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Clinical and Dermoscopic Study of Palmoplantar Keratodermas

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Abstract

Background: Palmoplantar keratodermas (PPK) represents a group of skin disorders characterized by excessive epidermal thickening of palms and soles. They are classically divided into inherited and acquired groups. Dermoscopy is a non-invasive procedure that can aid in the clinical diagnosis of PPK.

Objectives: To study the clinical features and dermoscopic patterns of PPK caused by various dermatological conditions.

Methods: Ninety-eight patients with various types of PPK were included in this cross-sectional observational study after obtaining informed consent. Symptoms, general systemic findings, and dermatological manifestations were recorded. The dermoscopic examination was performed by a single observer using Heine Delta 20+ and FotoFinder Medicam 1000. Diagnostically challenging cases were biopsied for histopathological examination. SPSS (Statistical Package for Social Sciences) version 20 [IBM SPSS statistics (IBM Corp. Armonk, NY, USA released 2011)] was used to perform statistical analyses. The chi-square test was applied to examine statistical associations between qualitative variables. The level of significance was set at 5%.

Results: Out of 98 cases with PPK, 93 were acquired, and 5 were inherited. The commonest dermoscopy pattern included palmoplantar psoriasis (n = 48), showing a background light red color with yellow diffused white scales with regular dotted and glomerular vessels, followed by palmoplantar eczema (n = 39) (light red color with yellow patchy white background, yellow scales, and patchy dotted vessels). Light red/dull red background with diffuse white scaling and regular linear, dotted, or glomerular vessels were significantly in favor of palmoplantar psoriasis, while a yellow background, diffuse yellow scaling, patchy dotted vessels, and yellow crust were more in favor of palmoplantar dermatitis. Pityriasis rubra pilaris (PRP) (n = 3) showed a light red background, diffused white scales, and dotted and linear vessels with patchy distribution. Lichen planus (n = 2) revealed a light red color with a yellow background, diffused and peripheral white scales, and irregular linear (radial) and dotted vessels. Wickham's striae were found on palms. Tinea manuum with pedis (n = 1) showed a dull red background and diffused white and yellow scales with the localization of the scales in the skin furrows. Palmoplantar keratodermas secondary to ichthyosis vulgaris (n = 3) revealed a light red background with diffused white and yellow patchy scaling and regular linear and patchy glomerular vessels. Greither's disease showed a light red color with a yellow background, a diffused white scale pattern, and multiple dotted vessels arranged in an irregular pattern. Erythrokeratodermia variabilis showed a background color of light red and diffused white scales in a crisscross pattern.

Conclusions: Dermoscopy can reveal characteristic but not pathognomonic dermoscopic patterns that can be useful in the clinical diagnosis of various types of PPK. More studies with larger sample sizes may help validate these findings and identify new patterns.

Keywords: Palmoplantar Keratoderma, Dermoscopy, Psoriasis, Eczema

1. Background

Palmoplantar keratodermas (PPKs) represent a group of skin disorders characterized by excessive epidermal thickening of palms and soles (1) and are classically divided into inherited or acquired forms. Inherited PPKs have familial occurrence and an early age of onset in the majority of cases. Acquired PPKs usually occur in adulthood, may be diffuse or focal, and are usually associated with inflammatory skin conditions, infections, internal malignancies, drugs, and other systemic diseases. Symptoms range from hyperhidrosis and malodorous maceration to fungal infections that can have a negative impact on the patient's quality of life and lead to losing

one's job. Evaluation of PPK involves a clinical examination with medical and family history taking, histopathology assessments, and genetic testing. Family history may help identify hereditary PPK by disclosing an inheritance pattern. Dermoscopy is an office procedure used to magnify and visualize structures and patterns that are less visible to the naked eye, thus connecting clinical dermatology with microscopic dermatopathology (2).

Conditions causing PPK have a close morphological resemblance to each other and can be indistinguishable from each other clinically, a conundrum that can be resolved by dermoscopic examination and identifying distinctive diagnostic features. Dermoscopy has the potential to replace histopathology or may be more useful than histopathology in differentiating various causes of PPK (3).

2. Objectives

The main objective of this study was to investigate the clinical features and dermoscopic patterns of PPKs secondary to various dermatological conditions.

