Dermatology Practical & Conceptual

# Dermoscopy of Vitiligo and Other Hypopigmented Skin Lesions in Indian Patients: A Cross-Sectional Study

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## ABSTRACT

**Introduction:** Non-vitiligo hypopigmented skin lesions may be close clinical mimickers of vitiligo, resulting in a diagnostic dilemma. Dermoscopic features of vitiligo have been studied, but those of other hypopigmentation disorders are not well-characterized.

**Objectives:** We aimed to describe and compare the dermoscopic features of vitiligo and other hypopigmented skin lesions.

**Methods:** This was a cross-sectional study including 105 vitiligo and 137 other hypopigmented skin lesions, including ash-leaf macules (N=17), nevus depigmentosus (N=16), post-inflammatory hypopigmentation (N=16), pityriasis alba (N=15), pityriasis versicolor (N=14), idiopathic guttate hypomelanosis (IGH) (N=14), lichen sclerosus (N=12), leprosy (N=9), and others. Dermoscopic findings were recorded by concordance of at least two qualified dermatologists.

**Results:** Common dermoscopic findings in vitiligo were intermediate or ill-defined margins (96/105, 91.4%) and a complete absence of pigment network (70/105, 66.7%). Nevus depigmentosus lesions were mostly hypopigmented, with a faint pigment network throughout the lesion. In 15/17 (88.2%) ash-leaf macules, a characteristic pattern of sharply demarcated areas of normal pigment network was seen within a depigmented lesion. Almost all lesions of IGH had a sharply defined margin with completely absent pigment network; discernible eccrine openings within the lesion were seen in 9/14 (64.3%). Dermoscopic findings of a complete absence of pigment network, perifollicular retention of pigment, presence of vascular pattern, loss of discernibility of eccrine openings within the lesion, and lack of scaling were statistically significantly more common in vitiligo than other hypopigmented skin lesions ($P$ <0.001).

**Conclusion:** Vitiligo, nevus depigmentosus, ash-leaf macule, and IGH have distinctive dermoscopic features. Dermoscopy can aid in the differential diagnosis of vitiligo and other hypopigmented skin lesions.

## Introduction

Dermoscopy in hypopigmented conditions has largely been studied in the context of establishing stability of disease in vitiligo [1,2]. There is a lack of studies comparing dermoscopic features of vitiligo with non-vitiligo hypopigmentation disorders [3]. Data available on dermoscopic features of these common non-vitiligo hypopigmented lesions is also limited. Patients with innocuous hypopigmentation diseases such as pityriasis alba and nevus depigmentosus often present with apprehension and concern that the disease is vitiligo [4]. Some disorders presenting with hypopigmented macules, such as tuberous sclerosis manifesting as ash-leaf macules and hypopigmented macules of leprosy, may warrant a more extensive evaluation. We studied the dermoscopic features of vitiligo as well as other common hypopigmentation disorders and compared their findings.

## Methods

This was a cross-sectional comparative study conducted in the outpatient department and pigmentation clinic of a tertiary care hospital in North India from September 2019 to February 2021, after obtaining institutional ethics clearance (Ref. no. IECPG-420/30.08.2018). Patients presenting with hypo-depigmented skin lesions with a confirmed clinical diagnosis (based on two dermatologists' opinion) including but not limited to vitiligo, idiopathic guttate hypomelanosis, pityriasis alba, pityriasis versicolor, nevus depigmentosus, ash-leaf macule, lichen sclerosus, leprosy, piebaldism, pigmentary mosaicism, hypopigmented mycosis fungoides, post kala-azar dermal leishmaniasis, and post-inflammatory hypopigmentation were included in the study after informed consent. Patients were excluded if the diagnosis could not be made clinically based on two dermatologists' opinion, or the results of relevant investigations done to establish diagnosis were inconclusive (KOH mount for pityriasis versicolor, biopsy for lichen sclerosus, biopsy and slit skin smear for leprosy, biopsy and immunohistochemistry for hypopigmented mycosis fungoides, and biopsy and tissue smear for post kala-azar dermal leishmaniasis). Lesions with secondary changes of infection, trauma, or irritation over the lesion were also excluded. Vitiligo macules were categorized as progressive, stable, or repigmenting based on patient's history and/or previous photographs. A lesion of vitiligo which had appeared longer than three months earlier with no increase or decrease in size subsequently was classified as stable. If the lesion had decreased in size within the previous three months, it was classified as repigmenting. Lesions that had increased in size or had appeared anew within the previous three months were classified as progressive lesions.

### Sample Size Estimation

A feasibility-based sample size of a minimum of 200 lesions was set on the basis of sample size of previous similar studies ranging from 115 [5] to 176 [3].

