Can Dermoscopy Serve as a Diagnostic Tool in Dermatophytosis? A Pilot Study

Abstract

Background: Dermoscopy has been shown to be a useful tool in assisting the noninvasive diagnosis of various general dermatological disorders. **Aim:** The purpose of the study was to describe the dermoscopic findings in various dermatophytosis. **Materials and Methods:** This cross-sectional study included 100 clinically diagnosed tinea infections of skin, hair, and nails, which were evaluated using a dermoscope (Dermlite 3 gen DL3N, California USA, 10x). **Results:** Among 100 patients of dermatophytosis, 69 were males and 31 females. The maximum number of patients had tinea corporis, followed by tinea cruris and tinea capitis. Dermoscopic findings noted in cases of tinea corporis included diffuse erythema, follicular micropustules, and brown spots surrounded by a white-yellowish halo, broken hair, wavy hair, and rare, morse code hair. Dermoscopy of tinea capitis depicted comma hairs, corkscrew hairs, zigzag hairs, and morse code hairs. Proximal jagged edge, spikes, and longitudinal striations were present in the cases of onychomycosis. Dermoscopy of tinea incognito yielded morse code hairs, follicular micropustules, and easily deformable hairs that look weakened and transparent and show unusual bends. **Limitations:** Dermoscopic findings were not correlated to fungal culture. **Conclusion:** Dermoscopy can be used as a fast, inexpensive, and noninvasive diagnostic tool to enhance diagnosis of cutaneous fungal infections.

Keywords: *Dermatophytosis, dermoscopy, morse code hair, vellus hair*

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Introduction

The use of dermatoscopy is rapidly expanding. From its original use for assessing pigmented lesions, the indications for this device have expanded immensely.[1] From melanoma diagnosis to hair and nail assessment, the dermatoscope has reduced the need for a biopsy and other procedures and investigations.[2-5] The diagnosis of cutaneous fungal infection is currently made by direct microscopic examination with potassium hydroxide and fungal cultures; however, these conventional mycological examinations are rather complex, time-consuming, and require trained personnel and mycological tools. Further, the pandemic of dermatophytosis in India warrants a rapid examination technique. Dermoscopy is evolving as a simple, fast, and readily available diagnostic tool that can be performed at bed side, and recognition of these dermoscopic features is simple. As the indications for dermoscopy have evolved, so has the device itself. Hand-held dermatoscope has become even more portable.[6] The ability to combine a digital camera and a dermatoscope has greatly assisted in documentation of patients.[6] Attaching a dermatoscope to a mobile device such as an iPhone has taken portability to a new level.[6]

Dermoscopy of skin, hair and nails has evolved beyond limits over the past decade. In cases of tinea capitis, new trichoscopic features have surfaced up. At lower magnification, trichoscopy shows subtle horizontal white bands (interrupted), appearing as empty bands at higher magnification. It is called morse code-like hairs (bar code-like hairs). This feature coincides with the horizontal white bands; so, the infected hair appears as empty band, which is related to localized areas of fungal infection. These horizontal white bands are usually multiple and may cause the hair to bend and break.[7]

The present study was aimed to identify the characteristic dermoscopic findings of cutaneous fungal infection and to evaluate the usefulness of dermoscopy in clinical diagnosis of cutaneous fungal

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infections, based on the current literature and our personal experience.

Materials and Methods

This study with a cross-sectional design was carried out over a period of 6 months from October 2017 to April 2018 in the postgraduate department of dermatology of Government Medical College, Srinagar. One-hundred patients with clinical diagnosis of any form of dermatophytosis attending the outpatient department of dermatology, who were willing to be a part of the study, were included. A relevant history was taken regarding the onset, duration, progression, recurrence, and treatment modalities used. Diagnosis of dermatophytosis was made by clinical examination, direct microscopic examination with KOH, and fungal cultures using Saboraud's dextrose agar in some.