3. Methods

A cross-sectional study was performed on male and female patients in all age groups presenting with PPKs attending our dermatology outpatient department for 18 months from January 2021 to June 2022. A detailed history, including the age of onset, progression, involvement beyond palms and soles, association with other medical conditions, family history, systemic manifestations, and appendage involvement, was obtained from each patient. A clinical examination was carried out for all patients to gather relevant information, including morphological assessment of lesions, areas of involvement, associated dermatological diseases, and systemic symptoms, and confirm the diagnosis based on these findings. A biopsy was taken for histopathology examination if necessary. Dermoscopic assessment of the skin lesions was performed by a single observer using Heine Delta 20 Plus (10X) and FotoFinder Medicam 1000 (up to 140x). SPSS (Statistical Package for Social Sciences) version 20. [IBM SPSS statistics (IBM Corp. Armonk, NY, USA released 2011)] was used to perform statistical analyses. The chi-square test was applied to find any statistical association between qualitative variables. The level of significance was set at 5%.

4. Results

A total of 98 patients were evaluated, including 55 males (56.12%) and 43 females (43.87%), with a male-to-female ratio of 1.27:1. Office workers constituted the majority of the participants (62 patients, 63.26%). The age range of the patients was from 4 to 75 years, with a mean age of 39.5 years. The prevalence of various dermatoses causing PPK has been noted in Table 1, and their dermoscopic features have been summarized in Tables 2, 3, 4, and 5.

Acquired PPKs constituted most of our cases (n = 93 out of 98), where the commonest etiology was palmoplantar psoriasis (n = 48, 50%), followed by palmoplantar dermatitis (n = 39, 40.62%), pityriasis rubra pilaris (n = 3, 3.12%), lichen planus (n = 2, 2.08%), and tinea manuum with pedis (n = 1, 1.04%). Hereditary PPKs were established in 5 patients, including ichthyosis vulgaris (n = 3, 3.12%), Greither's syndrome (n = 1, 1.04%), and erythrokeratodermia variabilis (n = 1, 1.04%).

The commonest background color was light red and yellow (palm: 43.8%, sole: 47.9%) for psoriasis and (palm: 46.2%, sole: 56.4%) for eczema. The common scaling pattern in psoriasis was diffused white (palm: 29.2%, sole: 39.6%), whereas in eczema, it was patchy white with yellow (palm: 15.4%, sole: 33.3%). Vascular features in psoriasis showed regularly arranged dotted vessels as the commonest finding in the palms of 8 patients, whereas soles showed regular glomerular vessels in 11 patients. Eczema showed regular glomerular vessels as the commonest finding in the palms of 4 patients, whereas in soles, the most common finding was patchy dotted vessels. Pityriasis rubra pilaris revealed a light red background as the commonest finding (palm: 100%, sole: 66.7%). The scaling pattern showed diffused white scales (palm: 66.7%, sole: 66.7%). The vascular pattern of palms showed dotted vessels as the commonest finding (palm: 33.3%, sole: 33.3%). Lichen planus revealed light red with a yellow background in the palms of both patients, whereas in soles, a light red background was seen in both of them. Diffused white scales were common in the palms and soles of one of the patients. Regarding vascular features, irregular linear vessels were seen in palms and irregular dotted vessels in soles in 1 patient. Tinea manuum with pedis revealed a dull red background in both palms and soles. Diffused white-yellow scales were seen on the palms and soles, and patchy dotted vessels were seen in the soles of the patient. The dermoscopic patterns of hereditary PPKs have been described in Table 4.

Table 1. Prevalence of the Causes of Palmoplantar Keratoderma in 98 Patients

Disease	No. (%)
Acquired palmoplantar keratoderma (n = 93)	
Palmoplantar psoriasis	48 (50)
Palmoplantar dermatitis	39 (40.62)
Pityriasis rubra pilaris	3 (3.12)
Lichen planus	2 (2.08)
Tinea manuum with pedis	1 (1.04)
Total	93 (100)
Hereditary palmoplantar keratoderma (n = 5)	
Ichthyosis vulgaris	3 (3.12)
Greither's syndrome	1 (50)
Erythrokeratodermia variabilis	1 (50)
Total	5 (100)

5. Discussion

Clinically distinguishing different palmoplantar dermatoses is challenging, requiring histological examinations to provide a conclusive diagnosis (4). Dermoscopy findings in inflammatory dermatoses (inflammoscopy) have recently gained attention and can help reach a clinical diagnosis and reduce the need for biopsy (5, 6). This requires noticing important features when using dermoscopy for differentiating palmoplantar dermatoses, including scale patterns, morphology, arrangement of vascular structures, and any other specific feature (clues).