### Dermoscopic Examination

A maximum of three representative lesions in each patient were selected, and dermoscopy was done by at least two dermatologists (A.S., V.G., B.K.) using a hand-held dermoscope (DermLite DL3N hybrid pocket dermatoscope 3Gen Inc). Findings were noted by consensus of the two dermatologists, under the following headings (as per previous available literature, preliminary observations, and guided by the 2015 consensus statement of the International Dermoscopy Society [6]): (i) margins (well-defined, ill-defined or of 'intermediate' sharpness); (ii) background color; (iii) pigment network (distribution and type); (iv) perifollicular changes; (v) perilesional changes; (vi) vascular pattern; (vii) surface changes; (viii) hair density and color (leukotrichia); (ix) discernibility of eccrine openings; (x) any other additional findings.

The primary objective was to describe the dermoscopic features of various hypopigmentation skin disorders. The secondary objectives were to compare and contrast the dermoscopic features of vitiligo against all other hypopigmentation disorders and to compare the dermoscopic features of progressive and non-progressive vitiligo.

### Statistical Analysis

Continuous variables are presented as mean ± deviation (SD) and categorical variables as frequencies and percentages. Continuous variables were compared using the Student's *t*-test, and categorical variables using the Chi-squared test and Fischer's Exact test as applicable, setting level of significance as $P \leq 0.05$. All statistical analyses were performed using Stata 14 software (StataCorp. 2015).

## Results

Two hundred and forty-two hypopigmented lesions in 97 patients were included in this study: 105 vitiligo (38 patients) and 137 non-vitiligo (59 patients) (Table 1). The mean age of the patients was 23.33 ± 14.08 years (range 0.75- 71 years), 49 (50.5%) were males, and 48 (49.5%) were females. The Fitzpatrick skin type of patients was IV or V.

### Dermoscopic Findings of Vitiligo

Most (96/105, 91.4%) vitiligo lesions showed intermediate-to-ill-defined margins (Figure 1A), with only 9 (8.6%) lesions showing a well-defined margin. The background color of

**Table 1.** Number of Lesions and Number of Patients Included for Each Diagnosis.

| Diagnosis | Number of lesions | Number of patients |
|---|---|---|
| Vitiligo | 105 | 38 |
| Ash-leaf macule (ALM) | 17 | 6 |
| Nevus depigmentosus | 16 | 11 |
| Post-inflammatory hypopigmentation (PIH) | 16 | 6 |
| Pityriasis alba (P.alba) | 15 | 6 |
| Idiopathic guttate hypomelanosis (IGH) | 14 | 5 |
| Pityriasis versicolor (PV) | 14 | 5 |
| Lichen sclerosus (LS) | 12 | 5 |
| Leprosy | 9 | 4 |
| Piebaldism | 6 | 4 |
| Pigmentary mosaicism | 6 | 2 |
| Discoid lupus erythematosus (DLE) | 5 | 2 |
| Post kala-azar dermal leishmaniasis (PKDL) | 3 | 1 |
| Chronic arsenic toxicity | 3 | 1 |
| Hypopigmented mycosis fungoides | 1 | 1 |
| **Total** | 242 | 97 |

most vitiligo lesions (63.8%) was depigmented (Figure 1B). Two-thirds of vitiligo lesions (66.7%) showed complete absence of pigment network (Figure 1B), and a further 26.7% showed only a partially present network (Figure 1A). Of the 91 lesions that showed follicles within the lesion, leukotrichia was seen in 28 (30.7%), and 35 (38.6%) lesions showed perifollicular retention of pigment (Figure 1B). A vascular pattern (linear vessels, dotted vessels, or both) was seen in 45/105 (42.8%) vitiligo lesions. Of these, 39 (86.7%) were on some form of treatment, most commonly topical corticosteroids, calcineurin inhibitors, or some form of phototherapy or photochemotherapy. Only a single lesion of vitiligo showed scaling. Amongst segmental vitiligo, leukotrichia was seen in all but one lesion (8/9, 88.9%). An inverse pigment network was seen in three lesions only, all of which were repigmenting lesions located on bony prominences (knee, elbow, and just above lateral malleolus).

## Comparison of Dermoscopic Features of Progressive and Non-Progressive Vitiligo

In terms of activity, 39 (37.1%) lesions were progressive, 36 (34.3%) stable, and 30 (28.6%) repigmenting. For the purpose of clinically meaningful analysis, stable and repigmenting vitiligo lesions were taken together to represent non-progressive vitiligo, then compared with progressive vitiligo (Table 2). The majority of progressive lesions showed an ill-defined margin (20/39. 51.3%) (odds ratio (OR)=4.2). A complete absence of pigment network was seen more often in non-progressive vitiligo (48/66, 72.02%) as compared to progressive vitiligo (22/39, 56.41%) ($P$ = 0.044). Faint pigment network was seen more often in the progressive group ($P$ = 0.014, OR=3). Perifollicular pigment retention was more commonly seen in non-progressive group ($P$ = 0.009) (Sensitivity (Sn) 48.3%, Specificity (Sp) 80.6%). Perilesional hyperpigmentation was more frequently a feature of non-progressive group, seen in 19.7% (13/66) ($P$ = 0.001) (Sp 97.4%, Sn 19.6%). Leukotrichia was observed in 23/66 (34.8%) non-progressive vitiligo lesions, compared to 5/39 (16.1%) of progressive lesions. A vascular pattern was more likely to be seen in non-progressive group ($P$ <0.001). Eccrine openings or white dots were discernible within a depigmented lesion of vitiligo, more commonly in the progressive group (Figure 1).