All the patients were subjected to clinical examination and dermoscopic examination. In all cases, the affected areas of skin, scalp, and nails were examined by a handheld dermoscope (Dermlite 3 gen DL3N, California USA), with a magnification of 10x. Images were recorded directly by the digital camera attached to the dermatoscope. The contact plate of dermoscope was cleaned with sanitizer to prevent contamination. Our study was approved by the institutional ethics committee and was conducted in accordance with the Declaration of Helsinki. All those willing to participate were explained the procedure and the reason for photography before taking their written informed consent. Case selection was by simple random sampling by using lottery method.

Inclusion criteria: We included clinically diagnosed cases of dermatophytosis of both genders in all ages in our study. In the case of multiple lesions, we randomly selected active lesions for dermoscopic evaluation.

Exclusion criteria: We excluded patients refusing for consent and those who had undergone topical and systemic antifungal treatment for last 1 and 6 months, respectively.

Dermoscopic markers are very characteristic but not found in all patients. Cases in which the characteristic dermoscopic features were appreciated were said to have a positive dermoscopy, whereas in those in which these findings could not be appreciated were said to have a negative dermoscopy.

During dermoscopy of internal areas like tinea cruris, patients were undressed in a gown. A drape or a sheet was placed over the genitals while examining the internal areas like groins. During dermoscopy of internal areas, utmost care was taken to respect patient privacy.

Results

Out of 100 patients of dermatophytosis, 69 were males and 31 were females with a male-to-female ratio of 2.22:1. Patients ranged in age from 2 to 69 years, with a mean age of 24 ± 1.2 years. Various types of dermatophytosis that were detected in our study are depicted in Table 1, with tinea corporis being the most common type, followed by tinea cruris and tinea capitis. Tinea incognito in all types of

Table 1: Dermoscopic findings of dermatophyte infections

Type	Number (*n*=100)	Dermoscopic findings (*n*=number)
Tinea corporis	30	Diffuse erythema, intense, not as regular dots, whitish scales (30) Follicular micropustules (11) Brown spots surrounded by a white-yellowish halo (6) Wavy hair, broken hair (4) Morse code hairs of vellus hairs (1)
Tinea cruris	27	Same as T corporis Morse code hairs (8) Easily deformable hairs that look weakened and transparent and show unusual bends (2)
Tinea capitis	12	Comma hairs, corkscrew hairs, zigzag hairs, black dots, short vellus, bar code (morse code hairs) (10) Inter follicular scales (10) Follicular pustules/Abscesses present in Kerion (5) Cigarette ash hairs (3)
Tinea unguium	11	Proximal jagged edge of onycholysis (11) Spikes (8) Longitudinal striae of different colors (aurora borealis pattern) (7) Pseudoleuconychia (2) Melanonychia with black dots (1)
Tinea pedis/ Tinea manuum	10	Whitish scales along the palmar and plantar creases (10) Brownish scales showing dried vesicles (4) Ares of intense erythema, unrelated to that of psoriasis or eczema (9)
Tinea incognito	38	Morse code hairs of vellus hairs (18) Follicular micropustules (14) Concentric areas of erythema separated by scales (13) Easily deformable hairs that look weakened and transparent and show unusual bends (15)

dermatophytosis were detected in 38 patients. In our study group, 12 patients had both tinea cruris and tinea corporis, whereas 12 patients had tinea capitis.

The maximum number of patients that was enrolled in our study were having tinea corporis (30 patients), followed by tinea cruris (27 patients). Dermoscopic findings noted in cases of tinea corporis included diffuse erythema in all the 30 patients; scaly broken hairs (16), follicular micropustules (11 patients); brown spots surrounded by a white-yellowish halo (6 patients) and wavy hair; and rarely morse code hair. Whitish superficial thin scales were seen distributed mainly along the skin creases. Dermoscopic findings of tinea cruris were similar to that of tinea corporis. In addition, morse code hairs were seen in about eight cases of tinea cruris [Figures 1 and 2].

In our study, the duration of the scalp lesions ranged from 3 weeks to 4 months, and only two patients had lesions for more than 6 months. KOH examination was positive in all cases. Among 12 patients of tinea capitis, dermoscopy was positive in 11 patients. Ten patients had comma hairs alone or in association with corkscrew hairs. One patient with kerion showed only crusts. Other dermoscopic features depicted in our cases of tinea capitis included zigzag hairs, black dots, short vellus, barcode (morse code hairs), cigarette ash hairs, and scales [Figures 3 and 4].

