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Dermoscopic patterns in active and regressive lichen planus and lichen planus variants: a morphological study

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Introduction

Dermoscopy is a non-invasive tool that is widely recognized and used in the diagnosis of pigmented and non-pigmented skin tumors [1,2]. In recent years, dermoscopy has been used for other dermatologic diseases including psoriasis, lichen planus, alopecia, and skin infestations [1,2]. Lichen planus (LP) is an acute or chronic inflammatory skin disorder characterized by discrete, violaceous, polygonal papules [2,3]. Though the diagnosis of LP can be made clinically, it can sometimes be challenging and histopathological examination is needed. Dermoscopic examination may be helpful in these settings to aid the diagnosis. In this study, we aimed to categorize the dermoscopic images of LP patients before and after treatment.

Materials and methods

We analyzed and categorized the dermoscopic images of 255 LP lesions from 60 patients who had been diagnosed with LP or LP variants clinically and confirmed by histopathological examination. The mean age of the patient group was 38.0 years old (range 19-60 years old). Out of 60 patients, 38 had classical LP (CLP), eight had acute generalized LP (AGLP), three had LP pigmentosus inversus (LPPI) and CLP coexistence, three had lichen planopilaris (LPp), one had a solitary LPP (SLPP) on the abdomen, one had a solitary annular LP on the glans penis (GALP), three had generalized annular atrophic LP (AALP), two had LP actinicus, and one had zosteriform LPP (ZLPP). We reanalyzed and categorized the dermoscopic images of 50 lesions from fifteen patients after treatment. The same dermatologist investigated each patient using a Foto-Finder handyscope® that magnifies lesions tenfold.

Results

Among the 255 active LP lesions, 170 were CLP, 30 were AGLP, 15 were LPp, 15 were LPPI, three were ZLPP, ten were AALP, ten were Ac LP, one was SLPP, and one was GALP (Table 1).

Among 170 CLP lesions, WS was observed in 152 lesions at a rate of 89.4%. These were morphologically sub-grouped as reticular WS in 110 lesions (64.7%), circular WS in two lesions (1.1%), linear WS in 13 lesions (7.6%), globular WS in

TABLE 1. Dermoscopic patterns in active or regressive LP and LP variants.

