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Original Research Article

Dermoscopy as a diagnostic tool to differentiate between tinea pedis and plantar psoriasis

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ABSTRACT

Background: Clinical differentiation between tinea pedis and plantar psoriasis may sometimes be challenging, with consequent diagnostic delays and unnecessary therapies; in such cases histopathological analysis helps to differentiate the 2 conditions. In this study we used a dermoscope as a non-invasive tool to investigate the significance of specific dermoscopic features and to improve their non-invasive differentiation.
Methods: A clinical diagnosis of plantar psoriasis/tinea pedis was made on basis of accepted literature and proved by histopathology. Image capturing was performed using a dermoscope. Based on combination of history, clinical, and dermoscopic examination conclusive diagnosis with specific dermoscopic features for each disease was achieved.
Results: The 15 patients of biopsy proven tinea pedis and 17 patients of biopsy proven plantar psoriasis were selected. We found that the presence of whitish powdery scales located in the furrows with apparently uninvolved skin in between was significant in tinea pedis whereas the presence of silvery white scales on a pinkish red erythematous background with regularly distributed red dots was significant in plantar psoriasis.
Conclusions: Dermoscopy showed significant patterns in tinea pedis and plantar psoriasis due to their well-known different histological and physio pathological background, with white diffuse scales reflecting the dry and hyperkeratotic nature of plantar psoriasis and the red dots signifying the pin point blood vessels seen clinically as Auspitz sign. The peculiar scaling in tinea pedis might result from the predilection of dermatophytes to proliferate in moist environment, such as the furrows.

Keywords: Dermoscopy, Tinea pedis, Plantar psoriasis, Inflammoscopy, Histopathology, Plantar dermatoses

INTRODUCTION

Tinea pedis is a dermatophyte infection affecting the soles and interdigital spaces, which typically presents as a diffuse white scaling/hyperkeratosis (keratoderma), with or without mild itching.[1] Palmoplantar psoriasis is a localized form of psoriasis having similar distribution characterized by erythema, hyperkeratosis with surrounding lichenification and coarse scaling. Its distinction from similar inflammatory dermatoses is often challenging, with consequent diagnostic delays, errors and unnecessary therapies. The main differential diagnoses of tinea pedis includes plantar psoriasis.[1] Plantar erythema and scaling associated with itching is commonly seen in these diseases and despite thorough examination, a definitive or confirmatory clinical diagnosis is not achieved. The diagnosis of cutaneous fungal infection is currently made by direct microscopic examination with potassium hydroxide and fungal cultures; however, these conventional methods are rather complex, time-consuming, and could yield false negative results. Further, the pandemic of dermatophytosis in India warrants a rapid examination technique.[2] The confirmatory diagnosis of plantar psoriasis is by

histopathological examination. Histopathology is confirmatory but not feasible in all patients. Recently, the applicability of dermoscopy has also been extended to the field of inflammatory skin disorders (Inflammoscopy) in order to assist the clinical diagnosis and decrease the number of cases requiring biopsy.[3,4] As the indications of dermoscopy have evolved, so has the device itself. Hand held dermoscope has become even more portable and has been validated in its day-to-day use in clinical practice.[5] In this study tinea pedis and plantar psoriasis were examined using dermoscopy, and significance of specific dermoscopic findings was investigated. The characteristic dermoscopic findings was also correlated to its corresponding finding in histopathological examination to see the significance of these characteristic findings in both the diseases. The diagnostic accuracy of a dermoscope with respect to histopathology in diagnosis of the above-mentioned conditions was also calculated.

Objectives

Objectives of the study were to identify the dermoscopic patterns in common chronic scaly dermatoses like tinea pedis and plantar psoriasis, to assess the clinical, histopathological and dermoscopic correlation in above-mentioned conditions and to evaluate diagnostic accuracy of a dermoscope in above-mentioned conditions.