Our study included 11 patients of onychomycosis: 8 males and 3 females. Among 11 patients, 9 patients had disto-lateral subungal onychomycosis, and 2 had superficial white onychomycosis. KOH positivity was seen in six patients. Proximal jagged edge of onycholysis, spikes, and longitudinal striations were present in all the 11 cases of onychomycosis. Longitudinal striations alone were seen in eight patients, whereas color changes were seen in seven cases of onychomycosis. Other dermoscopic features seen in our patients included pseudoleuconychia (two patients) and melanonychia with black dots (one patient) [Figures 5 and 6].

In cases of tinea manuum and tinea pedis, dermoscopic findings noted included whitish scales along the palmar and plantar creases, and brownish scales showing dried vesicles and occasional patchy globular vessels, unrelated to that of psoriasis or eczema [Figure 7].

Dermoscopy of tinea incognito yielded morse code of vellus hairs, easily deformable hairs that look weakened and transparent, and showed unusual bends; follicular micropustules and concentric areas of erythema separated by scales [Figures 8a, b and 9]. The dermoscopic findings are summarized in Table 1.

Discussion

The diagnosis of cutaneous fungal infection is currently made by direct microscopic examination with potassium hydroxide and fungal cultures; however, these conventional mycological examinations are rather complex, time-consuming, and require trained personnel and

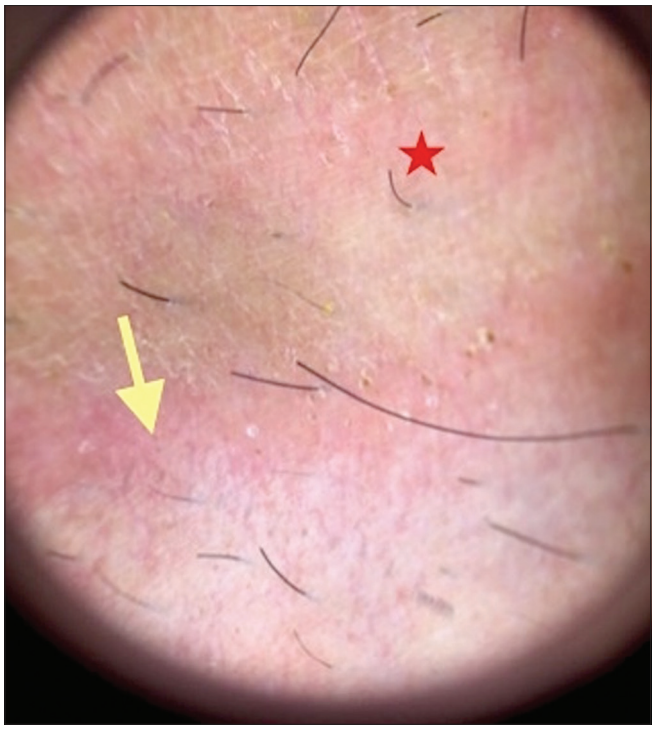

Figure 1: Tinea corporis: Diffuse erythema, scaling (yellow arrow), and broken hairs (red star) in tinea corporis. The whitish superficial thin scales can be seen distributed along the skin creases. (×10)