	CLP 170 lesions N (%)	AGLP 30 lesions N (%)	LPp 15 lesions N (%)	LPPI 15 lesions N (%)	SLPP 1 lesion N (%)	ZLPP 3 lesions N (%)	GALP 1 lesion N (%)	AALP 10 lesions N(%)	Ac LP 10 lesions N(%)	RLP 50 lesions N (%)
WS	**152(89,4)**	**18(60)**	**6(40)**	–	–	–	**1(100)**	**7(70)**	–	–
Morphology										
Reticular	110(64,7)	10(33,3)	1(6,6)							
Circular	2(1,1)	4(13,3)	1(6,6)				1(100)	7(70)		
Linear	13(7,6)		1(6,6)							
Globular	15(8,8)		3(20)							
Radial streaming	9(5,2)		1(6,6)							
Perpendicular	–	4(13,3)	5(33,3)							
Veil like	–	4(13,3)	9(60)							
Combined	3(1,7)		–							
Color										
White	112(65,8)	10(33,3)					1(100)	7(70)		
Yellow	13(7,6)	4(13,3)								
Blue-white	27(15,8)	4(13,3)								
WS (–)	**18(10,5)**	**10(33,3)**		**15(100)**	**1(100)**	**3(100)**	–	**3(30)**	**10(100)**	**50(100)**
Invisible WS	–	2(6,6)		–	–	–	–	–	–	–
Pigment pattern	**20(11,7)**	–	**13(86,6)**	**15(100)**	**1(100)**	**3(100)**	**1(100)**	**10(100)**	**10(100)**	**30 (60)**
Dots/globules										
–peripheral	8(4,7)									6(12)
–diffuse				5(33,3)		3(100)				6(12)
Peppering										
–peripheral										3(6)
–diffuse				3(20)	1≠(100)				10(100)	3(6)
Perifollicular/ annular			8≠(53,3)	8*(53,3) 8*(53,3)	1≠ (100)			2(20)	–	2*–2≠
Linear										2*(4)
Reticular	2(1,1)							2(20)		1≠(2)
Circular										1(2)
Cobblestone				3*(20)						2* (4)
Homogen cloud like										
–peripheral	10(5,8)									1(2)
–diffuse			5(33,3)				1(100)	8(80)		1(2)
Pigment pattern (–)	**150(88,2)**	**30(100)**	**2(13,3)**	–	–	–	–	–	–	**20(40)**
Vascular pattern	**46(27)**	**24(80)**	**3(20)**	–	–	–	**1(100)**	**3(30)**	–	–
Red dots										
–perifollicular		6(20)								
–peripheral	4(2,3)	5(16,6)					1(100)			
–diffuse	15(8,8)	9(30)	3(30)							
Red globules	8(4,7)	4(13,3)								
Radial linear	19(11,1)	–								
Peripheral homogen		–						3(30)		
Vascular pattern (–)	**124(72,9)**	**6(20)**	**12(80)**	**15(100)**	**1(100)**	**3(100)**	–	**7(70)**	10(100)	**50(100)**
Background color										
Pink	64(37,6)	5(16,6)	2(13,3)			3(100)	1(100)			
Violet	66(38,8)	10(33,3)	5(33,3)							
Red	–	15(50)								
Brown	30(17,6)	–	8(53,3)	15(100)	1(100)				10(100)	40(80)
Yellow	10(5,8)	–								10(20)
White dots	2(1,1)	–	4(26,6)	10(66,6)	1(100)	–	–	–	–	3(6)
Yellow dots	10(5,8)	–	3(20)	–	–	–	–	–	–	–