5.1. Palmoplantar Psoriasis

Psoriasis-associated PPK can manifest in a variety of morphological forms, from thick hyperkeratotic plaques to predominantly pustular lesions (7). The typical discoid lesions seen in hyperkeratotic PPK are regularly present on other parts of the body as well and are frequently a component of the general spectrum of psoriasis vulgaris (8). In our study, 48 patients (50%) had palmoplantar psoriasis (Figure 1). Dermoscopic examination revealed a light red and yellow background as the most common finding, followed by a light red background. This was somehow similar to the findings of Yu et al. (9) Also; we observed frequent whitish scales with a diffused pattern, which was similar to the observations of Lallas et al. (10) The vascular pattern revealed dotted and glomerular vessels, which were in line with other studies on dermoscopic features of psoriatic lesions (9, 11, 12). Red globular ring patterns were found in the palms of 11 patients and soles of 15 patients, which are considered highly specific for psoriasis (13).

5.2. Palmoplantar Eczema

Hyperkeratotic eczema typically affects the palms, the volar parts of fingers, and occasionally, the plantar parts of the feet. Atopic dermatitis, allergic contact dermatitis, stasis dermatitis, and asteatotic eczema are a few examples of the various clinical entities that can be associated with eczematous dermatitis, all of which show the histological features of spongiosis (14-16). In our study, 39 patients (40.62 %) had palmoplantar eczema diagnosed based on clinical clues (Figure 2). Dermoscopic examination revealed a light-red and yellow background as the most common finding, followed by a yellow background. The light red and yellow background was seen in a higher ratio of our patients compared to a study by Cetinarslan et al. (17), who reported patchy white with yellow scales as the most common scale pattern, followed by patchy white and diffused yellow scales. These findings were in contrast to the reports of Cetinarslan et al. (17) and Errichetti and Stinco (11), who described that most scales were yellow in color. This could be due to ethnic-related skin color variations. The vascular pattern showed regular glomerular vessels, followed by patchy and undifferentiated dotted vessels. The higher incidence of dotted vessels with patchy distribution is on par with a previous study by Cetinarslan et al. (17).

5.3. Palmoplantar Psoriasis Versus Palmoplantar Dermatitis

Since most of our patients were diagnosed with either palmoplantar posoriasis or palmoplantar dermatitis, a comparison was made between the features of these two conditions, as summarized in Table 5.

To summarize, a light red/dull red background with diffused white scaling and regular linear, dotted, or

