



## Dermoscopy features on dermatomycosis

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### ABSTRACT

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Dermoscopy is a non-invasive tool mainly used to clarify pigmented and non-pigmented skin lesions. Based on its physical properties, dermoscopy is divided into non-polarized and polarized. Dermoscopy examination is a diagnostic technique that is often performed on skin disorders, including skin disorders due to fungal infections. Some of the fungal diseases that are examined by dermoscopy are tinea capitis, pityriasis versicolor and onychomycosis. The dermoscopy features found in tinea capitis are comma hair, corkscrew hair, black dots and short hair. Onychomycosis found dermoscopy chromonychia, white longitudinal stripes and opaque nails (cloudy). The dermoscopy in pityriasis versicolor shows hypopigmented and hyperpigmented patterns.

### ABSTRAK

Dermoskopi adalah suatu alat noninvasif utamanya digunakan untuk memperjelas lesi kulit pigmentasi dan nonpigmentasi. Berdasarkan sifat fisiknya, dermoskopi dibagi menjadi dua, yaitu nonpolarisasi dan polarisasi. Pemeriksaan dermoskopi merupakan teknik diagnosis yang sering dilakukan pada kelainan kulit termasuk kelainan akibat infeksi jamur. Beberapa infeksi jamur yang dilakukan pemeriksaan dermoskopi adalah tinea kapitis, ptiriasis versikolor dan onikomikosis. Gambaran dermoskopi yang dijumpai pada tinea kapitis adalah rambut koma, rambut *corkscrew*, *black dots* dan rambut pendek. Pada onikomikosis dijumpai gambaran dermoskopi kromonikia, garis-garis longitudinal putih dan kuku *opaque* (keruh). Gambaran dermoskopi pada ptiriasis versikolor dijumpai pola hipopigmentasi dan hiperpigmentasi.

### Keywords:

dermatomycosis;  
dermoscopy;  
skin lesions;  
pityriasis versicolor and  
onychomycosis

### INTRODUCTION

Dermoscopy is a non-invasive tool mainly used to clarify pigmented and non-pigmented skin lesions. Based on its physical properties, dermoscopy is divided into non-polarized and polarized. Dermoscopy examination is a diagnostic technique that is often performed on skin disorders, including skin disorders due to fungal infections. Dermoscopy is also known as dermatoscopy, epiluminescence microscopy, incident

light microscopy, and skin surface microscopy.<sup>1,2</sup> Dermoscopy procedures allow visualization of skin structures below the surface of the epidermis, the dermoepidermal junction, and the upper dermis which are invisible structures. Dermoscopy images can be photographed or digitally recorded for analysis and follow-up.<sup>2,3</sup>

Tinea infections are caused by dermatophytes. Tinea is usually followed by a Latin term that designates the involved site, such as tinea corporis and

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tinea pedis. The clinical diagnosis can be unreliable because tinea infections have many differential diagnoses, which can manifest identical lesions. Diagnostic examination for suspected tinea infection can be confirmed with a potassium hydroxide preparation or culture from the infected site.<sup>4</sup> Periodic acid-Schiff (PAS) Stain is the most sensitive and the most expensive diagnostic test for onychomycosis, but culture has good specificity for diagnostic tinea infection.<sup>4</sup> Dermoscopy examination can visualize skin or nail changes in dermatomycosis. Dermoscopic features of dermatomycosis will be described in this article.

## MATERIAL AND METHODS

Dermoscopic finding should always be associated with patients sign and symptoms and physical examination. In this review article some books that discuss about the use of dermoscopy, dermatomycosis and dermoscopy features on dermatomycosis were reviewed. Some journals published in PubMed, Scopus and EBSCO database were also used as sources articles. The search terms included 'dermatomycosis', 'tinea capitis', 'onychomycosis', 'pityriasis versicolor' combined with 'dermoscopy', 'dermatoscopy', 'trichoscopy'.

