Original Article

The Role of Dermoscopy as a Non-Invasive Adjunct in the Diagnosis of Acquired Hypopigmentary Disorders: A Correlative Study

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Abstract

Background: Acquired hypopigmentary disorders (AHDs) are those disorders that lead to a partial or complete deficiency of skin pigmentation. The diagnosis is not easy, especially in darker skin tones, where the psychosocial effects are significant. Proper and timely diagnosis depends on the combination of clinical observation, dermoscopy, and histopathology. The study aimed to evaluate the clinical, histopathological, and dermoscopic presentations of various acquired hypopigmentary disorders to enhance diagnostic accuracy and improve management in a tertiary care facility. **Material and Methods:** It is a prospective observational study that recruited 250 subjects with hypopigmented lesions at the Mahatma Gandhi Memorial Hospital, Warangal (April 2023-September 2024). The Patients were thoroughly examined by clinical examination, Wood's lamp, dermoscopy (ILLUCO IDS-1100), and skin biopsy, with histopathological confirmation by H and E and special stains (Masson-Fontana, Fite-Faraco). IBM SPSS software was used to perform statistical analysis, which included correlation coefficients. **Results:** The predominant diagnoses were Pityriasis versicolor (36.8%), followed by post-inflammatory hypopigmentation (25.6%), idiopathic guttate hypomelanosis (IGH) (18%), early vitiligo (12%), and Hansen disease (7.6%). Dermoscopy Pityriasis versicolor demonstrated non-uniform pigmentation with fine scales; IGH homogeneous white structureless areas with amoeboid/nebuloid borders; and vitiligo would have a reduced/absent pigment network with periflicular changes. The relationship among all three modalities was most strongly correlated in vitiligo (100%), then in IGH (95%), and in Pityriasis versicolor (90.9%). The study was conducted in one tertiary care setting and may not be generalisable to the community or primary care. No potential acquired hypopigmentary disorders were present in the disease spectrum, and the interobserver variation in dermoscopic interpretation was not formally evaluated. **Conclusion:** Dermoscopy is a valid and non-invasive complement to histopathology, with a significant impact on maintaining diagnostic accuracy in acquired hypopigmentary disorders. By combining these modalities, patient outcomes will improve, and the invasive procedure will be reduced.

Keywords: Acquired hypopigmentary disorders, Dermoscopy, Histopathology, Vitiligo, Pityriasis versicolor, Idiopathic guttate hypomelanosis.

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Introduction

The category of acquired hypopigmentary disorders (AHDs) is a broad group of dermatological conditions characterized by the partial or complete disappearance of pigmentation in previously normal skin. Though not malign in the majority of circumstances, these conditions may cause considerable psychological and cosmetic discomfort, especially among individuals of dark skin types. The pathogenesis will lie between the destruction of melanocytes and the suppression of melanin production to defects in melanosome transfer.[1] Hypopigmentary disorders are quite problematic to diagnose accurately due to their similar clinical characteristics. For example, early vitiligo, Pityriasis alba, idiopathic guttate hypomelanosis (IGH), and Hansen disease can manifest with similar hypopigmented macules and should therefore be carefully differentiated.[2] Clinical overlap: clinical examination, in combination with dermoscopic assessment and histopathological confirmation, is crucial for accurate diagnosis.[3] Non-invasive and magnified, non-guided imaging, called dermoscopy, allows one to visualize sub-surface skin structures and pigmentary networks. It can help identify hidden diagnostic clues, including perifollicular pigmentation, altered pigment networks, scaling, and vascular structures, which would otherwise be hard to see with the naked eye.[4] As an example, in vitiligo, dermoscopy may indicate alterations in the pigment network and the perifollicular repigmentation pattern, which indicates active melanocyte regeneration, and is valuable in disease activity and treatment response measurement.[5,6] Histopathology remains the gold standard for definitive diagnosis, providing details on melanocyte density, epidermal changes, and dermal inflammation.[3] Nonetheless, dermoscopy fills the gap between

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clinical suspicion and histological diagnosis, providing a quick, patient-centered diagnostic method.[7] This research aimed to determine the clinico-histopathological and dermoscopic correlation of frequent AHDs among patients attending a tertiary care hospital in South India and consequently enhance the accuracy of diagnostic management.