METHODS

Approval was taken from the ethical committee before starting the study and a written consent was taken from all the participants and the study was carried out over a period of 12 months. A cross sectional study was conducted in the OPD of department of dermatology, venereology and leprosy at MVJ medical college and research Hospital, Bangalore for a period of 1 year from May 2020 to May 2021 on 17 patients (Eight men/nine women; average age, 34 years [range, 4-55]; average disease duration, 65 weeks [range, 4 weeks to 7 years]) of biopsy proven plantar psoriasis and 15 patients (seven men / eight women; average age, 25 years [range, 8-45]; average disease duration, 75 weeks [range, 4 weeks to 5 years]) of biopsy proven tinea pedis were performed. Only the study subjects who were not taking any systemic or topical therapies and did not have any secondary changes like infections or artefacts were included in the study. A presumptive clinical diagnosis was first achieved, followed by a 3 mm punch biopsy from the target area for histopathological examination. After achieving a histopathological diagnosis, dermoscopy was done to evaluate the dermoscopic features. The subjects were refrained from treatment until dermoscopy was done, to avoid resolution of disease features (average 5-7 days). One dermoscopic image from each foot of a target plantar area (with erythema and desquamation) was taken from each patient by both the non-contact and contact (using ultrasound gel) method using both non-polarized and polarized light for visualization of the vessel morphology in plantar psoriasis. Dermoscopic imaging of tinea pedis was conducted using non polarized light only. This was done using a hand held dermoscope (DERMLITE 3 GEN DL3N, California, USA, 10x) connected to a mobile device for image capturing and storage (SAMSUNG GALAXY S10). The images were reviewed by two dermatologists and corresponding findings were noted. Statistical analysis was performed by chi square test and Fishers exact test (statistical significance set at <0.05). Diagnostic accuracy tests for sensitivity and specificity calculated by formulating tables manually and using function specifics in Microsoft excel for calculations.

RESULTS

A total of 32 patients were included in study, of which 15 cases were biopsy proven to be tinea pedis and 17 cases were biopsy proven to be plantar psoriasis. The average age of patients with tinea pedis was 25 years ranging from 8-45 years of age. The average disease duration of tinea pedis was 75 weeks with a minimum of 4 weeks to a max of 5 years. The average age of patients with plantar psoriasis was 34 years, ranging from 4 years to 55 years of age. Average disease duration for plantar psoriasis was 65 weeks with a minimum of 4 weeks to max of 7 years.

Clinical features

The clinical features of tinea pedis and plantar psoriasis (Table 1). We found that the most common clinical features in tinea pedis was scaling (100%) and itching (100%) followed by foul smell (60%). The most common clinical features seen in plantar psoriasis was scaling (100%) and itching (88%) of patients. The most common associated condition in both these group of patients was hyperhidrosis seen in 4 (26.6%) patients of tinea pedis and 2 (11.76%) patients of plantar psoriasis. The clinical photographs also show that both groups of patients had similar distribution and involvement and lesions appeared similar to the naked eyes as seen in Figure 1 (A and B).

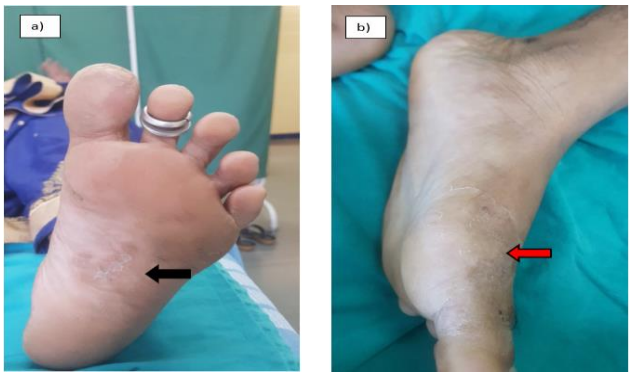

Figure 1 (A and B): (Left) typical clinical appearance of a scaly plaque with itching on the plantar aspect of left sole (black arrow) in a case of plantar psoriasis. (Right) typical appearance of a well-defined focal scaly plaque with itching on sole and medial border of left leg (red arrow) in a case of tinea pedis.