## DISCUSSION

### Dermoscopy features on tinea capitis

Tinea is a superficial fungal infection with a prevalence of 20-25% of the world's population. Based on the etiology of tinea, tinea is divided into 3 major groups, namely the genus *Trichophyton*, *Microsporum*, and *Epidermophyton*. The clinical presentation of dermatophytosis depends not only on the source of infection but also on host factors. Dermatophytes are classified into

anthropophilic, zoophilic, and geophilic. Tinea is classified based on the affected area for example the tinea capitis occurred on the head. In the United States, tinea capitis is most commonly caused by *T. tonsurans*. Exposure to pets, especially cats, is associated with tinea capitis caused by *M. canis*.<sup>1,2</sup>

Since tinea capitis usually affects groups of children, taking the history of similar symptoms in the surrounding environment of the patient is necessary. Tinea capitis is more common in young males aged 3-9 years. The infection usually starts as a red papule that gets bigger and can affect the whole head. Symptoms of tinea capitis are erythema, itching, scaling, and alopecia. Symptoms may vary based on the causative organism and can vary from mild dandruff-like forms to kerion-like inflammation that may discharge pus and fall off permanently with enlarged lymph nodes. In general, tinea capitis is divided into the black dot, gray patch, and inflammatory types. The inflammatory types are known as kerion and favus. In children, the most common tinea capitis variant is the gray patch.<sup>5,6</sup>

Tinea capitis is a dermatophyte infection involving the hair, scalp, and their derivatives (eyebrows and eyelashes), which are generally caused by dermatophytes of the genera *Trichophyton* and *Microsporum*.<sup>7</sup>

Tinea capitis is the most common dermatophytosis in children. In some cases, the clinical appearance and symptoms are less clear and require mycological confirmation. However, new culture results can be obtained after 4 weeks, thereby hampering patient management and increasing the risk of transmission. In these cases, trichoscopy can guide the diagnosis. Therefore, specific dermoscopic signs for tinea capitis must be confirmed.<sup>8</sup>

The clinical picture of tinea capitis

may vary based on the pathogen, host resistance, and immune status. The clinical picture varies from asymptomatic to severe inflammation that can lead to alopecia with scarification. Children aged 6 months to 12 years are the age range that is often encountered. The clinical picture pattern is in the form of broken hair with scales. In *Microsporum* infection, the most common feature is patching alopecia, often circular, showing multiple broken hairs with minimal inflammation and a scaly scalp. In *Microsporum* infection, similar clinical features were found in *M. canis* and *M. audouinii* infection, but *M. canis* was more inflammatory and itchy. Symptoms of *M. canis* begin as scaly, erythematous, papular eruptions with hairs that break or fall off easily. Lesions generally become highly inflammatory, although *M. audouinii* is less inflammatory. In *Trichophyton* infection, multiple patchy hair loss is often seen with minimal inflammation and scaling that gives the appearance of black dot tinea, scaly alopecia plaques, seborrheic-like scales, and/or inflammatory kerion.<sup>8,9</sup>

The diagnosis can be determined based on clinical findings, especially if the lesion is typical. Tinea capitis needs to be differentiated clinically from various differential diagnoses such as dermatitis, lichen planus, pediculosis capitis, chronic folliculitis, and other follicular inflammatory conditions. Additional laboratory tests that can be performed to confirm the diagnosis include examination of 10-20% potassium hydroxide (KOH) on samples obtained by squamous scrapings. Wood's lamp examination is an additional diagnostic method, but cannot be used for black dot variant tinea capitis that occurs due to fungal invasion of the follicle (endotrix) such as *T. tonsurans*, *T. mentagrophytes*. This organism produces large spores in the hair shaft (large spore endotrix) and

does not fluoresce with Wood's lamp. *M. canis* and *M. audouinii* are organisms that produce small-spore ectothrix outside the hair shaft. The fungus will glow on examination of Wood's lamp, showing a yellow-green fluorescence in the hairs involved.<sup>10,11</sup>

Identification of fungi can be determined based on macroscopic (growth characteristics, pigment formation) and microscopic morphology (mainly macroconidia and microconidia). Culture generally takes about 7-14 days. *Microsporum canis* microconidia showed thick-walled macroconidia with spindle echinulata with terminal knobs and flat colonies of yellowish-white color, coarse hair with adjacent radial lines. Microscopic examination of *M. audouinii* showed chlamydoconidia and hyphae pectinate (comb-like) with colony morphology is grayish-white with widely spaced radial stripes.<sup>9,12</sup>