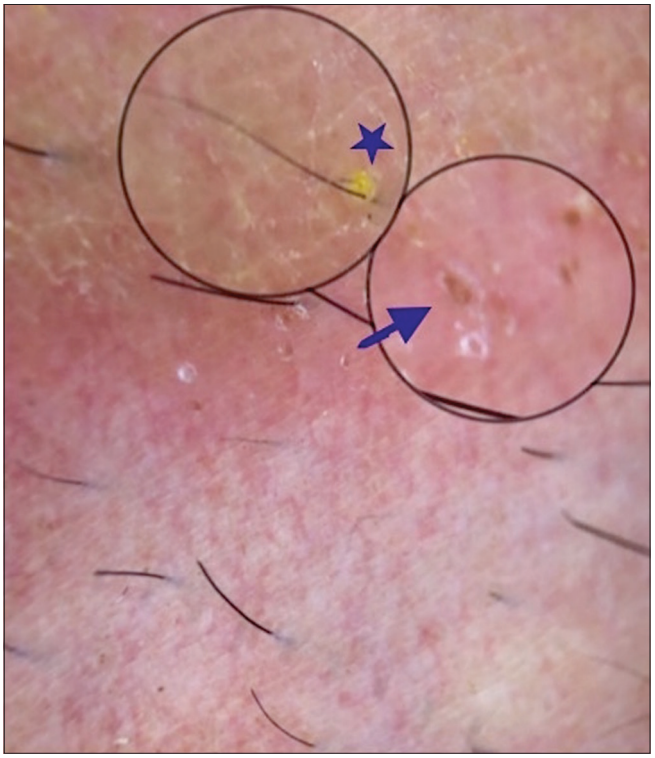

Figure 2: Tinea corporis: Dermoscopic features suggesting fungal invasion of hair follicle, such as follicular micropustules (blue star) and brown spots surrounded by a white-yellowish halo (blue arrow) (×10)

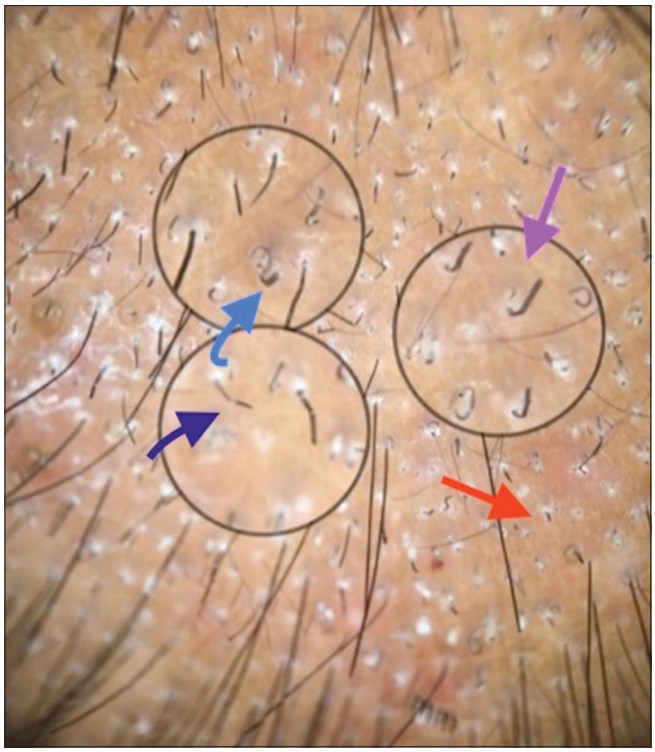

Figure 3: Tinea capitis: Comma hairs (purple arrow), corkscrew hairs (blue arrow), black dots (red arrow), zigzag hairs, and bar code or morse code hairs (dark blue arrow) (×20)