*+≠: *same lesions*

CLP: Classical lichen planus
AGLP: Acute generalized lichen planus
LPp:Lichen planopilaris
SLPP: Soliter lichen planus pigmentosus
LPPI: Lichen planus pigmentosus inversus
LPP: Lichen planus pigmentosus
AALP: Annular atrophic lichen planus
Ac LP: LP actinicus
ZLPP: Zosteriform lichen planus pigmentosus
GALP: Genital annular lichen planus
RLP: Regressive lichen planus
WS: Wickham striae

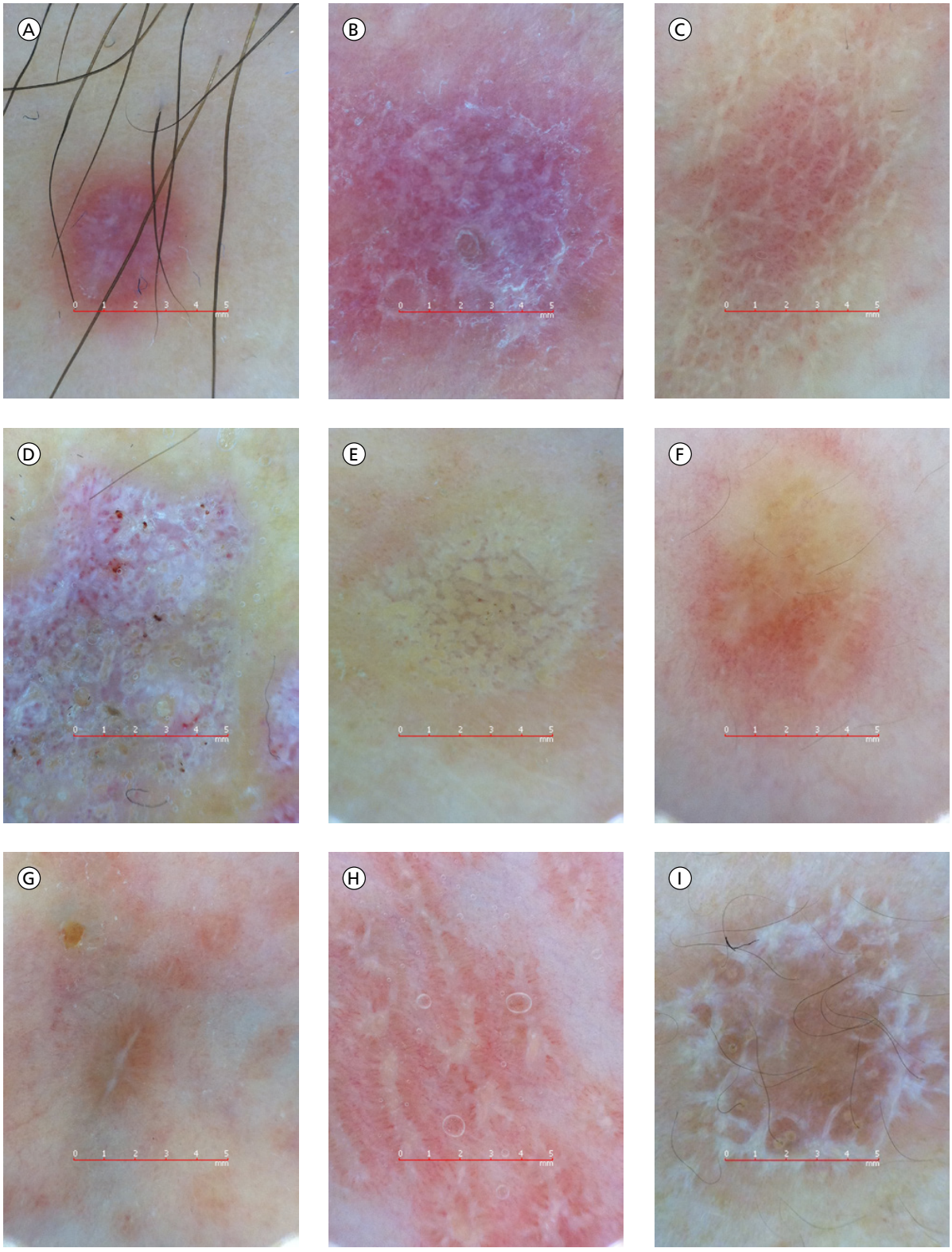

Figure 1. (A) Radial streaming WS pattern surrounded by red dots. (B) White broad reticular WS on a pink background. (C) Yellow fine reticular WS surrounded by red dots. (D). White-blue veil-like WS surrounded by red globules and diffuse yellow dots. (E) Yellow globular WS surrounded by red dots. (F) Yellow reticular veil-like WS and peripheral red dots. (G) Linear yellow WS with peripheral diffuse pigmentation. (H) Yellow reticular WS and radial linear vessels perpendicular to WS. (I) Reticular-circular WS and yellow dots. [Copyright: ©2015 Güngör et al.]

