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## **Dermoscopic features of uncomplicated tinea versus steroid-modified tinea: An observational study in Indian patients**

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### **Abstract**

**Background:** Tinea is one of the most common superficial fungal skin infections. Steroid-modified tinea infections may present with atypical morphology. This study aims to observe the difference between dermoscopic features of uncomplicated dermatophytosis and steroid-modified dermatophytosis.

**Methods:** This observational study was conducted in 60 patients with tinea cruris, tinea corporis and tinea faciei in the outpatient dermatology department of a tertiary care center. Patients were divided into group A and group B. Group A included 30 patients with no history of steroid use in the past three months. Group B included 30 patients with a history of steroid usage in the past three months. Dermoscopy was performed in both groups using a USB 2.0 dermoscope (Dino-Lite Premier AM3113T<sup>®</sup>, Magnification – 20x to 50x and 200x) to study the characteristic features in tinea infections. Chi-square test and Fisher's exact test were applied as applicable.

**Results:** Out of 60 cases of dermatophytosis, 20 cases were of tinea corporis, 28 cases of tinea cruris, and 12 cases of tinea faciei. Dermoscopic features of hair follicular involvement (perifollicular scale, follicular micropustules, the involvement of vellus hair, yellow hair, morse code hair, and transparent hair) were significantly more common in group B than in group A (P = 0.004, P = 0.039, P = 0.0001, P = 0.01, P = 0.03, P = 0.002, respectively for each feature).

**Conclusions:** All dermatophytosis patients with a history of steroid use showed characteristic signs on dermoscopic examination irrespective of their morphologic appearance. Thus, dermoscopy can be used as a rapid diagnostic method for steroid-modified cases of tinea.

**Keywords:** *dermoscopy, morse code hair, steroid-modified tinea, yellow hair*

### **Background**

The number of patients presenting with dermatophyte skin infections continues to increase each day in the dermatology outpatient department.<sup>1</sup> On the other side, dermatologists face the increasing prevalence of steroid-modified dermatophytosis. Topical steroid application changes the typical morphological appearance of skin lesions, which may mimic eczema, psoriasis or irritant contact dermatitis, complicating the diagnosis.<sup>2</sup> Antifungal drugs are costly, and long-

term treatment is necessary. Due to the chronic nature of the problem, many patients choose to switch physicians to look for second opinions. In such scenario, making the correct diagnosis and picking up signs for long-term systemic treatment are crucial for the physicians. Dermoscopic features provide the healthcare providers with a quick, non-invasive, reliable diagnosis of steroid-modified tinea and help doctors identify the depth of the problem and consider the duration of treatment needed for the patients. The current literature suggests that dermoscopic patterns in

tinea corporis and cruris include diffuse erythema, whitish scales, and brown spots surrounded by a white halo, while steroid-modified tinea may reveal morse code hair, follicular micropustules and transparent hair.<sup>3</sup> Dermoscopic patterns of follicular involvement are commonly observed in patients with steroid use. Steroid use leads to immune suppression, thereby resulting in deeper follicular involvement of dermatophyte. This study noted a similar difference between dermoscopic features of uncomplicated dermatophytosis and steroid-modified dermatophytosis.

## Methods

This observational study was carried out from June 2018 to June 2019. Sixty patients diagnosed with tinea cruris, tinea corporis and tinea faciei infections visiting the dermatology outpatient clinic were included in the study. The inclusion criteria were male or female patients of all ages diagnosed with dermatophytosis in the form of tinea cruris, tinea corporis, and tinea faciei based on clinical features and KOH (10% potassium hydroxide) examination with and without a history of topical or oral steroid use in the last three months. Fungal culture was done with SDA (Sabouraud dextrose agar) in KOH negative cases only. Patients who were not willing to give consent or patients who had undergone treatment with topical antifungal without steroid combination and systemic antifungal for the last 1 and 6 months, respectively, were excluded. After obtaining written informed consent from all patients, demographic data and detailed disease history, including duration of fungal infection, and any previous medical treatment was noted. Detailed clinical examination was done to record the size, site and number of lesions. Other sites like nails and hair were examined for fungal infections and signs of topical steroid were noted.