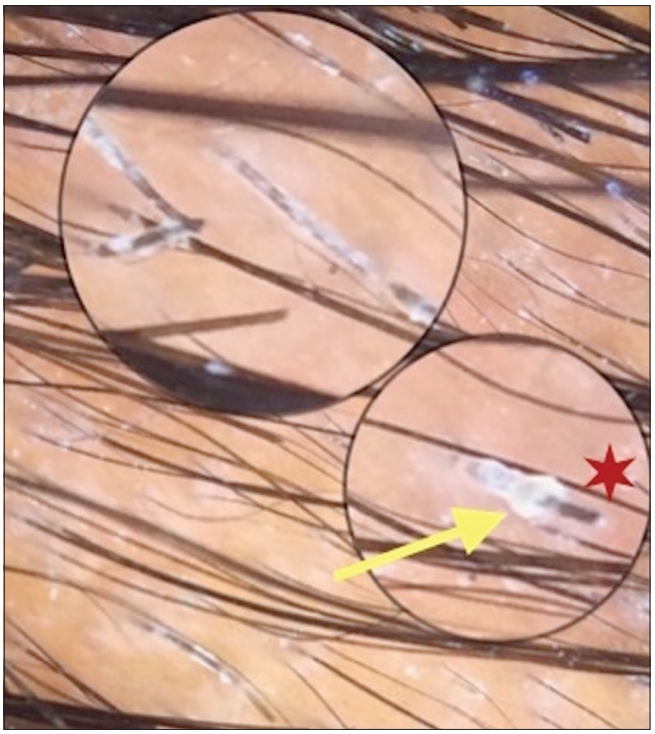

Figure 4: Tinea capitis: Scales coating the hairs (yellow arrow) with cigarette ash-shaped hairs (red star) (×20)

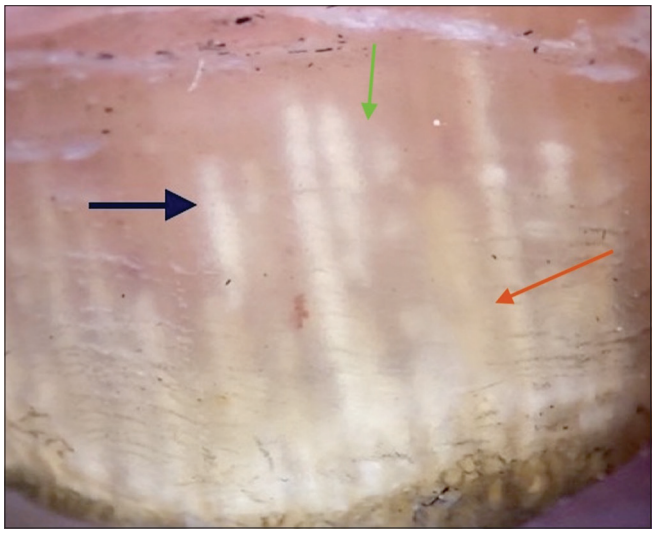

Figure 5: Onychomycosis: Jagged edge of the proximal margin of the onycholytic area (green arrow), with sharp structure (spikes) directed to the proximal fold (black arrow), white-yellow longitudinal striae in the onycholytic nail plate (red arrow) (×10)

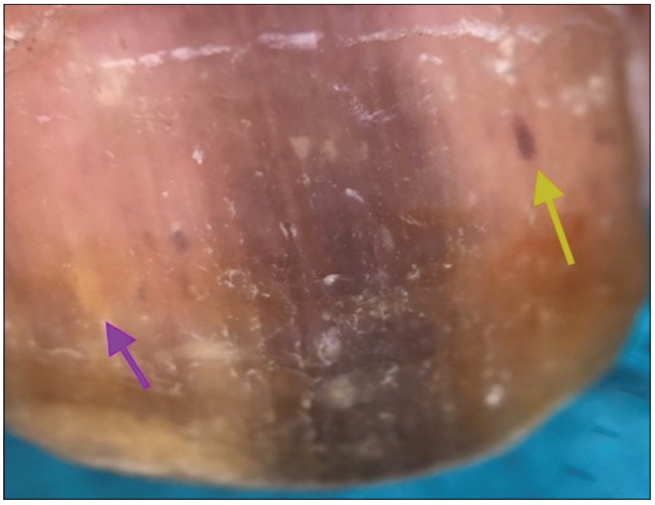

Figure 6: Fungal melanonychia: Black dots may be due to dermatophytoma (yellow arrow), orange-yellow color due to colonies of fungi (purple arrow) (×10)

mycological tools. Dermoscopy may be a helpful auxiliary tool in assisting the noninvasive recognition/differential diagnosis of several "general" dermatoses by magnifying both surface structures and subsurface features that are invisible to the unaided eye.