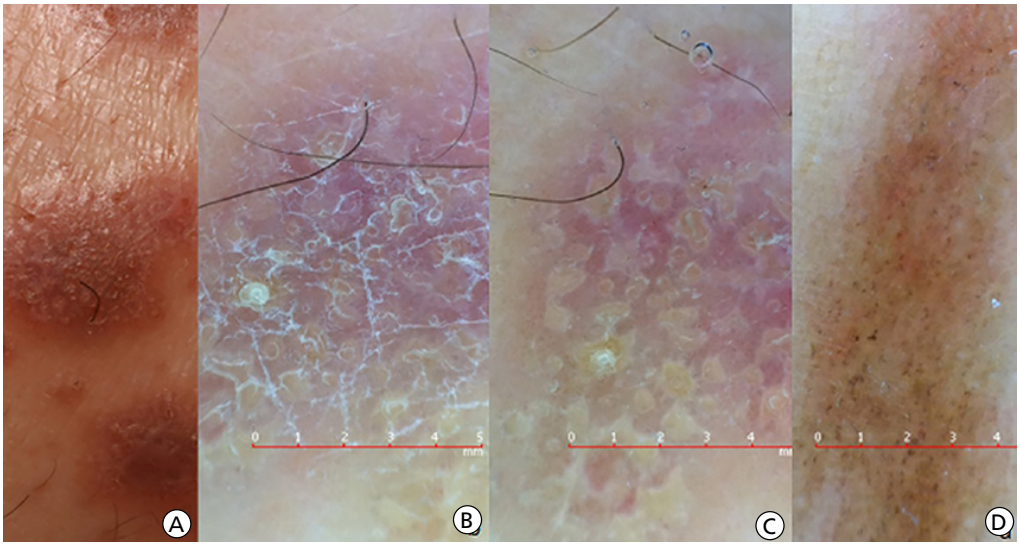

Figure 2. Clinical and dermoscopic images of a CLP patient. (A) Multiple discrete, violaceous, polygonal papules on the leg. (B) Dermoscopic examination without gel. (C) Dermoscopic examination with gel; yellow dots corresponds to hyperkeratosis. (D) The same patient LP lesion in axilla; different from the leg lesions, diffuse brown dots without WS are seen. [Copyright: ©2015 Güngör et al.]

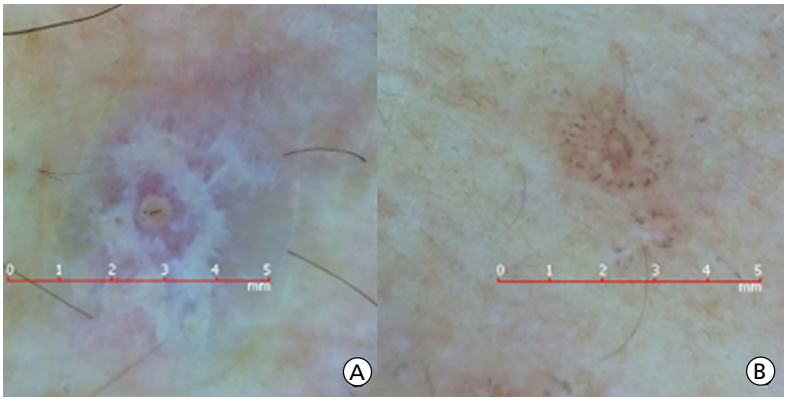

Figure 3. (A) White reticular-circular WS surrounded by red dots of a CLP patient. (B) Peripheral brown dots in circular arrangement of the same lesion after treatment. [Copyright: ©2015 Güngör et al.]

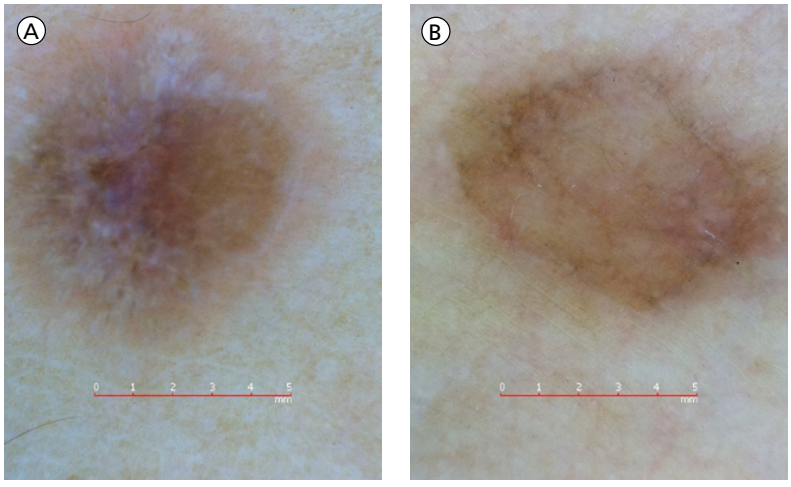

Figure 4. (A) Circular white WS and reticular blue-white WS and diffuse homogeneous pigmentation. (B) Circular pigmentation without WS of the same lesion after four weeks of treatment. [Copyright: ©2015 Güngör et al.]