Dermoscopy is a non-invasive diagnostic tool that can assist in the diagnosis that has been widely used. *Trichophyton tonsurans* infection presents with coma hairs and multiple corkscrews that can occur due to hair degradation and external resistance. While the infection by *M. canis*, can be found with dystrophic hair, elbow-shaped hair, and hair damage that has different heights. Horizontal bands and translucent hairs are common in *M. canis* infection. The dermatoscopic patterns found were comma hair (41%), corkscrew hair (22%), short hair (49%), and black dots (33%). Histopathological examination is generally not required. When performed, histopathological examination gives an image of the spores in the hair follicle or stratum corneum. Arthroconidia and hyphae can be found on the surface of the hair (ectothrix) or within the hair shaft (endotrix).<sup>9,13,14</sup>

Other trichoscopy findings of tinea capitis can often be observed, but are

not typical, including broken hairs, black dots, and perifollicular-interfollicular scaling. Hair breakage and black spots can be observed in both the endothrix and ectothrix in tinea capitis with incidence rates of 8-100% (mean of 57%) and 17-80% (mean of 34%). In 6-95% (mean of 59%) and 53-100% (mean of 89%) of patients with tinea capitis, diffuse perifollicular scaling is detected.<sup>15</sup>

### Comma hairs

Comma hairs are short C-shaped hairs, which have homogeneous pigmentation and thickness (FIGURE 1). They were first described by Slowinska *et al.* in 2008.<sup>15</sup> Comma hairs are formed due to cracks and subsequent bending of the hair shaft filled with hyphae. The frequency of hair coma varies between 13 and 100% in patients with tinea capitis. They are also occasionally detected in patients with alopecia areata and trichotillomania.<sup>15,16</sup>

### Corkscrew hairs

Corkscrew hairs is a depiction of multiple twisted and coiled hairs with a corkscrew-like structure (FIGURE 2). This was first described by Hughes *et al.*<sup>17</sup> in 2011 as a specific form of commas hair in black patients (with African hair type) or a specific trichoscopy finding of tinea capitis caused by *T. soudanense*. However, corkscrew hairs were also found in fair-skinned patients with straight hair. They were observed in endothrix tinea capitis caused by *T. tonsurans* and *T. violaceum*. In addition, corkscrew hairs can also be detected in ectothrix fungal infections caused by *T. verrucosum*, *M. canis*, and *M. audouinii*. The incidence of corkscrew hairs can vary between 14 and 100% (mean of 32%) of patients with tinea capitis. Corkscrew hairs can be described as a specific trichoscopy feature of tinea capitis. However, they can also be observed in ectodermal dysplasia.<sup>16,17</sup>