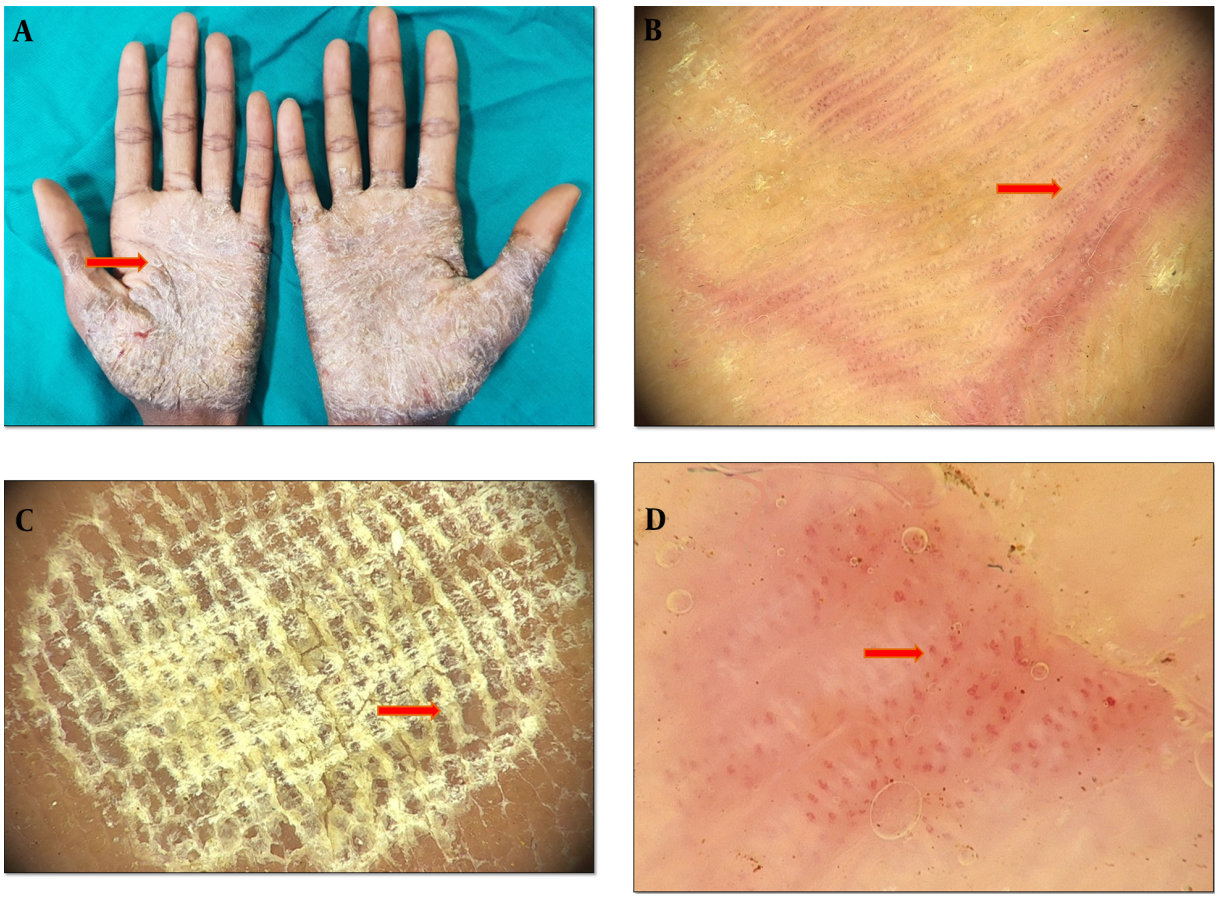

Figure 1. A, erythematous scaly plaques of psoriasis distributed symmetrically over the palms, B, dermoscopy features of palmoplantar psoriasis, showing regular dotted vessels (the red arrow), C, dermoscopy features of palmoplantar psoriasis, showing characteristic diffused white scales (the red arrow) with a dull-red background, D, dermoscopy findings showing irregularly spaced rows of glomerular vessels (the red arrow) (Medicam1000, 20x).

glomerular vessels was in favor of palmoplantar psoriasis, while a yellow background, diffused yellow scaling, patchy dotted vessels, and yellow crust were more in favor of palmoplantar dermatitis. Almost similar findings have also been reported by Yu et al. (9).

5.4. Pityriasis Rubra Pilaris

Red-orange waxy "sandal-like" PPK is characteristic of PRP. All three patients diagnosed with this condition had plantar involvement, and 2 of them had palmar involvement as well (Figure 3). A dermoscopic examination revealed a light red and orange background. The scale pattern showed diffused and patchy white scales. Errichetti and Stinco described the presence of unspecified whitish scales on dermoscopic examination of PRP lesions (18). The vascular pattern showed mixed morphology with regular linear vessels and patchy dotted vessels, as reported by Errichetti and Stinco. (18).

5.5. Lichen Planus

Palmoplantar LP displays a variety of clinical and morphological features, such as diffused scaly variant, hypertrophic variant, punctuate keratoses, diffused keratoderma, erosive or ulcerative lesions, pigmented macular variant, vesicular lesions, keratotic plaques with pits, and umbilicated papules (Figure 4A and B). Dermoscopic examination revealed a light red and yellow background in both patients. This was in accordance with a study by Makhecha et al., who reported a red background in early/active LP lesions (19). Diffused and peripheral white scales were also reported by Nayak et al. (20) Likewise, irregular linear (radial) and irregular dotted vessels were reported by Vazquez-Lopez et al. (21).