Patients were divided into Group A and Group B. Group A were patients with no history of use of topical or oral steroid for fungal infection in the past three months and Group B were patients with a history of topical steroid use for more than 30 days or oral steroid use for more than 15 days in the past three months.<sup>4,5</sup> Upon KOH examination, the skin lesion was cleaned with distilled water. The sample was collected from the active edge of the lesion with a blunt scalpel edge. In lesions with minimal scaling, distilled water was applied to the lesion with the aim to remove the scale easily. In steroid-modified eczematous lesions, we removed the scale and crust followed by scraping from the margin of the lesion. Scraped material was placed directly on the slide. Potassium hydroxide 10% was added to the collected material, covered by a

coverslip made of fragile glass and gently preheated before examining for fungi. Fungal culture was done with SDA (Sabouraud dextrose agar) in KOH negative cases only.

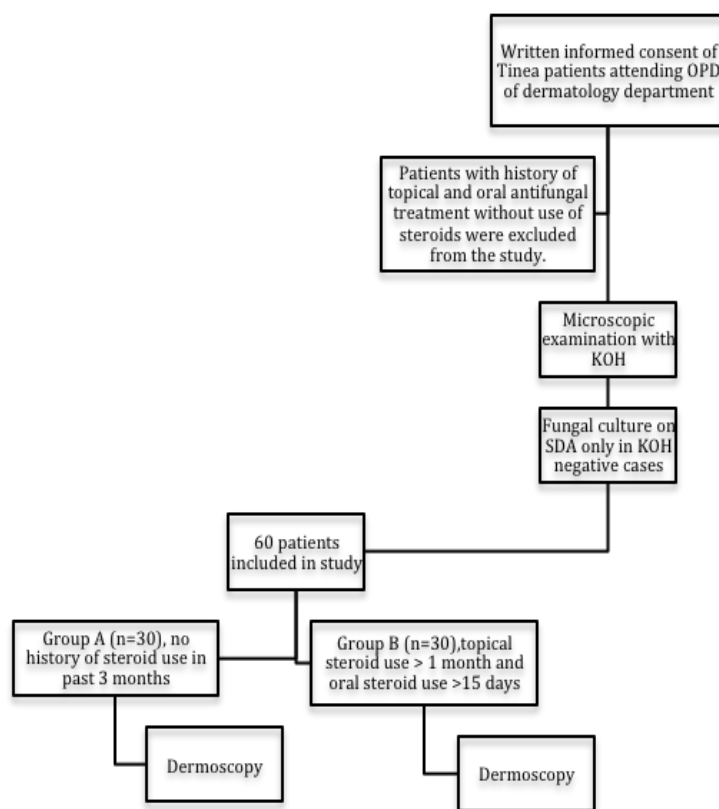
Dermoscopy was performed with a USB 2.0 dermoscope (Dino-lite Premier AM3113T®, Magnification: 20x-50x and 200x). Dermoscope was cleaned with sanitizer, and cling film was used during examination to prevent contamination of scope. The images were stored and interpreted by two independent observers. The institutional ethics committee approved this study.

Statistical testing was conducted with WINPEPI® software. Chi-square test and fisher exact test were applied as applicable. P-value < 0.05 was considered statistically significant. The research flow of this study is presented below (Figure 1).

## Results

Sixty patients were enrolled in the study. Demographic data, dermoscopic features of Group A and B are described in Table 1. Most commonly used preparation were combinations of highly potent topical corticosteroid e.g. clobetasol along with antifungal and antibacterial combinations sold as over-the counter (OTC) medicine. Duration of application varied from 4 months to 2 years. Dermoscopic features of hair follicular involvement such as peri-follicular scale, follicular micro pustule, involvement of vellus hair, yellow hair, morse code hair, transparent hair were significantly more common in group B patients than in group A patients (P = 0.004, P = 0.039, P = 0.0001, P = 0.01, P = 0.03, P = 0.002).