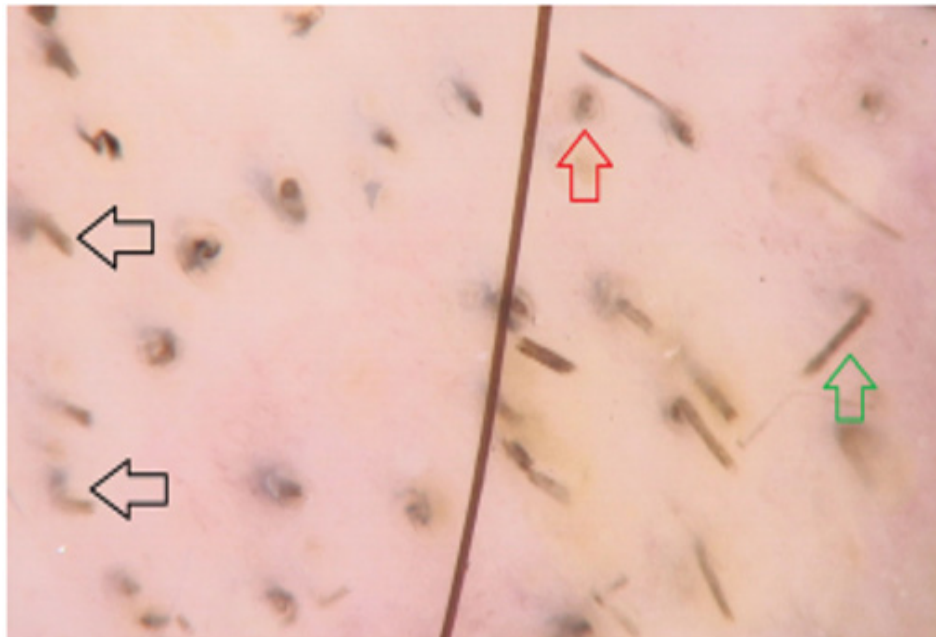


FIGURE 1. Characteristics of comma hair.<sup>16</sup>

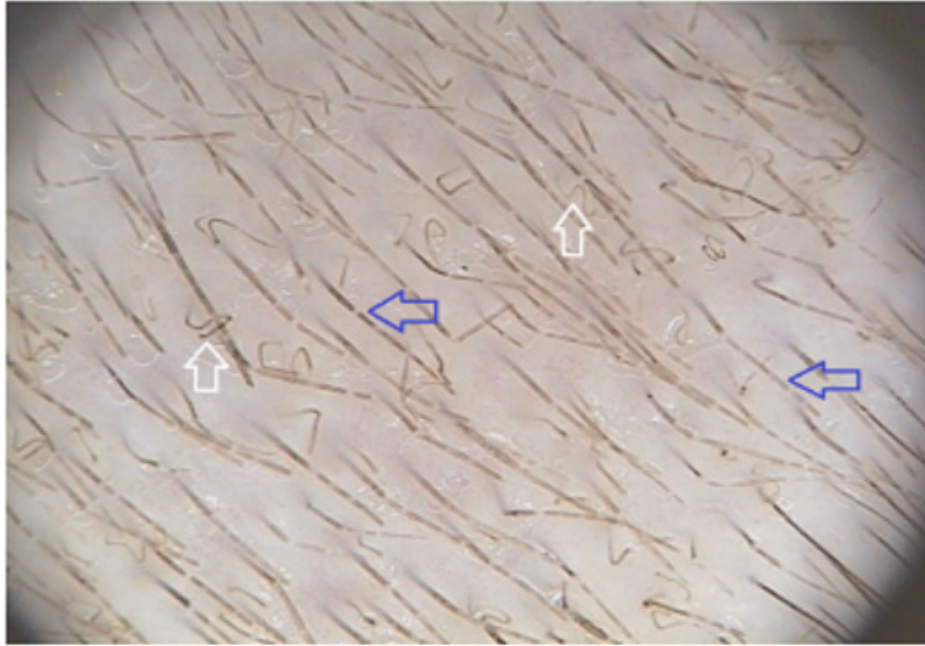


FIGURE 2. Characteristics of corkscrew hair.<sup>16</sup>

#### ***Hair like morse code/barcode hairs***

Morse code-like hair also known as barcode-like hair represents hair with several thin white bands along the hair shaft. This term was introduced in 2011 by Rudnicka *et al.*<sup>18</sup> Morse code-like hair is formed due to the buildup of spores around the hair shaft causing transverse perforation of the hair shaft. It was observed only in patients with ectothrix type fungal infection with an incidence rate of between 12% and 56% (mean of 22%).<sup>16,18</sup>

#### ***Zig zag hair/zig zag hairs***

Zigzag hair, first described by Rudnicka *et al.*<sup>18</sup> is a crooked hair with several sharp angles. Formation resulting from incomplete transverse fracture along the hair shaft. Zig zag hair was observed only in patients with ectothrix type fungal infection with an incidence rate between 5 and 49% (mean of 21%). They have also been reported in patients with alopecia areata.<sup>16,18</sup>

#### ***Bent hairs***

Twisted hair is characterized by the bending of the hair shaft with homogeneous thickness and pigmentation. In contrast to commas hair, no shortening of the hair shaft was observed. Very few studies have reported curling hair in tinea capitis, with an incidence rate of 4-71% (mean of 27%). They were only observed in patients with ectothrix type fungal infection.<sup>15</sup>