5.6. Tinea Manuum with Pedis

Scaling, erosion, and erythema of the inter-digital and sub-digital skin of feet with keratoderma of the

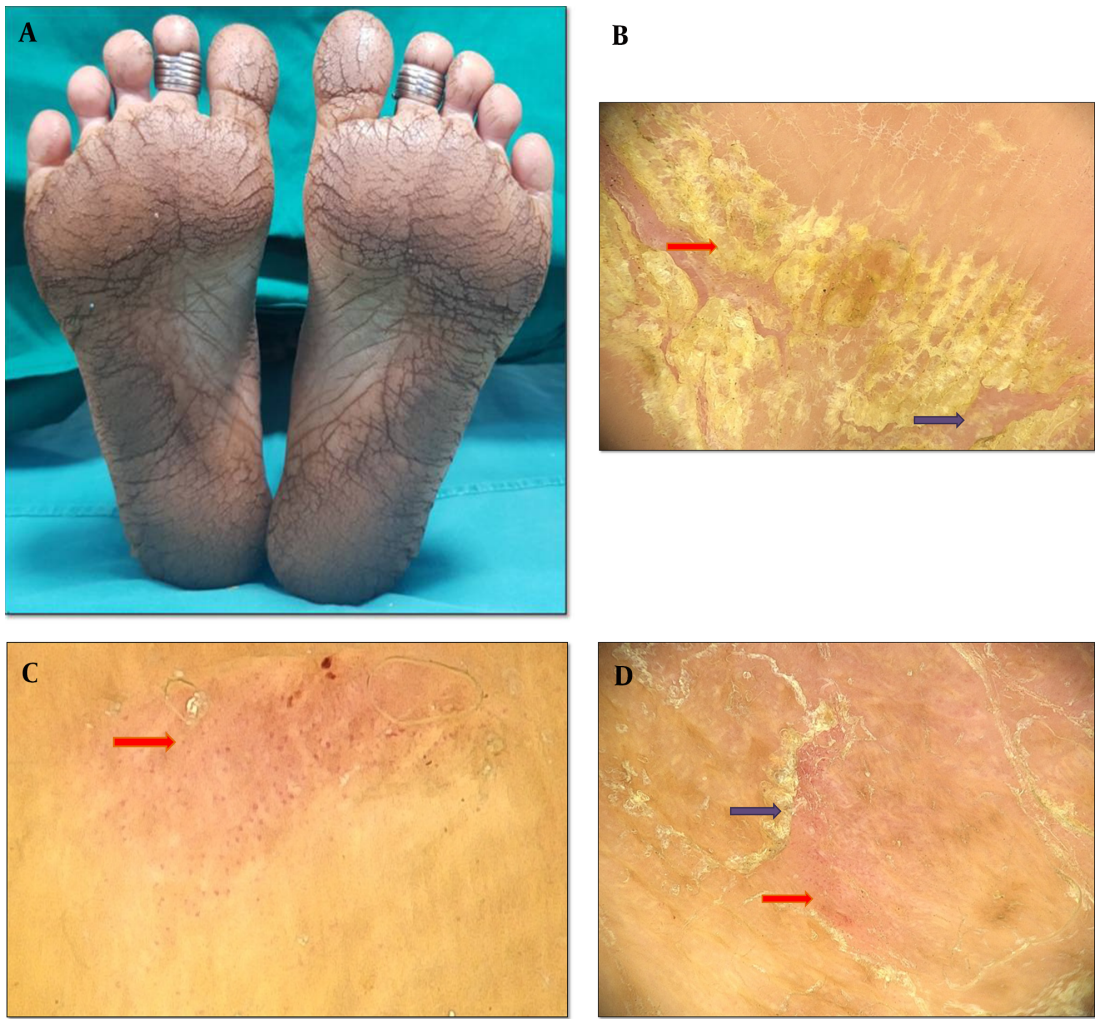

Figure 2. A, hyperkeratotic scaly eczematous plaques with fissures distributed symmetrically over the plantar aspect of feet, B, dermoscopy findings of palmoplantar dermatitis showing patchy yellow (red) and white (purple) scales, C, dermoscopy examination showing dotted vessels (red) with a patchy distribution behind a light-red background, D, dermoscopy examination showing dotted vessels (the red arrow) in with clustered distribution and peripheral scales (the purple arrow) (Medicam1000, 20x).

instep are characteristic (22). In our study, one patient was diagnosed with PPK secondary to tinea manuum with pedis. Dermoscopic examination showed a dull red background with diffused white-yellow scales. The localization of the scales in skin furrows was characteristic, which was similar to a report by Errichetti and Stinco (22) The possible explanation might be the localization of dermatophytes, facilitating their proliferation in humid environments such as skin furrows. Patchy dotted vessels were also seen, which was similar to another study by Jakhar et al. (23).