Table 1: Clinical features of tinea pedis, (n=15) and plantar psoriasis, (n=17).

Symptoms	Tinea pedis, n (%, p)	Plantar psoriasis, n (%, p)
Scaling	15 (100, <0.0001)	17 (100, 0.04)
Itching	15 (100, <0.0001)	15 (88.24, <0.0001)
Pain	0	2 (11.76)
Fissures	0	5 (29.41)
Fissures with pain	0	2 (11.76)
Fissures without pain	0	3 (17.54)
Foul smell	9 (60, 0.0206)	0
Hyperhidrosis	4 (26.67)	2 (11.76)

Dermoscopic features

The dermoscopic features of tinea pedis and plantar psoriasis (Table 2 and Figure 2). We found that the most common dermoscopic finding in tinea pedis was white fine powdery scaling in dermatoglyphics adjoining the furrows (all patients, 100%) with apparently uninvolved skin in between the dermatoglyphic lines (Figure 3). On the other side, the main dermoscopic findings in plantar psoriasis was white scales on a more/ less evident erythematous pinkish red background (14, 82.35%) with a diffuse distribution seen in these patients (14, 82,35%). In addition, regularly distributed dotted vessels were also observed in 13 (76.47%) patients (Figure 4).

From a statistical point of view, presence of fine powdery scales in furrows ($p<0.001$) with apparently uninvolved skin in between lines ($p<0.001$) was significant in tinea pedis whereas presence of silvery white scales ($p<0.001$), over an erythematous pinkish red background ($p<0.001$) with regularly distributed red dots ($p<0.001$) was significant in plantar psoriasis.

Table 2: Dermoscopic features of tinea pedis and plantar psoriasis, (n=15).

Dermoscopic finding	Tinea pedis, n (%)	Plantar psoriasis, n (%)
Brownish orange dots	0	4 (23.53)
Dotted vessels/red dots (regular)	0	13 (76.47)
Focal distribution	10 (66.67)	3 (17.65)
Diffuse distribution	5 (33.33)	14 (82.35)
Silver white scales	0	14 (82.35)
Pinkish red background	0	10 (58.82)
Brown crusts	0	7 (41.18)
Fine powdery white scales in furrows	15 (100)	0
Uninvolved skin between dermatoglyphic lines	14 (93.33)	0

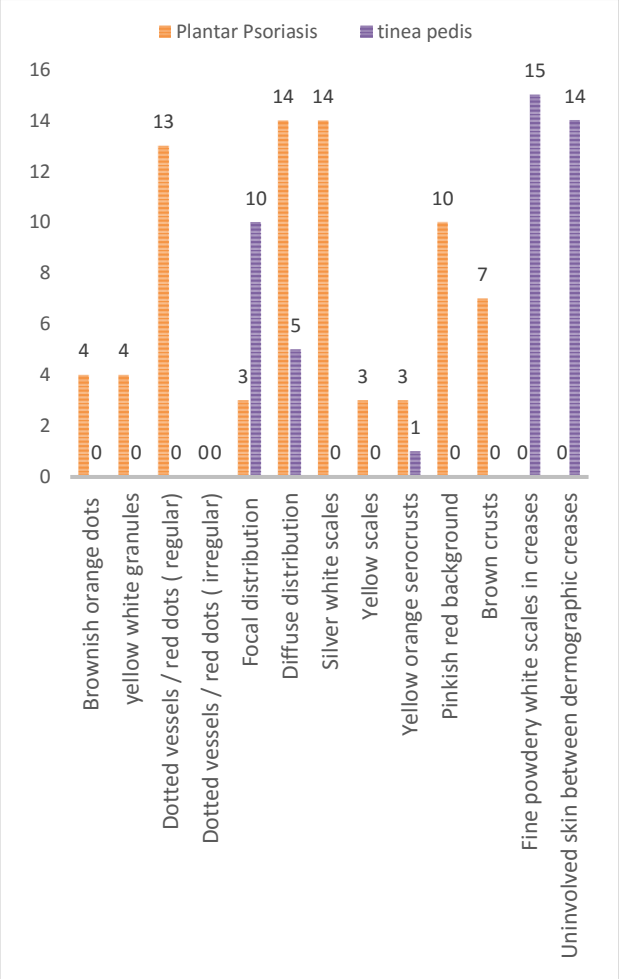

Figure 2: Dermoscopic features in tinea pedis and plantar psoriasis. The top of each bar shows the n for each dermoscopic finding.