#### ***Block hairs and i-hairs***

Block hairs are very short hairs with horizontally transverse distal ends. While i-hairs are block hairs with dark accented distal ends. These terms were introduced by Rudnicka *et al.*<sup>18</sup> Very few studies have reported block hairs and i-hairs in tinea capitis, with incidence rates of 4-50% (mean of 10%) and 4-33% (mean of 10%). They are also detected in patients with alopecia areata and trichotillomania.<sup>16,18</sup>

To be able to determine the causative

agent of fungal infection in tinea capitis, apart from fungal culture, trichoscopy examination can also help determine the causative agent of tinea capitis. The following is a schematic overview of the trichoscopy appearance and the causative agent of tinea capitis.<sup>19</sup>

### **Dermoscopy features in nail fungi infection**

Nails are a special form of the stratum corneum which is composed of keratin. Human nails mainly function as protection of the distal finger, helping to hold various small objects, improving fine touch and aesthetic function of the hand. For evaluation of nail abnormalities, the doctor needs to take a detailed history and perform an examination of the nail under adequate light. Various nail abnormalities such as discoloration, pigmentation, changes in texture and surface, and vascular abnormalities need to be assessed comprehensively.<sup>20,21</sup>

In interpreting abnormalities in the nails, doctors need to understand the components that make up the disorder. The details of the micro-components are often obscured by the reflection of light from the nail surface, causing a variety of otherwise distinct abnormalities to appear similar. With the help of dermoscopy, doctors can overcome these optical obstructions and reveal diagnostic details of a nail lesion.<sup>3</sup>

The use of dermoscopy in the evaluation of nail abnormalities is still quite new and is still being developed. Examination by dermoscopy or known as onychoscopy is an easy and fast procedure. Dermoscopy can well describe abnormalities in the nail plate

and base and detect vascular changes.<sup>4</sup> Nail dermoscopy can particularly improve the clinician's ability to diagnose abnormalities in nail fungal diseases such as onychomycosis, thus leading to histopathological examination and re-evaluation.<sup>22,23</sup>

Onychomycosis is often considered to be the most common nail disorder with approximately 40 to 50% of all nail diseases. Most are distal or distal-lateral subungual onychomycosis. Some bacteria and fungi can cause brown-black discoloration of the nail plate. *Pseudomonas* colonization can cause longitudinal green stripe discoloration. The main characteristics of onychomycosis are jagged edges and sharp longitudinal white indentations that correspond to the proximal development of the fungus. Another sign is a longitudinal line with irregular pigmentation consisting of various colors (white, yellow, orange, and brown) in the area of onycholysis (FIGURE 3).<sup>24</sup> A black dot with a homogeneous yellow-orange base of the nail plate can also be seen in onychomycosis.<sup>4,25,26</sup>

Onychomycosis may have several characteristic dermoscopy features of the nail plate and free edge of the nail. On the nail plate can be found chromonychia, namely yellow, brown, or green nail color associated with onycholysis trauma in the distal, lateral, or distal-lateral part, opaque nails (cloudy), and white longitudinal stripes (longitudinal white streaks). At the free end of the nail, a subungual keratosis is often found in broken or crushed nails and ventral or dorsal chromonychia. The Skin area around the nails may look dry and scaly.<sup>27</sup>



FIGURE 3. A) White-yellowish macule on subungual distal onychomycosis. B) Melanochia fungal: picture of pigment aggregate with various colour pigmentation

### Dermoscopy in pityriasis versicolor (PV)

Pityriasis versicolor (PV) or tinea versicolor is a superficial fungal infection caused by *Malassezia*, characterized by changes in skin pigment, due to fungal colonization of the stratum corneum which is the normal flora of human skin. Clinically characterized by hyperpigmented or hypopigmented macules, round to oval lesions commonly found on the trunk, upper arms, and face. Although some patients may complain of mild pruritus, the disease is often asymptomatic. Patients usually seek treatment because of the cosmetic appearance associated with this condition.<sup>28</sup>