The study was carried out with the intention to evaluate the usefulness of dermoscopy in the diagnosis of cutaneous fungal infections. In our study, we studied dermoscopic features of 12 patients of tinea capitis. Our study detected comma and/or corkscrew hairs in 10 of 11 cases of positive dermoscopy. Morse code hairs were also seen. Morse code hairs develop due to masses of arthroconidia formed at intervals in the hair shaft (dots) which are separated by thinner fragments where only hyphae develop (bars).[8] In our experience, these dermoscopic markers are very characteristic but not found in all patients. Isa *et al.*[9] report the results of dermoscopy in 43 patients with tinea capitis, which were evaluated clinically and

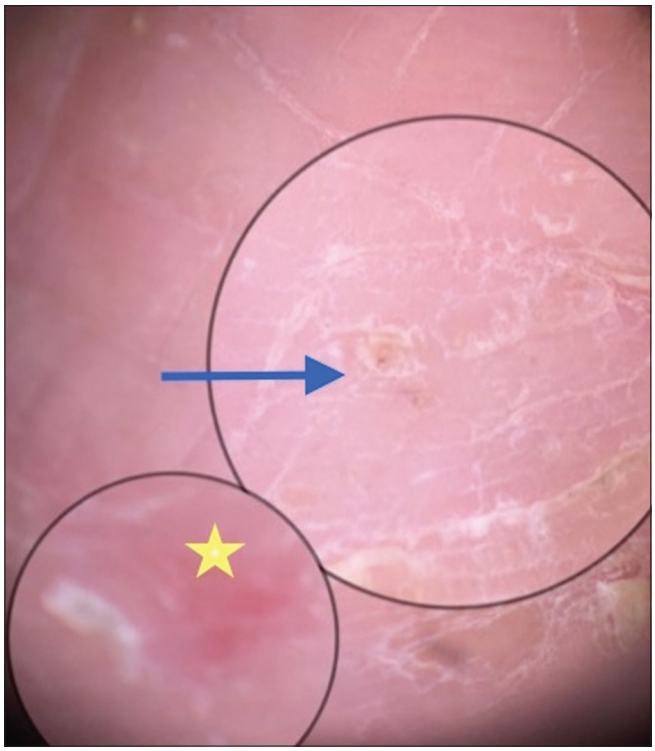

Figure 7: Tinea manuum: Scaling in the palmar creases, brownish scales showing dried vesicles (blue arrow), areas of intense erythema due to patchy vessels (yellow star), unrelated to that of psoriasis or eczema (×20)

with dermoscopy. Comma hairs were found in seven patients, whereas corkscrew hairs were found in three patients. Slowinska *et al.*,[10] Crocker *et al.*,[11] and Hughes *et al.*[12] reported small series of patients with tinea capitis and positive dermoscopy but did not provide information about the prevalence of positive dermoscopy findings among patients with tinea capitis.

The diagnosis of onychomycosis is moving from clinicopathologic tools, which are time-consuming and give false-negative results in up to 35% of cases, to clinicoimaging diagnosis.[13,14] The characteristic dermoscopic findings in cases of onychomycosis reported in our study included spikes and longitudinal striations of different colors (aurora borealis pattern), color changes, pseudoleuconychia, and melanonychia with black dots. These distinctive dermoscopic features for onychomycosis were in conformity with the results of studies conducted by Piraccini *et al.*,[15] De Crignis *et al.*,[16] and Kilinc *et al.*[17]

Dermoscopic findings in tinea corporis included diffuse erythema, intense, not as regular dots; follicular micropustules; and brown spots surrounded by a white-yellowish halo, suggesting invasion of hair follicle. The follicular micropustules can be seen mostly in vellus hairs and the inflammation can lead to loss of the vellus hair with post-inflammatory hyperpigmentation in the form of brown spot and hypopigmentation or even mild scarring leading to white halo formation. Dermoscopic findings of tinea cruris were similar to that of tinea corporis. In