## Dermoscopic Findings of Non-Vitiligo Hypopigmented Lesions

*Nevus depigmentosus (N=16) (*Figure 2*):* Margins of most of the lesions (14/16, 87.5%) were of intermediate definition. The background color of most (87.5%) lesions was hypopigmented. The majority of lesions (10/16, 62.5%) had a pigment network present throughout the lesion, whereas it was partially present in three, similar to that of ash-leaf macule in two, and completely absent in one. Most of the lesions had no perifollicular and perilesional changes. Three (18.8%) lesions showed partial leukotrichia.

*Ash-leaf macules (N=17) (*Figure 3*):* Pigment network in the majority of lesions (15/17, 88.2%) had a characteristic patchy pattern of sharply demarcated areas of normal pigment network with jagged margins, within the depigmented lesion. The specificity of this "ALM-like" ("ash-leaf macules"-like) pigment network for ash-leaf macule (compared to all other diagnosis) was 97.23%, with sensitivity of 88.2% and a negative predictive value (NPV) of 99.1%. The positive predictive value (PPV) was 71.4%, with four lesions of pigmentary mosaicism and two lesions of nevus depigmentosus showing a similar pattern.

Additional differences from nevus depigmentosus included the background color, being depigmented in ash-leaf macules ($P$ <0.001), and lack of leukotrichia in any of the lesions examined.

*Pityriasis alba (N=15) (*Figure 4*):* Most (13/15, 86.7%) lesions had ill-defined margins. The majority (73.3%) of lesions had a hypopigmented background, with a normal or faint network present throughout the lesion in 93.3%

**Table 2.** Dermoscopic Findings of Vitiligo and Comparison by Activity of Disease.

| Diagnosis Findings | Progressive N=39 | Non-progressive N=66 | p-value | Total (All vitiligo) n=105 |
|---|---|---|---|---|
| **Margins** | | | **p=0.001** | |
| Well-defined | 4 (10.6%) | 5 (7.6%) | | 9 (8.6%) |
| Intermediate | 15 (38.5%) | 48 (72.7%) | | **63 (60%)** |
| Ill-defined | **20 (51.3%)** | 13 (19.7%) | | 33 (31.4%) |
| **Pigment Network- distribution** | | | **p=0.044** | |
| Complete presence | 5 (12.8%) | 2 (3%) | | 7 (6.7%) |
| Complete absence | **22 (56.4%)** | **48 (72.7%)** | | **70 (66.7%)** |
| Partially present | 12 (30.8%) | 16 (24.2%) | | 28 (26.7%) |
| **Pigment network- type, when present (N=35)** | | | **p=0.029** | |
| Normal | 1 (5.9%) | 4 (22.2%) | | 5 (14.3%) |
| Faint | **16 (94.1%)** | 11(61.1%) | | **27 (77.1%)** |
| Inverse | 0 | 3 (16.7%) | | 3 (8.6%) |
| Absent | 22 | 48 | | 70 |
| **Other features** | | | | |
| Depigmented background | 25 (64.1%) | 42 (63.6%) | p=0.962 | **67 (63.8%)** |
| Perifollicular pigment retention (n=91) | **6/31 (19.4%)** | **29/60 (48.3%)** | **p=0.009** | 35 (38.5%) |
| Perilesional hyperpigmentation | 1 (2.6%) | **13 (19.7%)** | **p=0.001** | 14 (13.3%) |
| Perilesional white globules | **11 (28.2%)** | 5 (7.6%) | **p=0.009** | 16 (15.2%) |
| Leukotrichia (N=91) | 5/31 (16.1%) | **23/60 (34.8%)** | **p=0.035** | **28 (30.7%)** |
| Vascular pattern | 5 (12.8%) | **40 (60.6%)** | **p<0.001** | 45 (42.9%) |
| Eccrine openings discernible | **11 (28.2%)** | 2 (3%) | **p=0.002** | 13 (12.4%) |
| Scaling | 0 | 2 (3%) | p> 0.05 | 2 (1.9%) |
| Erythema | 4 (10.3%) | 15 (22.8%) | p=0.118 | 19 (18.09%) |