Other sign of follicular involvement such as brown dot was also noted more often in Group B patients than in Group A patients but there was no statistically significant difference between two groups. Moreover, diffuse erythema with or without scaling was observed in all patients of the group A and B.



**Figure 1.** Research flow. OPD: outpatient department, KOH: potassium hydroxide, SDA: Sabouraud dextrose agar

**Table 1.** Demographic data and dermoscopy features of Group A and B.

Study group		Group A (n=30)	Group B (n=30)	P value
Gender	Male	18	22	
	Female	12	8	
Site	Tinea cruris	14	14	
	Tinea corporis	12	8	
	Tinea Faciei	4	8	
Dermoscopic features (n= number)	Diffuse erythema with peripheral whitish scales	28 (93%)	17 (56%)	P=0.002
	Diffuse erythema with peri-follicular scale	10 (33%)	22 (73%)	P=0.004
	Follicular Micro pustule	4 (13%)	12 (40%)	P= 0.039
	Involvement of vellus hair	4 (13%)	19 (63%)	P=0.0001
	Brown dot	4 (13%)	9 (30%)	P=0.209
	Yellow hair	2 (6%)	11(36%)	P=0.01
	Morse code hair	3 (10%)	11 (36%)	P=0.03
	Transparent hair terminal hair	2 (6%)	13 (43%)	P=0.002
	Telangiectasia	-	10 (33%)	
	Atrophy (white structure-less area)	-	4 (13%)	

## Discussion

Dermoscopy, also known as epiluminescent microscopy, is a procedure to evaluate the skin surface with a microscope.<sup>6</sup> Initially, demoscopy was more commonly used to examine the pigmented lesion to detect early changes of malignancy, thus avoiding unnecessary biopsies. Nowadays, the spectrum of conditions examined by dermoscopy continue to expand.<sup>7</sup>

Tinea is a dermatophytic fungal infection of the skin, hair and nail. In this study, we included cases of tinea corporis, tinea cruris and tinea faciei. Arthroconidia of dermatophytes adhere with keratinocytes and germinate to produce hyphae. For the fungus to survive, fungal growth and penetration should be faster than the turnover rate of keratinocytes.<sup>8</sup> Steroid application inhibits mitotic activity, leading to reduced keratinocyte proliferation and in turn creates a favourable mechanism for fungal growth.<sup>9</sup> Local immunosuppression caused by the suppression of useful cytokines increases the risk of infection.<sup>10</sup> Anti-inflammatory effect leads to reduction in redness and itching and masking of the classical morphological appearance of pre-existing infection, thereby resulting in the development of steroid-modified tinea.<sup>11</sup>

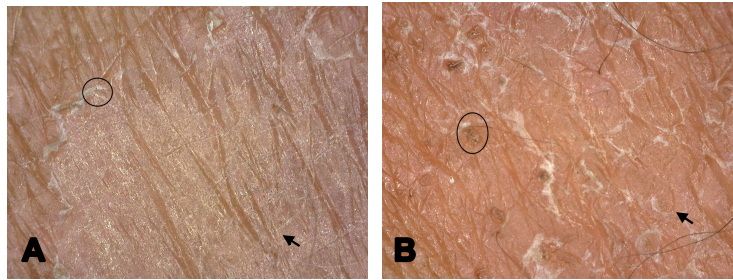
Diagnosis of tinea is based on clinical features. Further investigations are only recommended in cases of doubtful situations, which may include skin scraping followed by microscopic examination and mycological culture; however, both examinations are costly, time-consuming and require trained people and lab equipment. Therefore, dermoscopy may serve a pivotal role in the diagnosis of tinea due to its simplicity, cost-effectiveness and rapidness.<sup>12</sup>

Indian studies have reported an epidemic of superficial dermatophyte infections in recent years.<sup>1</sup> In India, tinea infections may persist for a very long time. The most common factors for stubborn fungal infections in Indian patients are hot and humid climate, poor hygiene, and rampant use of topical steroids. Usually, topical steroid preparations are available in combination with antifungal drugs, leading to suboptimal delivery of antifungal drugs, resulting in long-term therapy and chronic disease.<sup>13</sup> Moreover, due to uncontrolled use of topical steroid applications, patients of tinea presented with various morphologic appearances, which further complicated the confirmation of diagnosis.