15 lesions (8.8%), radial streaming WS in nine lesions (5.2%), and combined WS patterns in three lesions (1.7%). The WS color was white in 112 lesions (65.8%), yellow in 13 lesions (7.6%), and blue-white in 27 lesions (15.8%). Among 170 CLP lesions, pigment patterns were observed in 20 lesions (11.7%). They were sub-grouped as peripheral dots/globules in eight lesions (4.7%), peripheral homogeneous cloud-like pigment pattern in ten lesions (5.8%), and reticular pigment pattern in two lesions (1.1%). Among 170 CLP lesions, vascular patterns were observed in 46 lesions (27%). These were sub-grouped as peripheral red dots in four lesions (2.3%), diffuse red dots in 15 lesions (8.8%), red globules in eight lesions (4.7%), and radial linear vessels in 19 lesions (11.1%). Violet, pink, brown, and yellow background colors were observed (listed in order of decreasing frequency). Yellow dots were observed in ten lesions and white dots were observed in two lesions among CLP lesions. Dermoscopic images of CLP lesions are shown in Figures 1-4.

Among 30 AGLP lesions, WS was observed in 18 lesions (60%). These were morphologically sub-grouped as reticular WS in ten lesions (33.3%), cir-

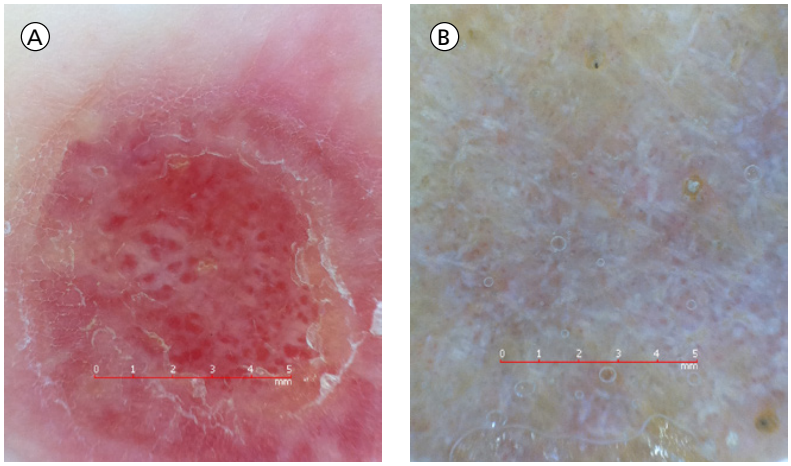

Figure 5. (A) White reticular WS on the center, on a red background, and peripheral homogeneous yellow-white WS in an AGLP patient. (B) Perpendicular white WS in an AGLP patient. [Copyright: ©2015 Güngör et al.]

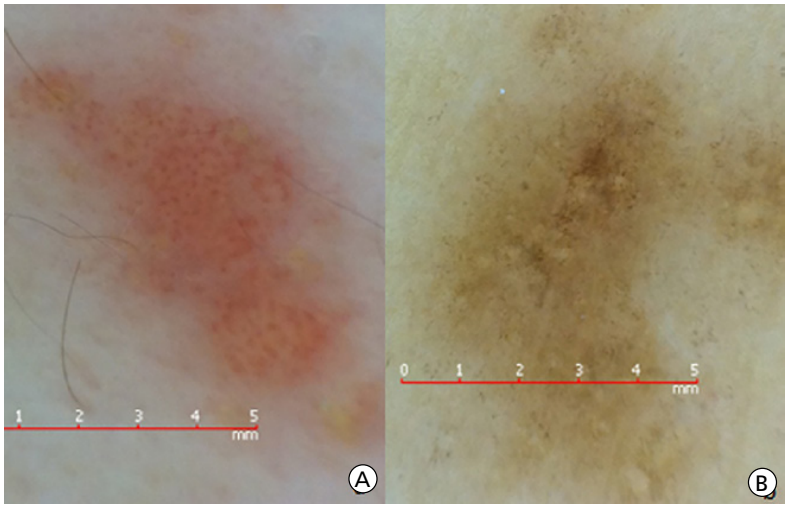

Figure 6. (A) Perifollicular red dots, on a yellow-pink background without WS in an AGLP patient. (B) Diffuse brown dots and reticulated pigmentation on a brown background after three months of treatment of the same patient. [Copyright: ©2015 Güngör et al.]