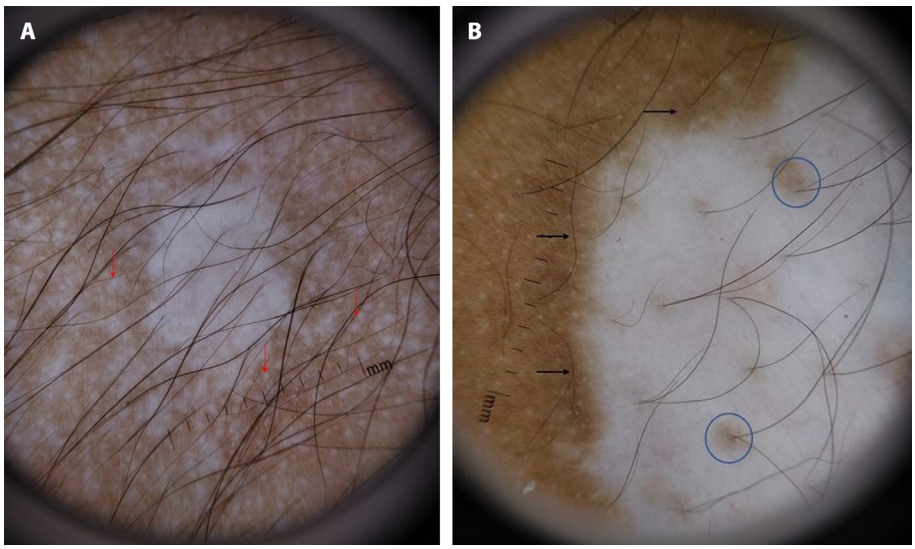


**Figure 1.** A) Dermoscopy of a progressive vitiligo lesion showing ill-defined margins, partially present pigment network, perilesional white globules (red arrows), and lack of perifollicular changes. No vascular changes are seen, and no eccrine openings are discernible within this lesion (DL3, 10X, polarized). B) Dermoscopy of a non-progressive (stable) vitiligo lesion showing well-defined margin with complete absence of pigment network and perifollicular pigment retention (blue circle). Marginal hyperpigmentation is also seen (black arrow), and no eccrine openings are discernible within the lesion (DL3 10X, polarized).

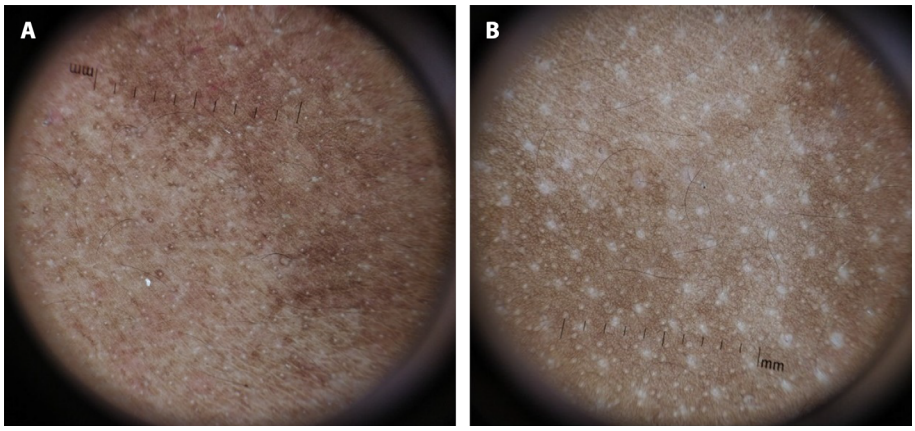


**Figure 2.** A) and B) Dermoscopic features of nevus depigmentosus showing intermediate margin with background hypopigmentation and faint pigment network present throughout the lesion, with lack of surface, vascular, or other changes (DL3, 10x, polarized).

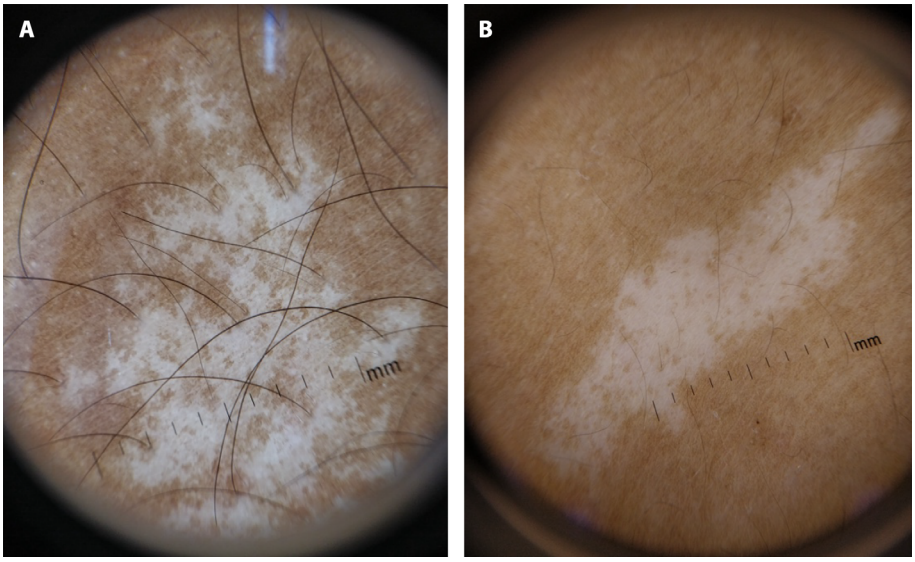


**Figure 3.** A) and B) Dermoscopy of ash-leaf macule showing characteristic pigment network ('ALM-like') in ash-leaf macule with sharply demarcated islands of normal pigment network with jagged margins (blue arrow) within the depigmented lesion (DL3, 10X, polarized).

lesions. Erythema was seen in 60% lesions and scaling in one-third.