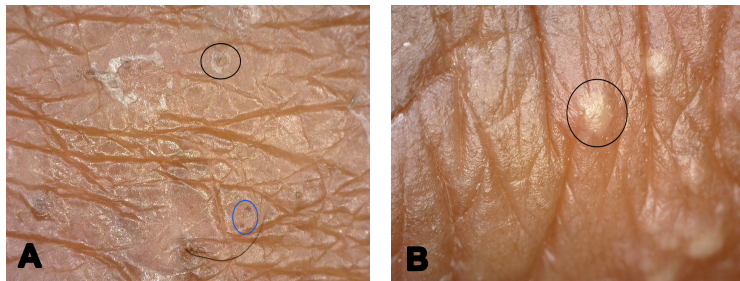
We noted several differences between uncomplicated tinea infection (Group A) and steroid-modified tinea infection (Group B) patients. Diffuse erythema with marginal scales (Figure 2.A) was the most common dermoscopic finding in patients of Group A. In contrast, perifollicular scales with erythema background (Figure 2.B) was the most common finding in patients of Group B. Dermoscopic finding of follicular involvement was significantly higher in patients of Group B. It is a known fact that steroid-modified dermatophytosis is associated with deeper invasion of fungus into the dermis along with inflammation of hair follicles, which may bring about deep abscesses and formation of "Majocchi's granuloma".<sup>14</sup> These pustules can be seen macroscopically. However, with the aid of dermoscopy, we can also identify follicular micropustules as a reliable initial sign of local immunosuppression. These pustules resolve with brown dot surrounded by white halo (Figure 3.A and 3.B).

We observed features of hair shaft involvement in the form of vellus hair involvement, yellow hair, morse code hair, and transparent, weak, easily deformable hair which were more common in non-glabrous skin, such as axilla, mons pubis and beard area.

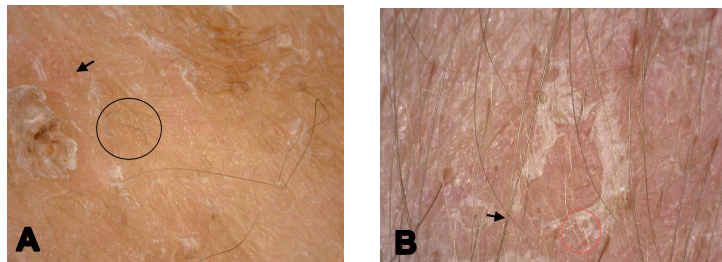
Clinical differentiation between tinea cruris or tinea corporis with other mimicking conditions such as eczema, impetigo, psoriasis and pityriasis rosea may sometimes pose a diagnostic challenge.<sup>15</sup> The suspicion of steroid-modified tinea should rise in cases refractory to conventional therapy for the respective conditions. In such cases, dermoscopy can aid in the confirmation of steroid-modified tinea. Dermoscopic features of eczematous lesion consist of yellowish scaling or sero-crusting along with patchy dotted blood vessels on dull red background. Psoriatic lesions usually appear as symmetric whitish scales and regularly-distributed dotted vessels on a light red background. Lesions of pityriasis rosea exhibit as peripheral arrangement of the scales and patchy distribution of loosely arranged dotted vessels on a yellowish background.<sup>16</sup>



**Figure 2. A.** Scaling patterns in tinea infection. Diffuse erythema with central clearing (black arrow) and peripheral scaling (black circle). **B.** Diffuse erythema (black arrow) with perifollicular scaling (black circle).