The diagnosis of PV can be made by dermoscopy. Dermoscopy examination is gaining popularity as a non-invasive procedure for the diagnosis of different pigmentary and inflammatory disorders. However, rare evidence exists in PV dermoscopy patterns.<sup>29</sup>

Dermoscopy in PV in the literature is still not well described. In the study of

dermoscopy in PV, most were reported in patients with Fitzpatrick skin type IV-V. The appearance of non-uniform pigmentation was the most common dermoscopy seen in hypopigmented and hyperpigmented lesions. Among the various scaling patterns, uneven scaling was observed more frequently in hypopigmented lesions whereas scaling in grooves was more frequent in dermoscopy of hyperpigmented lesions. Inconspicuous ridges and grooves, perilesional hyperpigmentation, and variable vascular patterns are other dermoscopy features of the lesion.<sup>28-30</sup>

The new dermoscopy pattern in hypopigmented and hyperpigmented PV lesions is an important feature as the finding of scale patterns, pigmentation patterns and border patterns can be better visualized using a dermatoscope. These patterns can be useful for differentiating PV from other similar-looking disorders. The scale pattern can also be used as a measure to assess the severity of the disease and can help doctors to decide on treatment.<sup>31-33</sup>

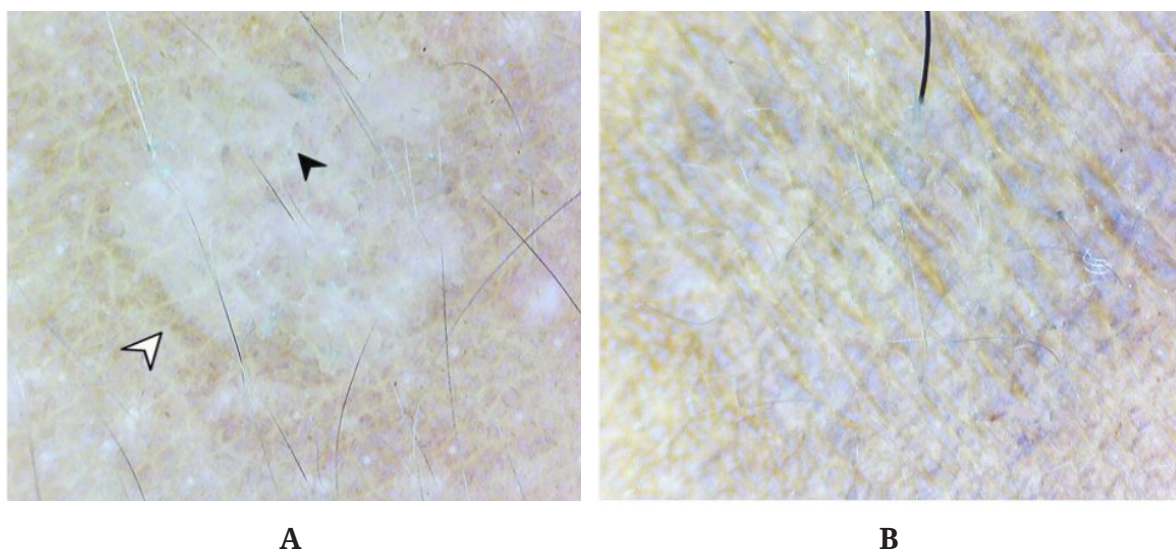


FIGURE 4. A. Dermoscopy findings from hypopigmented lesions show non-uniform pigmentation, inconspicuous ridges and grooves, hyperpigmented perilesional hyperpigmentation (white arrows), and uneven scaling (black arrowheads). (B) Dermoscopy (10x original magnification) of a hyperpigmented lesion showing nonuniform pigmentation.<sup>29</sup>

## CONCLUSION

Dermatomycosis diagnosis is based on clinical features, KOH scrapping, and wood lamps. Dermoscopy is a non-invasive tool mainly used to clarify pigmented and non-pigmented skin lesions. Dermoscopy examination is a diagnostic technique that is often performed on skin disorders, including skin disorders due to fungal infections. In recent years dermoscopy can be used as one of the diagnostic tools for dermatomycosis.

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