5.7. Hereditary Palmoplantar Keratoderma

In our study, 5 patients were diagnosed with hereditary palmoplantar keratoderma (Table 1). Ichthyosis vulgaris is clinically characterized by extensive skin scaling with large, centrally adherent white scales with extensor distribution and is often accompanied by palmoplantar hyperkeratosis (24). All 3 patients with ichthyosis vulgaris revealed plantar involvement, and 2 of them had palmar involvement as well. A dermoscopy examination revealed a light red or dark background and diffused crisscross white and patchy yellow scales. The vascular pattern revealed regular linear and patchy glomerular vessels. Greither's disease showed a light red and yellow background in dermoscopy examination, in addition to a

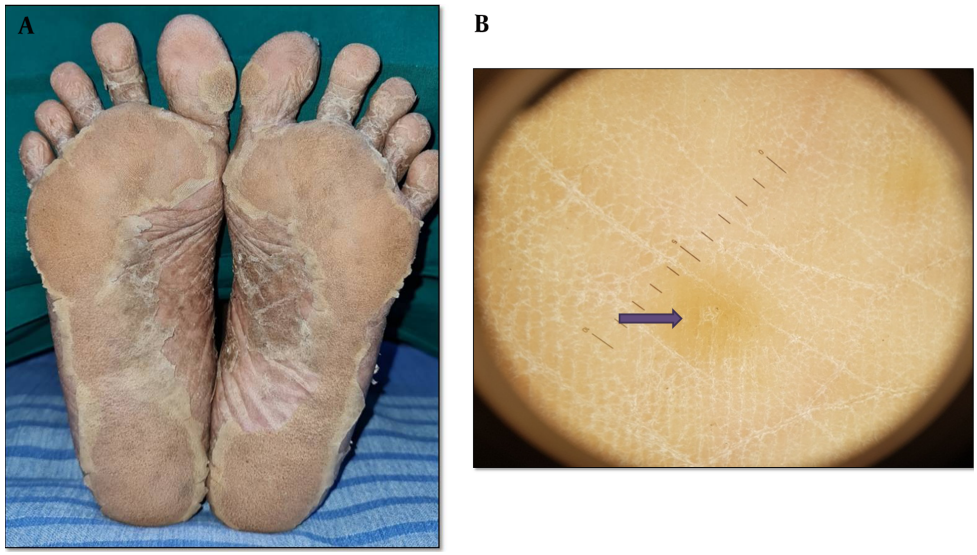

Figure 3. A, hyperkeratotic scaly plaques (PRP sandal) distributed symmetrically over both soles, B, dermoscopy findings in PRP, showing homogenous structure with less orange areas (the purple arrow) (Heine delta 20+, 20x).

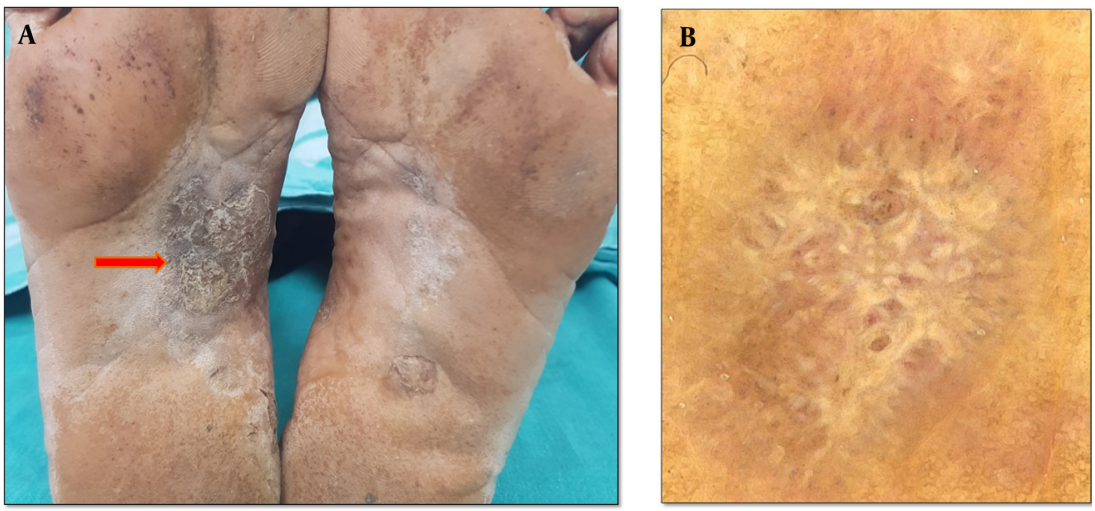

Figure 4. A, violaceous scaly plaques of lichen planus distributed over the instep (the red arrow) and plantar area of both feet; B, dermoscopy findings in lichen planus, showing Wickham's striae (the purple arrow) and peripheral linear and dotted vessels (the red arrow) (Medicam1000, 20x).

diffused white scale pattern and multiple dotted vessels arranged in an irregular pattern. Erythrokeratodermia variabilis showed a background color of light red, diffused white scales with a crisscross pattern, and no distinctive vascular features. There is a paucity of studies on hereditary PPKs.