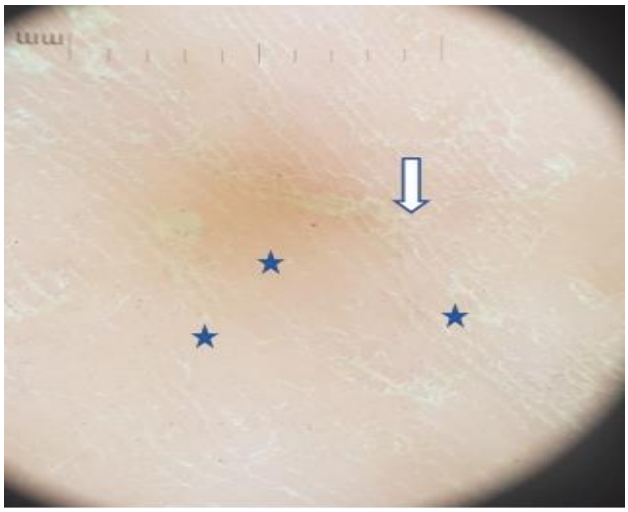

Figure 3: Typical dermoscopic appearance of a case of tinea pedis, with fine white powdery scales along the dermatoglyphic lines and furrows (white arrows), 10X. Fine scaling along furrows (white arrow) with apparently uninvolved skin in between the lines (blue stars), 20X. Mild hyperpigmentation is also present.

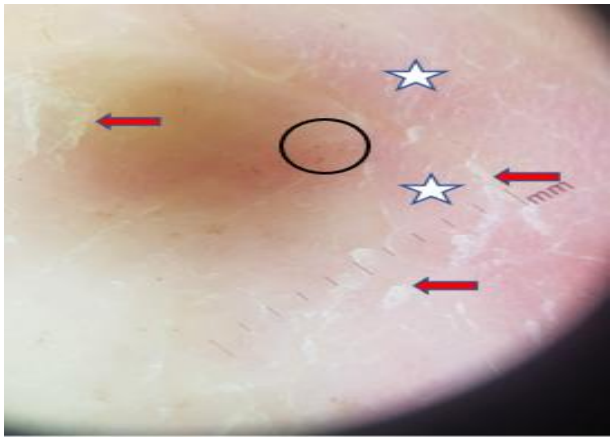

Figure 4: Typical dermoscopic image (non-contact, non-polarized) of a case of plantar psoriasis, showing silvery white scales (red arrow) on an erythematous background (white stars), 10X. This is a dermoscopic image (contact, polarized), of multiple regularly distributed red dots (black circle). The scales are not visible due to the use of a contact medium, which in this case is ultrasound gel. This accentuates the visibility of the underlying vessels.

Histopathological-dermoscopic correlation

A histopathological dermoscopic correlation was done and the characteristic dermoscopic findings in tinea pedis and plantar psoriasis was compared with the corresponding histopathological feature seen as per the literature. In tinea pedis, it was seen that all cases showed hyperkeratosis which corresponded to the fine powdery scaling along the furrows (100%, p<0.001) while the uninvolved areas in between were seen histopathologically as melanin deposits in the epidermis with no hyperkeratosis (93.33%, p<0.001). On the other side, in cases of plantar psoriasis it was seen that psoriasiform hyperplasia corresponded to the silvery white scales (82.35%, p<0.001), the hypogranulosis corresponded to the erythematous pinkish red background (58.82%, p<0.001) and the regularly distributed red dots (76.47%, p<0.001) corresponded to the supra-papillary thinning with dilated capillaries in the elongated dermal papillae. The histopathological and dermoscopic correlation in tinea pedis and plantar psoriasis is summarized in Table 3 respectively.