*Pityriasis versicolor (N=14) (*Figure *5):* All the lesions had intermediate-to-ill-defined margins and a hypopigmented background. Six of 14 (42.9%) lesions had complete presence of pigment network throughout the lesion, and 50% had partial presence. Perifollicular hypopigmentation was seen in 5 (35.7%) lesions, and white globules were seen in the perilesional area in half the lesions. Scaling was a frequent finding, seen in 85.7% of lesions.

*Idiopathic guttate hypomelanosis (IGH) (N=14) (*Figure *6):* Almost all the lesions (13/14, 92.8%) had a sharply defined margin. In all 14 lesions, the background was depigmented, and the pigment network was completely absent. There were no vascular, surface, or other changes in any of the lesions. Nine of 14 (64.3%) lesions had discernible eccrine openings outlined by a brown line, within the lesion.

*Lichen sclerosus (LS) (N=12):* The striking feature was presence of structureless white areas (9/12, 75%), which would become less evident on switching to non-polarized mode. Half the lesions also showed shiny white streaks. Two-thirds of the lesions showed comedo-like openings/follicular plugs. Two-thirds of the lesions also showed loss of hair over the lesion.

Leprosy (N=9) lesions (one borderline tuberculoid and 4 borderline lepromatous patients) were most often ill-defined, with complete or patchy presence of pigment network. Hair loss was seen in only one lesion, and there was no loss of eccrine openings.

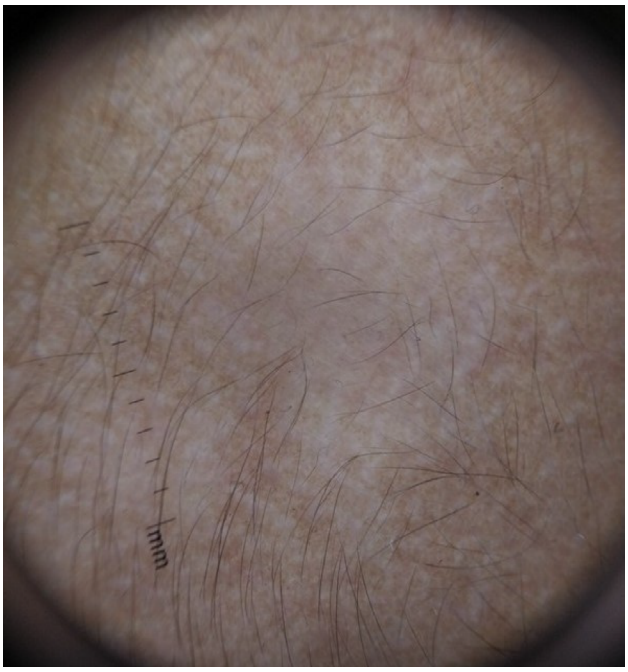

**Figure 4.** Dermoscopy of pityriasis alba showing ill-defined hypopigmented lesion with faint pigment network present throughout the lesion and subtle erythema (DL3, 10X, polarized).

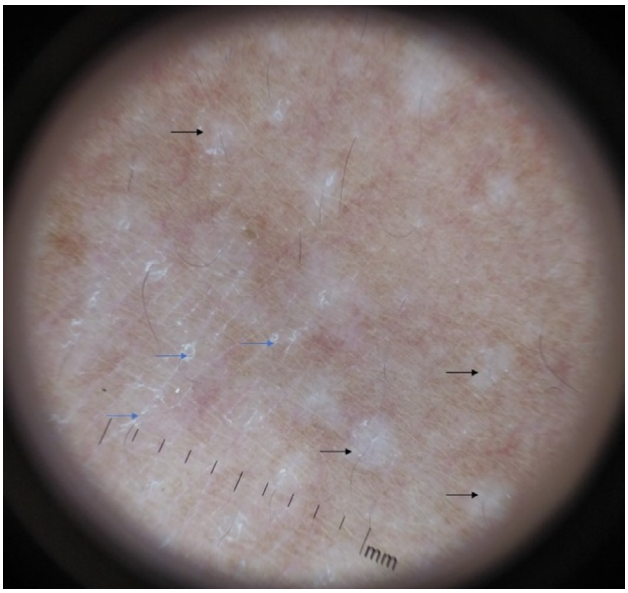

**Figure 5.** Dermoscopy of pityriasis versicolor showing hypopigmented background with presence of faint network, perifollicular hypopigmentation and fine gray-white scaling (blue arrow) (DL3, 10X, polarized).

Lesions of piebaldism (N=6) showed a complete loss of pigment network (5/6, 83.3%) and both follicular and non-follicular islands of pigmented skin within the lesion. All the patients had complete leukotrichia, and in most (5/6, 83.3%), it also extended beyond the lesion.

Lesions of post-inflammatory hypopigmentation of undiagnosed etiology (N=16) showed variable pigment network, and most lesions (81.3%) showed changes other than pigmentary change, such as vascular patterns, erythema, scaling, pigmented dots, and shiny white streaks

**Figure 6.** Dermoscopy of idiopathic guttate hypomelanosis showing well-defined lesion with depigmented background, complete absence of pigment network, and brown outlined discernible eccrine openings (black arrows) (DL3 10X, polarized).