In our study, a skin biopsy for histopathological examination was performed when clinical and dermoscopic features were unable to confirm the diagnosis. So, a total of 13 biopsies were performed.

5.8. Limitations

(1) Most cases studied included psoriasis and eczema, but other conditions were relatively infrequent, so more studies are recommended on these rarer dermatoses.

(2) Only five of our patients were diagnosed with hereditary palmoplantar keratoderma during the study period, so it was not feasible to gather detailed

Table 2. Dermoscopy Findings of Patients with Palmoplantar Psoriasis (n = 48)

Dermoscopic Findings	No. (%)	
	Palms	Soles
Background color		
Light red	16 (33.3)	12 (25.0)
Dull red	9 (18.8)	11 (22.9)
Yellow	2 (4.2)	2 (4.2)
Light red + yellow	21 (43.8)	23 (47.9)
Scales		
Diffuse white	14 (29.2)	19 (39.6)
Peripheral white	2 (4.2)	3 (6.3)
Patchy white	10 (20.8)	7 (14.6)
Diffuse yellow	2 (4.2)	2 (4.2)
Patchy yellow	2 (4.2)	1 (2.1)
Diffuse white + yellow	5 (10.4)	6 (12.5)
Peripheral white + yellow	1 (2.1)	0 (0.0)
Patchy white + yellow	8 (16.7)	8 (16.7)
Vascular pattern		
Linear		
Regular	7 (14.6)	4 (8.3)
Undifferentiated	0 (0.0)	2 (4.2)
Patchy	0 (0.0)	2 (4.2)
Dot		
Regular	8 (16.7)	5 (10.4)
Irregular	1 (2.1)	3 (6.3)
Undifferentiated	4 (8.3)	3 (6.3)
Patchy	0 (0.0)	3 (6.3)
Glomerular		
Undifferentiated	8 (16.7)	11 (22.9)
Patchy	3 (6.3)	4 (8.3)
Others		
Yellow crusts	2 (4.2)	0 (0.0)
Hemorrhagic crust	0 (0.0)	1 (5.1)
Brownish orange globules	0 (0.0)	2 (4.2)

Table 3. Dermoscopy Findings of Patients with Palmoplantar Dermatitis (n = 39)

Dermoscopic Findings	No. (%)	
	Palms	Soles
Background color		
Light red	5 (12.8)	7 (17.9)
Dull red	5 (12.8)	0 (0.0)
Yellow	11 (28.2)	9 (23.1)
Light red + yellow	18 (46.2)	22 (56.4)
Scale		
Diffuse white	4 (10.3)	7 (17.9)
Peripheral white	2 (5.1)	0 (0.0)
Patchy white	5 (12.8)	2 (5.1)
Diffuse yellow	1 (2.6)	7 (17.9)
Patchy yellow	3 (7.7)	4 (10.3)
Diffuse white + yellow	1 (2.6)	5 (12.8)
Patchy white + yellow	6 (15.4)	13 (33.3)
Vascular pattern		
Linear		
Regular	0 (0.0)	2 (5.1)
Undifferentiated	2 (5.1)	0 (0.0)
Patchy	1 (2.6)	1 (2.6)
Dot		
Regular	1 (2.6)	0 (0.0)
Irregular	0 (0.0)	1 (2.6)
Undifferentiated	2 (5.1)	6 (15.4)
Patchy	3 (7.7)	12 (30.8)
Glomerular		
Regular	4 (10.3)	2 (5.1)
Undifferentiated	0 (0.0)	1 (2.6)
Patchy	0 (0.0)	5 (12.8)
Others		
Orange dots	2 (5.1)	0 (0.0)
Yellow crusts	0 (0.0)	4 (10.3)
Hemorrhagic crust	0 (0.0)	2 (5.1)
Yellowish orange areas	0 (0.0)	1 (2.6)

dermoscopic findings of hereditary PPK.