Diagnostic accuracy of dermoscopy (Sensitivity, specificity)

It was seen that for tinea pedis, the dermoscope had a sensitivity of 100% and specificity of 100% suggesting that the dermoscope was highly sensitive and specific in diagnosing tinea pedis whereas in case of plantar psoriasis, the dermoscope had a sensitivity of 76.47% and specificity of 93.94% suggesting that the dermoscope was moderately sensitive but highly specific in diagnosing plantar psoriasis. It has been summarized in Table 4 for tinea pedis and Table 5 for plantar psoriasis.

Table 3 A: Histopathological dermoscopic correlation in tinea pedis (n=15) and plantar psoriasis, (n=17).

Tinea pedis	Histopathologic finding	Corresponding dermoscopic finding	Dermoscopic positive finding, n (%)
1.	Hyperkeratosis	Fine powdery scales in dermatoglyphic lines	15 (100)
2.	Melanin deposition in epidermis	Apparently uninvolved skin between the creases	14 (93.33)
3.	PAS staining demonstrating hyphae in stratum corneum	Hyphae cannot be visualized	0
Plantar psoriasis			
1.	Parakeratosis	Brownish orange dots	4 (23.53)
2.	Supra-papillary thinning with dilated capillaries in elongated dermal papillae	Regular dotted vessels/red dots	13 (76.47)
3.	Psoriasiform hyperplasia	Silvery white scales	14 (82.35)
4.	Hypo-granulosis	Pinkish red background	10 (58.82)

Table 4: Diagnostic accuracy of dermoscopy in tinea pedis (n=15).

Characteristic dermoscopic findings present	Characteristic dermoscopic findings absent
15	0
Sensitivity=100%	Specificity=100%

Table 5: Diagnostic accuracy of dermoscopy in plantar psoriasis (n=17).

Characteristic dermoscopic findings present	Characteristic dermoscopic findings absent
13	4
Sensitivity=76.47%	Specificity=93.94%

DISCUSSION

Dermoscopy is a non-invasive tool useful in diagnosis of many infections and infestations.[6] The role of trichoscopy, the dermoscopy of scalp and hair diseases in dermatophytosis of the scalp is well established in literature. However, at present, there are very few reports describing the dermoscopic patterns in dermatophytosis involving other body parts with only three reports documenting the dermoscopic findings in tinea mannum in Indian population.[2,7,8] Similarly, there were very few reports describing the dermoscopic patterns in palmar psoriasis and a meticulous search of literature yielded two case reports documenting the same.[9,10] To the best of our knowledge, this is the first study showing the usefulness of dermoscopy in the differential diagnosis of plantar dermatoses to differentiate between tinea pedis and plantar psoriasis. Dermoscopic features in tinea pedis and Plantar psoriasis were observed to differ in these skin diseases. A comparison with the published literature, revealed the findings in our study were mostly similar, but in lower frequencies.

Dermoscopic features

In our study, the most common dermoscopic finding in tinea pedis was white fine powdery scaling along the dermatoglyphics and the adjoining furrows with apparently uninvolved skin in between (Table 2). These findings were similar to other recently conducted studies by Errichetti et al where he had mentioned similar observations in tinea mannum.[11] In another Indian study, conducted by Bhat et al a dermoscopic analysis of 100 patients with tinea infection was conducted (involving 10 cases of tinea mannum / tinea pedis) and it was seen that all patients had similar dermoscopic findings.[2] In another case report by Jakhar et al, similar findings were seen in a middle-aged man with tinea mannum.[7] Scales are of prime importance in dermatophytosis as they yield fungal elements in microscopic examination and imply the activity of the disease. These peculiar findings in dermatophyte infection mainly suggested the predilection of the dermatophytes to moist environment mainly the furrows of the feet and interdigital webspace and sparing of the spaces in between the furrows/dermatoglyphic lines mainly due to friction.