## Comparison of Dermoscopic Features of Vitiligo Versus Other Hypopigmentation Disorders

As a group, non-vitiligo lesions more often showed a well-defined margin (32/137, 23.4%) than did vitiligo (9/105, 8.6%) ($P$ <0.001). A complete absence of pigment network was seen in 66.7% of vitiligo lesions, whereas it was seen in 30.6% of non-vitiligo group, making a lesion 10 times more likely to be a vitiligo lesion when it showed this feature (OR=10) (Table 3).

Perifollicular retention of pigment and leukotrichia, although present in only 38.5% and 30.8% of lesions of vitiligo, respectively, were important points of differentiation from the non-vitiligo group, with perifollicular pigment retention having a specificity of 93.9% for vitiligo ($P$ <0.001) (Table 3). There were no significant differences in perilesional changes between the two groups. In lesions on hair bearing sites, leukotrichia was present in 28/91 (30.8%) of vitiligo lesions and in 9/137 (7.8%) of non-vitiligo lesions ($P$ <0.001). Eccrine openings were discernible in 70.8% of non-vitiligo lesions but only in 12.4% lesions of vitiligo ($P$ <0.001). Lesions of vitiligo were more likely to show

**Table 3.** Dermoscopic Findings of Vitiligo vs Non-Vitiligo Lesions.

| Diagnosis Findings | Vitiligo N=105 | Non-vitiligo N=137 | p-value |
|---|---|---|---|
| **Margins** | | | p=0.008 |
| Well-defined | 9 (8.57%) | **32 (23.4%)** | |
| Intermediate | 63 (60%) | 64 (46.7%) | |
| Ill-defined | 33 (31.4%) | 41 (29.9%) | |
| **Pigment Network- Distribution** | | | P < 0.001 |
| Complete presence | 7 (6.7%) | 42 (30.7%) | |
| Complete absence | **70 (66.7%)** | 42 (30.7%) | |
| Partially present | 28(26.7%) | 32(23.4%) | |
| Ash-leaf macule like* | 0 | 21 (15.3%) | |
| **Pigment network- type, when present** | **(N=35)** | **(N=95)** | p<0.001 |
| Normal | 5 (14.3%) | 38 (40%) | |
| Faint | **27 (77.1%)** | 54 (56.8%) | |
| Inverse | 3 (8.6%) | 2 (2.1%) | |
| **Other features** | | | |
| Depigmented background | **67 (63.8%)** | 53 (50.5%) | p<0.001 |
| Perifollicular pigment retention | **35/91 (38.5%)** | 10/115 (8.7%) | p<0.001 |
| Perilesional changes | 33 (31.4%) | 43 (31.4%) | p=0.994 |
| Leucotrichia | **28/91 (30.8%)** | 9/115 (7.8%) | p<0.001 |
| Vascular pattern | **45 (42.8%)** | 29 (21.2%) | p<0.001 |
| Eccrine openings discernible | 13(12.4%) | **97(70.8%)** | p<0.001 |
| Scaling | 1 (1%) | **29 (21.2%)** | p<0.001 |
| Erythema | 19 (18.1%) | **33 (24.1%)** | p=0.261 |
| Structureless areas | 4 (3.8%) | 14 (10.2%) | p=0.060 |

a vascular change and less likely to show surface changes like scaling (P <0.001 for both parameters), though 73.3% lesions of vitiligo were being treated by topical, phototherapy, or systemic agents, which may have been a confounding factor.

On comparing nevus depigmentosus with vitiligo, patterns of pigment network between the two groups were significantly different (*P* <0.001). the background color of most nevus depigmentosus lesions was hypopigmented, whereas the background color of most vitiligo lesions was depigmented (*P* <0.001). Perifollicular pigment retention, a feature of vitiligo, was not seen in nevus depigmentosus (*P* = 0.009). A vascular pattern was more frequently seen in vitiligo (*P* = 0.020). Leukotrichia was more frequently seen in vitiligo, though was also seen in three cases of nevus depigmentosus and was not statistically significant (*P* = 0.328). Eccrine openings were discernible within nevus depigmentosus lesions, but not in vitiligo (*P* <0.001).

Pityriasis alba lesions showed an ill-defined margin much more frequently compared to vitiligo. A complete absence of pigment network was 90.91% sensitive and 93.33% specific for vitiligo when compared with pityriasis alba, which most frequently showed a complete presence of pigment network. Scaling and erythema were both pointers to pityriasis alba over vitiligo (OR=69 for scaling, OR=6.7 for erythema for a diagnosis of pityriasis alba over vitiligo) (*P* <0.001). Leukotrichia was not seen in pityriasis alba.

IGH lesions more often had a well-defined margin compared to vitiligo (*P* <0.001). Distinct eccrine openings with a brown outline, distinctive in IGH (64.3%), were discernible in a minority of vitiligo lesions only (13/105, 12.4%) (*P* <0.001). Leukotrichia was exclusive to vitiligo lesions.