**Figure 3. A.** Perifollicular pustular pattern and its evolution. Perifollicular micropustule (black circle) **B.** Perifollicular pustule resolving with brown dot (blue circle) and perifollicular scaling (black circle)



**Figure 4. A.** Features of hair shaft involvement. Diffuse erythema (black arrow), horizontal white bands due to fungal invasion (morse code hair) leading to bending of hair (black circle). **B.** Yellow hair (black arrow), involvement of vellus hair (red circle)

Tinea faciei should be differentiated from other facial inflammatory dermatoses. Most common mimickers are seborrheic dermatitis, photosensitive dermatosis such as rosacea lupus erythematosus and polymorphic light eruption.<sup>17</sup> Seborrheic dermatitis is a type of endogenous eczema. The dermoscopic features are dotted vessels with a patchy distribution in combination with yellow scales or crusts on erythematous background. Erythematotelangiectatic variety of rosacea will have polygonal arrangement of vessels. Follicular plugging and perifollicular whitish halo are usually seen in early lesions of discoid lupus erythematosus.<sup>18</sup>

Morse code hair is identified as horizontal white bands on hair fibre, hence commonly known as bar code hair (Figure 4.A).<sup>19</sup> Gomez-Moyano et al. has described pathogenesis of bar code hair which resembles concentric rings of tinea corporis due to centrifugal destruction of keratinous layer of hair fibre caused by localised areas of fungal invasion.<sup>20</sup> Lacarrubba and Verzi have stated that the weakness of transparent hair is due to a massive fungal invasion involving the entire length of the hair shaft, leading to the loss of strength and multiple bends.<sup>21</sup> Both terminal hair and vellus hair may have translucent appearance. In our study, vellus hair involvement was the most frequent finding of shaft involvement (Figure 4.B). Gomez-Moyano et al. reported higher number of vellus hair involvement compared to translucent terminal hair and morse code hair, which was consistent with our findings.<sup>22</sup> The explanation behind this finding may be that the fungus can penetrate keratinous layer of non-medullated vellus hair easily.<sup>22</sup> According to Gomez-Moyano and Crespo-Erchiga, vellus hair involvement in tinea suggests the need for systemic antifungal treatment.<sup>23,24</sup> A new dermoscopic feature consisting of yellow hairs is also likely due to extensive fungal invasion of terminal hair shaft for whole length and it can be a stage prior to development of transparent hair.

Based on these facts, it is evident that follicular involvement is due to aggressive fungal infection and patients with follicular involvement need longer duration of therapy. Atrophy and telangiectasia were predominantly observed in patients with tinea faciei of Group B resembling dermoscopic features of TSDF (Topical Steroid Damaged Face). We speculate that steroid usage increases the chances of hair involvement; which can be easily detected with dermoscopy. With the aid of dermoscopy, the detection rate of steroid-modified tinea infection can be risen and unnecessary use of antifungal drugs can be prevented.

## Conclusion

Dermoscopy is a relatively new diagnostic procedure of infectious conditions. Regarding its high diagnostic value, the dermatologists need to develop an eye for dermoscopy. Diagnosis of uncomplicated tinea is usually straightforward and can easily be done with clinical examination; however, dermoscopy has been proven to be a boon in atypical cases of steroid modified tinea.<sup>25</sup> Dermoscopic patterns of follicular involvement, such as diffuse erythema with peri-follicular scale, follicular micropustules, involvement of vellus hair, yellow hair, morse code hair and transparent terminal hair are more prevalent in patients with steroid-modified tinea, while the pattern of diffuse erythema with peripheral whitish scales is associated uncomplicated tinea. These dermoscopic patterns may not only serve as clues for steroid-modified tinea but may also differentiate patients with and without past history of steroid use. Further study with larger sample size may be prompted to validate our results.

## Author Contributions

All authors act as the guarantor of the manuscript. MNG is the main investigator of this study. NS participated in the conception, data acquisition and writing of the study. AC and SS participated in data interpretation, data analysis and statistical analysis of the study.

## Conflict of Interests

The authors declared no conflict of interest regarding the publication of this article.

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