Materials and Methods

Study Design and Setting: The observational study was prospective and conducted in the Department of Dermatology, Venereology, and Leprosy at Mahatma Gandhi Memorial Hospital, Warangal, between April and September 2023. The institutional ethics committee reviewed the study and provided its ethical clearance, and informed consent was obtained from all the participants.

Study Population: Two hundred and fifty patients who came with one or more hypopigmented lesions were recruited. Those with both male and female ages (5 years and older) were involved.

Inclusion Criteria

Patients who have developed hypopigmented macules or patches.

- Readiness to have dermoscopy and skin Biopsy.
- Participation and follow-up informed consent.

Exclusion Criteria

- Patients with inherited hypopigmented diseases (e.g., albinism, nevus depigmentosus).
- The Chemical leukoderma and the general depigmentation.
- Uncooperative patients or those who decline a biopsy.

Clinical Assessment

A clear history of onset, duration, course, symptoms present, and family history was obtained. Sensory changes, distribution, and changes in skin surface were recorded. Lamp tests and potassium hydroxide (KOH) tests of wood were done on demand.

Dermoscopy

A dermoscopy NPV ILLUCO IDS-1100 (1 ×10 in polarized and non-polarized) was used to carry out the dermoscopy. The ultrasound gel was used to examine the lesions in both dry and wet states, with the gel serving as the interface medium. Such parameters were assessed as pigment network, perifollicular pigmentation, scaling, lesion border, vascular pattern, and opening of appendages.

Histopathological Examination

Skin biopsies were fixed using 10 percent formalin, processed, and stained using Haematoxylin and Eosin (H&E). The special stains were applied (only when needed) and included Masson-Fontana (melanin) or Fite-Faraco (acid-fast bacilli). Dermoscopic and clinical characteristics were compared to histopathological findings.

Statistical Analysis

The data were analyzed using IBM SPSS version 24. The frequency, percentage, mean, and standard deviation were computed. Chi-square and correlation tests were used to assess correlations between clinical, dermoscopic, and histopathological diagnoses.

Results

A case of Pityriasis versicolor was the most prevalent diagnosis among the 250 patients (36.8%), followed by post-inflammatory hypopigmentation (25.6%), idiopathic guttate hypomelanosis (18%), early vitiligo (12%), and Hansen satirical disease (7.6%). [Table 1] summarizes the patient distribution according to the final diagnosis.

Table 1: Distribution of Patients based on their Diagnosis (N=250)

Pityriasis Versicolor	92	36.8
Post Inflammatory Hypopigmentation	64	25.6
Idiopathic Guttate Hypomelanosis	45	18.0
Early Vitiligo	30	12.0
Hansen's Disease	19	7.6
Total	250	100.0

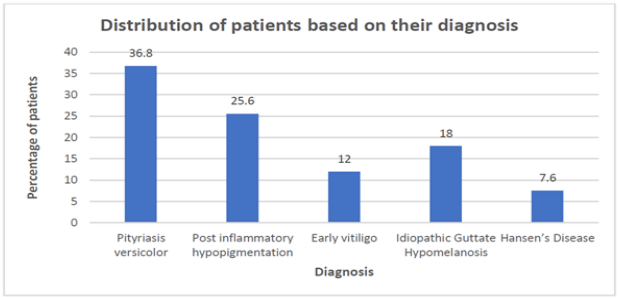

Figure 1: Distribution of Patients based on their Diagnosis.

Age and Gender Distribution

The sample comprised patients mostly aged 2140 years (42 percent), and it was predominantly male (1.3:1). Pityriasis versicolor and Hansen disease were more common among men. In contrast, post-inflammatory hypopigmentation and vitiligo were more common among women.

Site and Morphology

Scaly lesions were the most frequent morphological presentation, accounting for 62.8% [Table 2]. The upper trunk (27.2%) had the highest rate of involvement, followed by the lower limbs (20.8%) [Table 3].