## Discussion

Clinical differential diagnosis of hypopigmented skin lesions can be broad and challenging. There is a need for a handy, noninvasive tool like dermoscopy to reliably distinguish these entities. In this study, we found certain dermoscopic features that may be useful in distinguishing vitiligo from other hypopigmented skin lesions, such as a complete absence of pigment network, perifollicular retention of pigment, the

presence of vascular pattern, a lack of discernibility of eccrine openings within the lesion, and a lack of scaling. In addition, we found that nevus depigmentosus, ash-leaf macules, and IGH have distinctive dermoscopic features.

Our findings in vitiligo are largely similar to those in previous studies. Metaphorical terms like "starburst" and "nebulous" pattern used previously for margins are likely analogous to the ill-defined margins seen in our study. An absent pigment network has been previously reported in about 30–40% of vitiligo lesions [1,7]. This was seen in two-thirds of vitiligo lesions (70/105, 66.7%) in our study. Perifollicular pigmentation has previously been reported to be seen in 40–75% lesions of vitiligo [1,2,8-10] and was seen in 38.6% lesions in our study. Marginal or perilesional hyperpigmentation was seen in our study in 13.3% lesions, slightly less frequently than in previous studies (20–40%) [1,2,8-10]. It has been strongly correlated in the literature to stable disease, which was corroborated in our study, being a specific, but not a sensitive finding. The association of perifollicular changes with stability is controversial in the literature, with two studies reporting an association with stability similar to our study [2,8], whereas Jha et al. [1] found that most lesions with this finding were of progressive nature. Thatte et al. [7] included only cases of evolving vitiligo and found this feature in 2/30 cases (6.7%) only, possibly supporting the association with non-progressive disease. The modest variation in frequencies of various findings could possibly be due to different proportions of active and stable lesions at various stages included in previous studies and to the higher proportion of progressive disease presenting to a tertiary care center. An absent pigment network and leukotrichia were also consistent pointers to stability of disease [1,11]. This stability may also suggest complete loss of pigment and therefore an endpoint, where further progression is not seen. Meanwhile, perilesional white globules (encompassing "polka dot appearance", "satellite lesions," or "tapioca sago appearance") was seen in progressive disease, also consistent with previous studies [1,2,10,11]. We observed an inverse pigment network in only three cases, all repigmenting lesions, contrary to an association with progressive disease as previously reported [1,7]. All three lesions were located on acral areas or bony prominences, and it was further observed that dermoscopy of normal skin of some healthy individuals also showed such a pattern on acral sites. We postulate that increased skin markings on acral sites may contribute to the appearance of an inverse pigment network, rather than to disease activity. An interesting finding which has not been previously commented upon in the literature was that the eccrine openings, which are seen as white dots outlined by a brown line throughout normal skin, were often not discernible within a depigmented lesion of vitiligo (87.6%).

The dermoscopic features of nevus depigmentosus (faint pigment network throughout the lesion) in our study are consistent with previous case reports [12-14]. Malakar et al. [13] differentiated this finding from areas of reticular network as well as zones of total loss of pigment network seen in ash-leaf macules. We also noted this characteristic pattern in 88.2% lesions of ash-leaf macules. This pattern was seen elsewhere only in lesions of pigmentary mosaicism, and in one lesion of segmental nevus depigmentosus, signifying possible correlation of this patchy pattern to mosaicism. This dermoscopic feature could thus be potentially used to screen neonates for ash-leaf macules and hence tuberous sclerosis.

Dermoscopic features of idiopathic guttate hypomelanosis have been well studied and are similar to those seen in our study. Well-defined margins (termed "amoeboid" and "petaloid" previously) are considered characteristic of IGH [8,15]. Studies also mention "homogenous whitish areas" [16] and "shiny porcelain-white macules" [8], likely pertaining to a depigmented white background with complete loss of pigment network, as in our study. A recent multicenter study also recognized "periostial (follicles/eccrine sweat glands) brown pigmentation" in 91.7% cases of IGH (N=12), which emerged as a strong point of difference from vitiligo in our study [17].

Nayak et al. [18] examined 15 cases of pityriasis alba and reported "well-circumscribed pinkish patch with irregular scales" for all the lesions. The pinkish hue likely refers to erythema, although their finding of well-defined lesions and universal scaling differs from our study. For pityriasis versicolor, our findings are consistent with previous studies, including the largest series (N=164) by Mathur et al. [19] In lichen sclerosus, previous studies mention white or white-yellow structureless areas in 66.8% to 88.6% [20-22], and comedo-like openings/follicular plugs in 77.8% to 80% [20-22], corroborated in our study.