(3) Histopathology was not performed in all cases, so we could not perform a correlational analysis between dermoscopic and histopathological findings.

5.9. Conclusions

This study sought to investigate the dermoscopic features of various causes of PPKs and evaluate if these patterns could distinguish between them. This is important as conditions such as psoriasis and eczema mimic each other very closely while they have different treatments. Although histopathology can aid in the correct diagnosis, overlapping histological features are not uncommon (4). Dermoscopy, a non-invasive procedure, can be useful in reaching the correct clinical diagnosis in this condition. The primary takeaway from this study is that dermoscopy can be

Table 4. Dermoscopy Findings of Patients with Hereditary Palmoplantar Keratodermas (n = 5)

Dermoscopic Parameters	Disease, No. (%)		
	Greither's Syndrome (1)	Erythrokeratodermia Variabilis (1)	Ichthyosis Vulgaris (3)
Background color			
Light red + yellow	1 (100)	0 (0)	0 (0)
Light red	0 (0)	1 (100)	3 (100)
Scale			
Diffuse white	1 (100)	1 (100)	1 (33.3)
Patchy yellow	0 (0)	0 (0)	1 (33.3)
Vascular pattern			
Dotted irregular	1 (100)	0 (0)	0 (0)
Linear regular	0 (0)	0 (0)	1 (33.3)
Glomerular patchy	0 (0)	0 (0)	1 (33.3)

Table 5. Comparison of Significant Palmar and Plantar Dermoscopic Findings of Palmoplantar Keratodermas due to Psoriasis (n = 48) and Eczema (n = 39)

Dermoscopic Parameters	Diagnosis, No. (%)		Total, No. (%)	P-Value
	Palmoplantar Dermatitis (n = 39)	Palmoplantar Psoriasis (n = 48)		
Palmar dermatitis versus psoriasis, (palms)				
Background color				
Light red	5 (12.80)	16 (33.30)	21 (24.1)	0.026
Yellow	11 (28.20)	2 (4.20)	13 (14.9)	0.002
Scale				
Diffuse white	4 (10.30)	14 (29.20)	18 (20.7)	0.03
Vascular				
Linear regular	0 (0.00)	7 (14.60)	7 (8)	0.013
Dotted regular	1 (2.60)	8 (16.70)	9 (10.3)	0.032
Plantar dermatitis versus psoriasis, (soles)				
Background color				
Dull red	0 (0.00)	11 (22.90)	11 (12.6)	0.001
Scale				
Yellow	9 (23.10)	2 (4.20)	11 (12.6)	0.008
Diffuse white	7 (17.90)	19 (39.60)	26 (29.9)	0.028
Vascular				
Diffuse yellow	7 (17.90)	2 (4.20)	9 (10.30)	0.036
Dotted regular	0 (0.00)	5 (10.40)	5 (5.70)	0.038
Dotted patchy	12 (30.80)	3 (6.20)	15 (17.2)	0.003

a valid complementary tool for classifying various forms of keratodermas, particularly in situations where palmar/plantar involvement is the only or predominant manifestation of the disease. Furthermore, histopathology has a limited role in the diagnosis of PPK, whereas dermoscopy can be useful in establishing a clinical diagnosis. Whether dermoscopy can be a replacement for histopathology is a question yet to be answered in the future. Larger and more comprehensive studies on the patterns and special features of these conditions can also help answer this question.

Footnotes

Authors' Contribution: Atul Rajeendran acquired, analyzed, and interpreted the data and drafted the manuscript. Manjunath Mala Shenoy participated in developing the study's concept and design and the critical revision of the manuscript for important intellectual content. Malcolm Pinto was involved in acquiring the data and study supervision. Vishal Amin, Spandana Prakash Hegde, Amina Asfiya, and Ashmiya Abdul Razak were involved in data acquisition. All authors read and approved the final manuscript.

Conflict of Interests: The authors declare no conflict of interest.

Data Reproducibility: The dataset presented in the study is available on request from the corresponding author during submission or after publication. The data are not publicly available due to patient privacy.

Ethical Approval: This study was approved under the ethical approval code of YEC2/674; https://yenepoya.edu.in/yenepoya-ethics-committee-2.

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Informed Consent: All experiments were performed in compliance with the relevant laws and institutional guidelines and state the institutional committee that has approved the experiments. Informed consent has been obtained from all the participants in the study.

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