Table 2: The Distribution of Patients depending on the Characteristics of Lesions (N= 250)

Scaly	157	62.8
Non scaly	93	37.2
Total	250	100

Table 3: Distribution of Patients Based on the Site of Hypopigmentation (N=250)		
Upper trunk	68	27.2
Lower limbs	52	20.8
Face and neck	45	18
Upper arms and axillae	35	14
Abdomen	31	12.4
Lower trunk	19	7.6

Dermoscopic Findings: The Dermoscopic evaluation was revealed the distinct patterns for the each disorder, summarized in the [Tables 4-7].

Table 4: The Dermoscopic Findings in Pityriasis Versicolor (N=92)		
Non-uniform pigmentation	92	100
Scaling in furrows (fine scales)	54	58.69
Pigmentary changes	50	54.34
Erythematous background	18	19.56

Table 5: The Dermoscopic Findings in the Early Vitiligo (N=30)		
Reduced pigmentary network	16	53.33
Absent pigmentary network	6	20
Perifollicular hyperpigmentation	3	10
Perilesional Hyperpigmentation	2	6.66

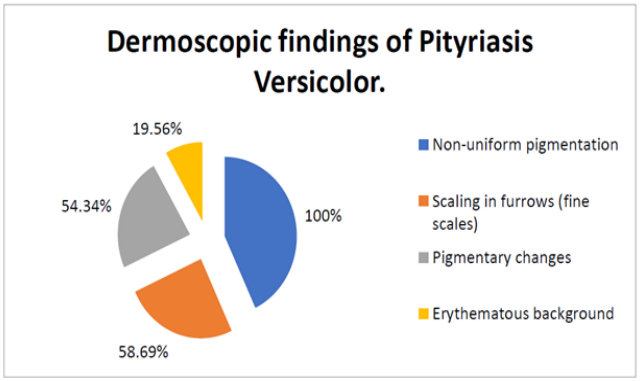

Figure 2: Clinical and Dermoscopic Presentation of Pityriasis Versicolor.

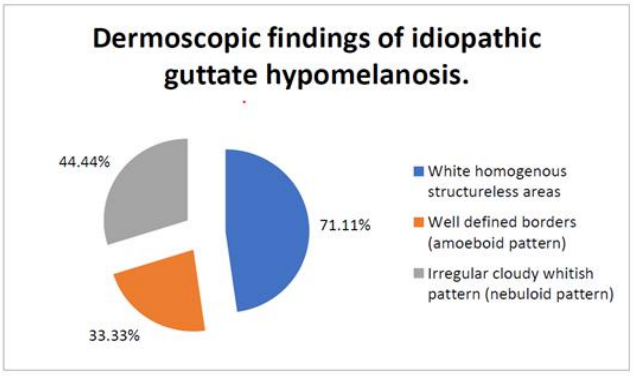

Figure 3: Clinical and Dermoscopic Presentation of Idiopathic Guttate Hypomelanosis.

Table 6: The Dermoscopic Findings in the Idiopathic Guttate Hypomelanosis (IGH) (N=45)		
White homogenous structureless areas	32	71.11
Irregular cloudy whitish pattern (nebuloid pattern)	20	44.44
Well defined borders (amoeboid pattern)	15	33.33

Table 7: Dermoscopic Findings in Hansen's Disease (N=19)		
Distorted pigment network	17	89.47
Focal white areas	14	73.68
Reduced follicular and eccrine openings	13	68.42
Widened skin lines	10	52.63
Brownish background	9	47.36
Linear and branching vessels	6	31.57

Correlation Analysis: The correlation between the diagnostic modalities as a whole is given in Table 8. Vitiligo showed the highest correlation among clinical, histopathological, and dermoscopic results (100% across all three pairings). The association between histopathological and dermoscopic findings was also high for IGH (95%) and Pityriasis versicolor (90.9%).