In our study, the most common dermoscopy findings in plantar psoriasis were slivery white scales on a pinkish red erythematous background with regularly distributed red dots (Table 2). In a recent dermoscopic analysis conducted by Lallas et al on 14 cases of palmar psoriasis, regularly distributed red vessels and diffusely distributed white scales were found to be most common features because they were reported in 77.3% and 68.2% cases, respectively.[12] In a similar study conducted by Errichetti et al it was seen that the most common dermoscopic findings in palmar psoriasis was dotted vessels and figure diffuse distribution of white scales seen in 40% and 100% of cases respectively.[10] In a study conducted by Nwako-Mohamadi et al in fifty-six patients of plaque type psoriasis, it was seen that the most common features observed in 148 lesions of psoriasis were light red background (43.9%), red dotted vessels (64.2%), white scales (77%) and patchy scaly distribution (56.5%) which was similar to the findings in our study.[13]

Histopathological-dermoscopic correlation

The histopathological dermoscopic correlation in tinea pedis showed that the white scaling in the furrows corresponded to the hyperkeratosis seen in fungal infections with the uninvolved skin in between showing melanin deposits in the epidermis. PAS staining showed fungal elements present at the sites of hyperkeratosis suggesting that the fine powdery white scales yielded fungal elements further strengthening the claim that the dermatophytes predilect to the moist environment (Table 3). On the other hand, the histopathological dermoscopic correlation in plantar psoriasis showed that the pinkish red background corresponded to the regions of hypogranulosis seen clinically as the layer of Duncan-Bulkley in lesions of plaque psoriasis. The regularly distributed red dots corresponded to the multiple red dotted vessels seen due to supra-papillary thinning and multiple dilated blood vessels in elongated dermal papillae which is clinically seen as the Auspitz sign. The silvery white scales corresponded to the psoriasiform hyperplasia which is characteristic feature seen in cases of psoriasis (Table 3).

Diagnostic accuracy of dermoscopy (Sensitivity, specificity)

In our study, in tinea pedis, it was seen that all cases which were histopathologically proven to be tinea pedis also showed the characteristic dermoscopic features and hence could be dermoscopically diagnosed as tinea pedis. As there was no false negatives or false positives results, dermoscopy for tinea pedis was highly specific (100%) and highly sensitive (100%) for its diagnosis when compared to the gold standard histopathology with PAS staining (Table 4) On the other side, in cases of plantar psoriasis, it was seen that while 17 cases were histopathologically proven to be plantar psoriasis, only 13 cases had the characteristic dermoscopic features while 4 cases had other features which led to a misdiagnosis and giving rise to false negative results for dermoscopy. 2 cases had typical dermoscopic features for psoriasis but histopathogically turned out to be eczematous dermatitis giving rise to false positive results. Hence dermoscopy for plantar psoriasis was moderately sensitive (76.47%) but highly specific (93.94%) for the diagnosis of plantar psoriasis (Table 5).

Limitations

The severity grading of the particular diseases was not taken under consideration. Although all cases included in

the study were of chronic duration, acute presentations or exacerbations were not taken into consideration.

CONCLUSION

Dermoscopy showed specific patterns in both tinea pedis and plantar psoriasis and the patterns remained consistent irrespective of age, sex, duration and site of involvement. The characteristic features were consistent in all cases and these parameters can also be checked for in treatment monitoring and prognosis. Dermoscopy can be used to select a specific site for obtaining biopsy so that the corresponding histopathological features specific to the disease can be obtained. The disappearance of all the dermoscopic features may suggest resolution of the disease as all findings had a pathological corelation.

Dermoscopy is not a substitute for mycological or histopathological study, but rather it complements it. It would nevertheless be recommended to use the diagnostic tool in settings, particularly where there is no availability of pathology reference laboratories. It leads to prompt treatment initiation and avoidance of unnecessary investigations

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