cular WS in four lesions (13.3%), perpendicular WS in four lesions (13.3%), and veil-like WS in four lesions (13.3%) (some lesions showed more than one pattern). In two AGLP lesions, a circular space between diffuse red dots were observed; as it is consistent with the same patients' other lesions' WS configuration, we defined this lesion as "invisible WS." The WS color was white in ten lesions (33.3%), yellow in four lesions (13.3%), and blue-white in four lesions (13.3%). Pigment patterns were not observed in any of the AGLP lesion. Vascular patterns were observed in 24 of 30 AGLP lesions (80%). These were sub-grouped as perifollicular red dots in six lesions (20%), peripheral red dots in five lesions (16.6%), diffuse red dots in nine lesions (30%), and red globules in four lesions (13.3%). Red, violet, and pink background colors were noticed (listed in order of decreasing frequency). Dermoscopic images of AGLP are shown in Figures 5-7.

Among 15 LPp lesions, WS was observed in six lesions (40%). These were morphologically sub-grouped as reticular WS in one lesion (6.6%), radial streaming WS in one lesion (6.6%), perpendicular WS in one lesion (6.6%), and veil-like WS in three lesions (20%). The WS color was blue-white in five lesions (33.3%) and white in one lesion (6.6%). Pigment patterns were observed

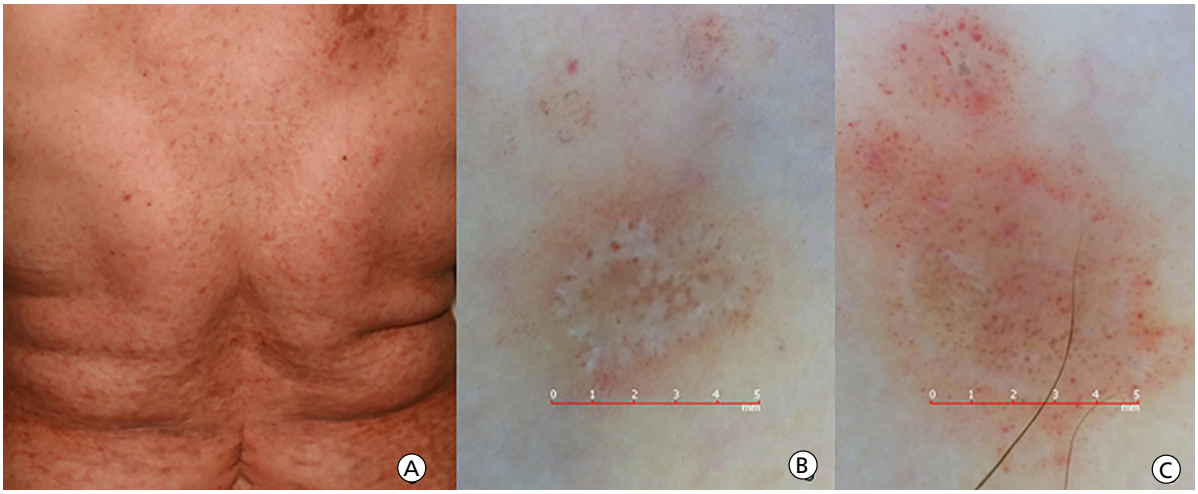

Figure 7. The clinical and dermoscopic images of the same AGLP patient. (A) Multiple erythematous purple macules and papules on the back of the patient. (B) White circular WS surrounded with red dots. (C) Diffuse red dots without WS; we interpreted white circular area as a WS, defined as "invisible WS." [Copyright: ©2015 Güngör et al.]