Table 8: Correlation Between the Clinical, Histopathological, and Dermoscopic Findings (%)			
Early Vitiligo	100	100	100
Idiopathic Guttate Hypomelanosis	88.88	84.44	95
Pityriasis Versicolor	86.95	95.65	90.90
Post Inflammatory Hypopigmentation	89.06	62.5	70.17
Hansen's Disease	100	52.63	52.63

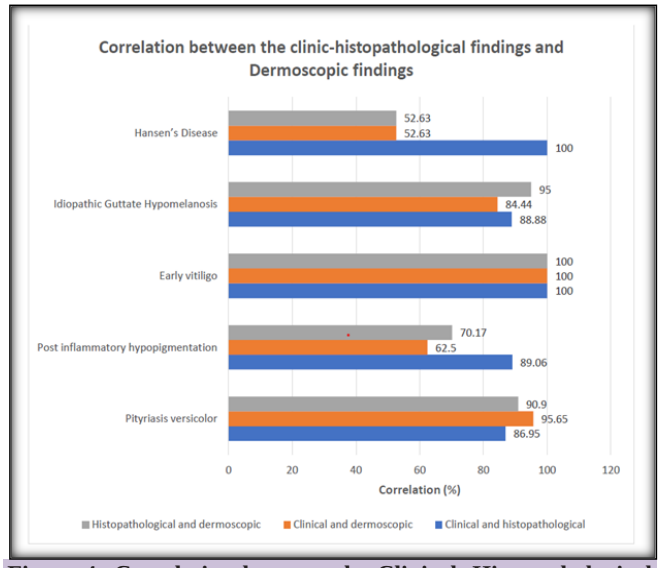

Figure 4: Correlation between the Clinical, Histopathological and Dermoscopic Findings

Discussion

The current research demonstrates the diagnostic value of dermoscopy as a complementary method for assessing acquired hypopigmentary disorders. Clinical, dermoscopic, and histopathological data integration offers the complete picture of disease morphology and prevents the pitfalls of diagnosis.[3,4] The next step in differentiation is made with histopathology, which reveals characteristic findings such as melanocyte loss in vitiligo, fungal spores in Pityriasis versicolor, or epidermal atrophy in IGH.[3]

Pityriasis versicolor, the most common in this study, typically occurs in humid environments among younger adults. Dermoscopic observation of perifollicular scaling and lack of homogeneous pigmentation was well correlated with histopathological findings of fungal hyphae and decreased epidermal melanin.

Idiopathic guttate hypomelanosis was most prevalent in older people and is consistent with cumulative photodamage.[8] Patterns of the dermoscopy (amoeboid and nebuloid) were associated with epidermal thinning and reduction in melanin that were found on histology.

Vitiglo demonstrated 100% clinical, histopathological, and dermoscopic concordance, demonstrating its diagnostic clarity.[9,10] Histological loss of melanocytes and basal melanin was related to the presence of perifollicular pigmentation and a pigment network absent.[11,12]

The rare disease, Hansen's disease, poses some diagnostic challenges. Bio-pathological findings (determined by dermoscopy) of distorted pigment schemes and diminished appendageal openings were associated with granulomatous inflammation and nerve involvement on biopsy. Poorer dermoscopic-histopathological concordance (52.63) can be explained by disease stage variation and ambiguous clinical morphology.[13]

The findings are consistent with those of other researchers, such as Behera et al,[14] (2019) Bindhu et al,[15] (2020) and Chug et al,[16] (2022) who refer to dermoscopy as a non-invasive adjunct diagnostic. Our results support the idea that dermoscopy serves as a bridge between intuitive and histological diagnosis in early or mild cases.[17,18]

Conclusion

Dermoscopy is a non-invasive, rapid, and repeatable diagnostic modality that bridges the gap between clinical assessment and histopathology in acquired hypopigmentary diseases. Typical dermoscopic features allow early identification of typical conditions- pityriasis versicolor, vitiligo, idiopathic guttate hypomelanosis, post-inflammatory hypopigmentation, and Hansen disease through dermoscopy, thus avoiding diagnostic time wastage and unwarranted biopsies.

A mixed-method approach combining clinical observation, dermoscopic assessment, and histopathological diagnosis will enable appropriate diagnosis and effective management of patients with hypopigmented skin lesions.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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