Distal subungal onychomycosis: dermoscopy shows spikes on the proximal edge of the onycholysis area (40x).[8] **(b)** Dermoscopic aspect of distal subungal onycholysis, which is yellow-white due to colony formation and conforms to a longitudinal striae pattern. Magnification x10.[24] **(c)** Proximal subungal onychomycosis: dermoscopy showing the linear edge of the white patch extending distally.[3] **(d)**Total Dystrophic Onychomycosis.[3]

plate. There is a scale on the nail's surface that shows micro dystrophic changes caused by the brittleness of the nails due to the presence of microorganisms. (Figure 7d).[3]

CONCLUSION

The use of dermoscopy as a diagnostic tool for superficial fungal infections can be considered a daily diagnostic tool. However, further research is needed to determine the sensitivity and specificity of dermoscopy for superficial fungal infections.

CONFLICT OF INTEREST

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AUTHOR CONTRIBUTION

Author PDS and MSS contributed to the literature review, manuscript preparation, and publication. Author IGAADK contributed to the theoretical approach and manuscript arrangement.

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