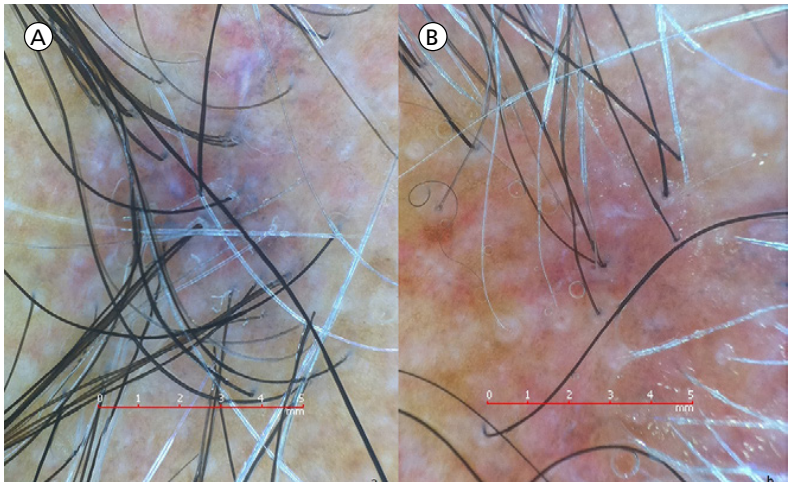

Figure 8. Dermoscopic images of a patient diagnosed with lichen planopilaris (LPp) with a history of four weeks. (A) Blue-white veil-like WS. (B) White veil-like WS on a pink background. [Copyright: ©2015 Güngör et al.]

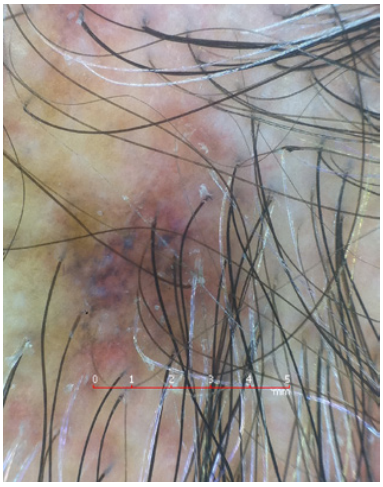

Figure 9. Dermoscopic image of a patient diagnosed with lichen planopilaris (LPp) with a history of six months, perifollicular pigmentation on a pink-brown background is seen. [Copyright: ©2015 Güngör et al.]

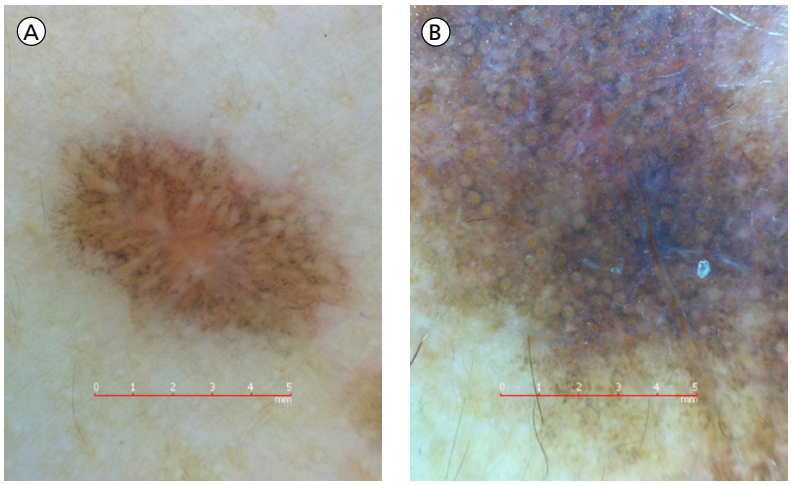

Figure 10. (A) Reticular peripheral pigmentation and white dots on a brown-yellow background without WS in an LPP patient on the trunk. (B) Perifollicular-annular pigmentation and white dots in an LPPI patient. [Copyright: ©2015 Güngör et al.]

in 13 of 15 LPp lesions (86.6%), further sub-grouped as perifollicular/annular in eight lesions (53.3%) and diffuse in five lesions (33.3%). Vascular patterns were observed in three of 15 LPp lesions (20%) as diffuse red dots. Brown, violet, and pink background colors were observed (listed in order of decreasing frequency). White dots were noticed in four lesions (26.6%) and yellow dots in three lesions (20%). Dermoscopic images of LPp are shown in Figures 8-9.