We found only one previous study comparing the dermoscopic findings in vitiligo with other hypopigmentation disorders. Meng et al. [3] studied 176 patients with various depigmented skin lesions, including 97 patients with vitiligo. They found residual perifollicular pigmentation as a pointer to vitiligo, which was corroborated in our study. In addition, we found other dermoscopic differences between vitiligo and other hypopigmented skin lesions: a complete absence of pigment network, perifollicular retention of pigment, leukotrichia, the presence of a vascular pattern, a lack of discernibility of eccrine openings within the lesion, and a lack of scaling. We propose a provisional guiding algorithm for dermoscopic approach to the diagnosis of hypopigmented lesions on the basis of our findings, which could be tested in a larger sample size by future researchers (Figure 7).

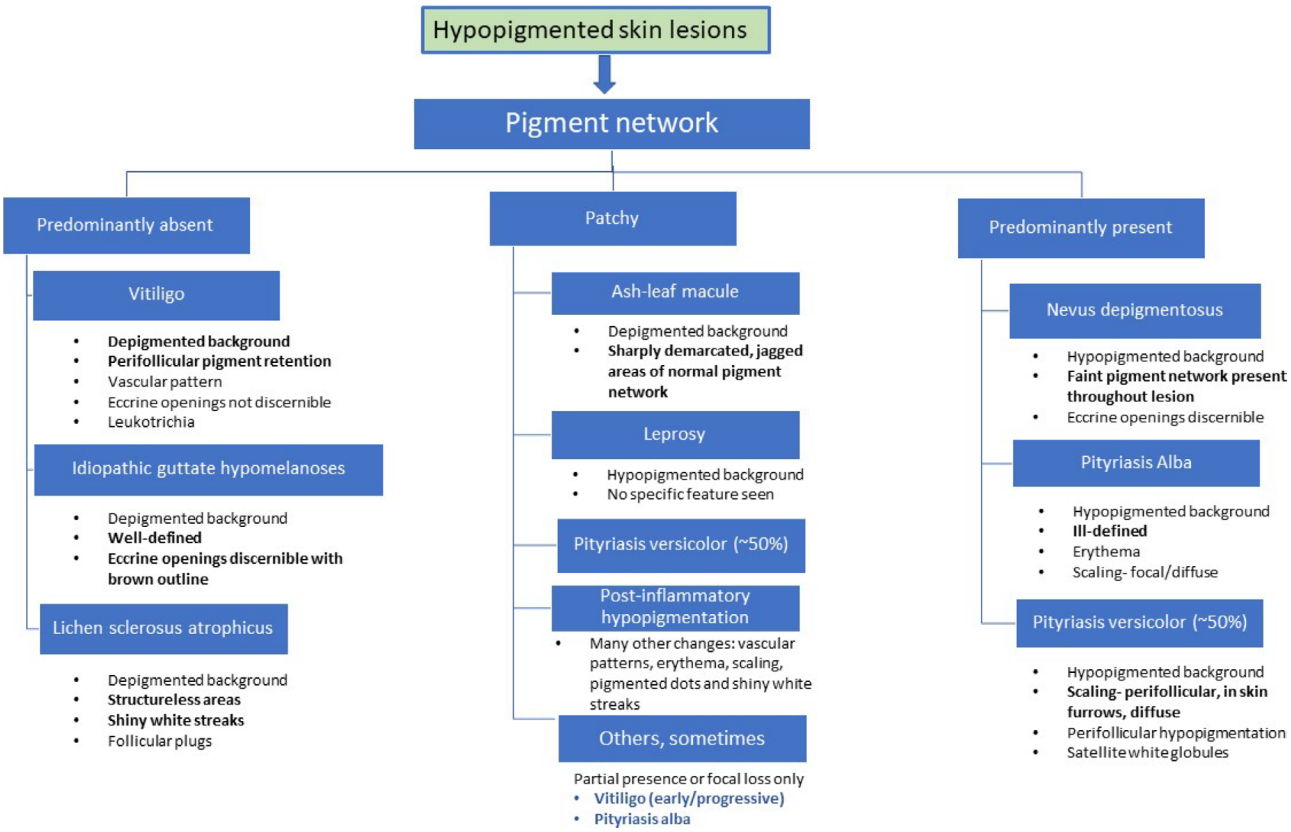


**Figure 7.** Algorithmic approach to dermoscopic diagnosis of hypopigmented skin lesions.

## Limitations

The strengths of our study include a large sample size of patients with skin of color and the use of the standardized dermoscopy nomenclature proposed by the 2015 consensus statement of the International Dermoscopy Society [5].

Our study has some limitations. The sample size was not formally calculated and was not sufficient for comparison of individual entities. The activity of some vitiligo lesions was established based on history alone, which may not be entirely reliable.

## Conclusion

Vitiligo, nevus depigmentosus, ash-leaf macules, nevus depigmentosus, and idiopathic guttate hypomelanosis have recognizable dermoscopic features. There are certain differences between the dermoscopic features of vitiligo and other hypopigmented skin lesions. Our findings need to be externally validated in larger studies on patients with different skin types.

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**Patient Consent on File:** Consent for the publication of recognizable patient photographs or other identifiable material was obtained by the authors and included at the time of article submission to the journal stating that all patients gave consent with the understanding that this information may be publicly available.

**Data Availability Statement:** The data underlying this article are available in the article, and further data will be shared on reasonable request to the corresponding author.

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