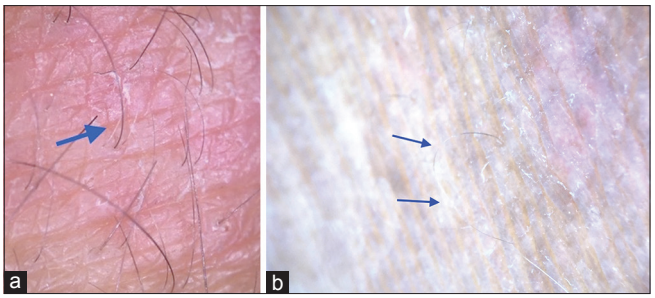

Figure 8: (a) Tinea incognito: Translucent hair that looks weakened and shows bends (blue arrow). (b) Easily deformable translucent hair with background post-inflammatory pigmentation in tinea incognito (×30)

addition, Morse code hairs were seen. Dermoscopy of tinea corporis has not been described in literature. Nicole *et al.*[18] reported a case of tinea corporis in an infant in whom dermoscopy helped to determine vellus hair involvement, causing treatment to be switched from topical to systemic antifungal therapy. They emphasized that dermoscopic features suggesting fungal invasion of hair follicle, such as follicular micropustules and brown spots surrounded by a white-yellowish halo, may help in therapeutic management.[18]

In our study, dermoscopy of tinea incognito yielded morse code hairs of vellus hairs, follicular micropustules, and concentric areas of erythema separated by scales. A new dermoscopic feature, consisting of translucent, easily deformable hairs that look weakened and transparent, and shows bends, is likely due to massive fungal invasion involving the whole hair shaft. Glomez-Moyano *et al.* observed scaly, broken, translucent hairs and morse code hairs in a 57-year-old man with tinea incognito and provided a correlation of this dermoscopic finding with direct microscopy.[8]

Dermoscopy has also been used to detect tinea of vellus hair.[19] A new criterion to start systemic antifungal therapy in tinea of vellus hair skin has been described: the observation of parasitized vellus hairs on direct examination. Dermoscopic examination can predict from the outset which cases of tinea of vellus hair skin will respond poorly or even not respond at all to topical treatment alone. Dermoscopy is no substitute for mycological study, but rather it complements it, as the parasitism of the vellus hair can be seen only by direct examination or with trichoscopy, but not in culture.[20]

Our study revealed a number of observations that were in conformity with the facts revealed by the studies of previous workers.

Conclusion

Dermoscopy is no substitute for mycological study, but rather it complements it. It would nevertheless be desirable to use this diagnostic tool, particularly when no optical microscope or mycology reference laboratory is available,

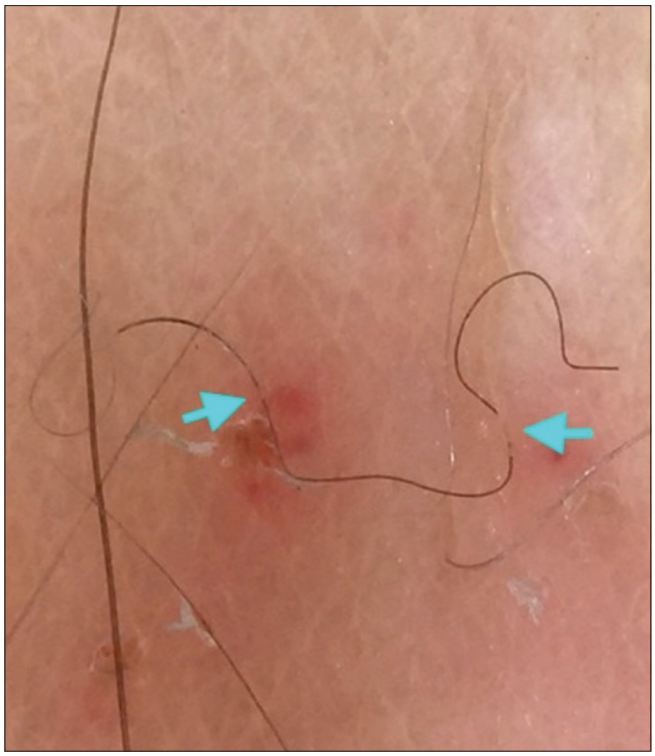

Figure 9: Multiple horizontal white bands due to fungal invasion, leading to bends and breaking of hair (morse code hair) (×70)

and may play a role in the pandemic of dermatophytosis in India. It leads to prompt treatment initiation and avoidance of unnecessary investigations. It may also serve to assess the response to treatment and treatment failure. Further study is underway to corroborate the findings of dermoscopy with fungal culture and the mycological cure.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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