Among fifteen LPPI lesions, WS and vascular patterns were not observed. Pigment patterns were observed in all LPPI lesions (100%) as diffuse dots/globules in five lesions (33.3%), diffuse peppering in three lesions (20%), perifollicular/annular pigmentation in eight lesions (53.3%), linear pigmentation in eight lesions (53.3%), and cobblestone pigmentation in three lesions (20%). Some LPPI lesions demonstrated more than one pigment pattern. The background color was brown in all LPPI lesions and white dots were observed in ten lesions (66.6%). Dermoscopic images of LPPI are shown in Figures 10-11.

The sole SLPP lesion demonstrated a pigment pattern of diffuse peppering combined with perifollicular/annular pigmentation on a brown background with white dots, while WS and vascular pattern were absent (Figure 12).

Among three ZLPP lesions, diffuse dots/globules were detected on a pink background in all lesions while WS and vascular patterns were absent (Figure 13).

The sole GALP lesion showed circular white WS with diffuse homogeneous cloud-like pigment pattern and peripheral red dots on a pink background (Figure 14).

Among ten AALP lesions, circular white WS was observed in seven lesions (70%), pigment patterns were observed in all AALP lesions, perifollicular-annular pigmentation was observed in two lesions (20%), diffuse homogeneous cloud-like pigmentation was observed in eight lesions (80%), diffuse reticular pigmentation was observed in two lesions (20%), and a peripheral homogeneous vascular pattern was detected in three lesions (30%) (some lesions showed more than one pigment pattern) (Figures 15-16).

In all ten AcLP lesions, diffuse peppering pigment pattern on a brown background was observed, while WS and vascular patterns were completely absent (Figure 17).

Among 50 RLP lesions, we observed no WS or vascular patterns in any of the lesions. Pigment pattern was observed in 30 of 50 RLP lesions (60%), sub-

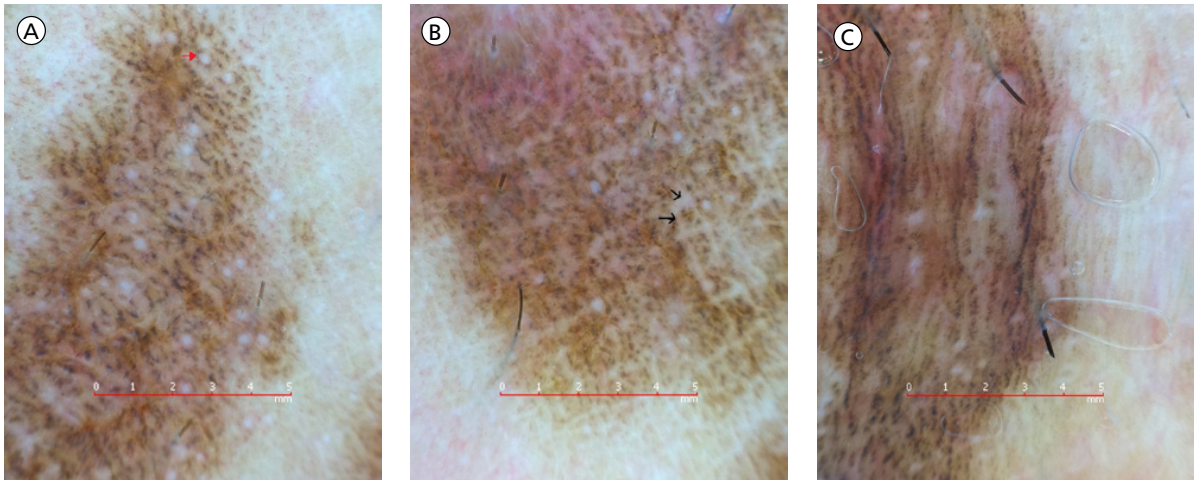

Figure 11. (A) One of three different lesions of the same patient with LPPI: perifollicular (red arrow) and reticular pigmentation. (B) One of three different lesions of the same patient with LPPI: perifollicular and cobblestone (black arrow) pigmentation. (C) One of three different lesions of the same patient with LPPI: perifollicular and linear pigmentation. Perifollicular pigmentation progress to reticular, cobblestone pigmentation or linear pigmentation. White dots are also seen in all lesions. [Copyright: ©2015 Güngör et al.]

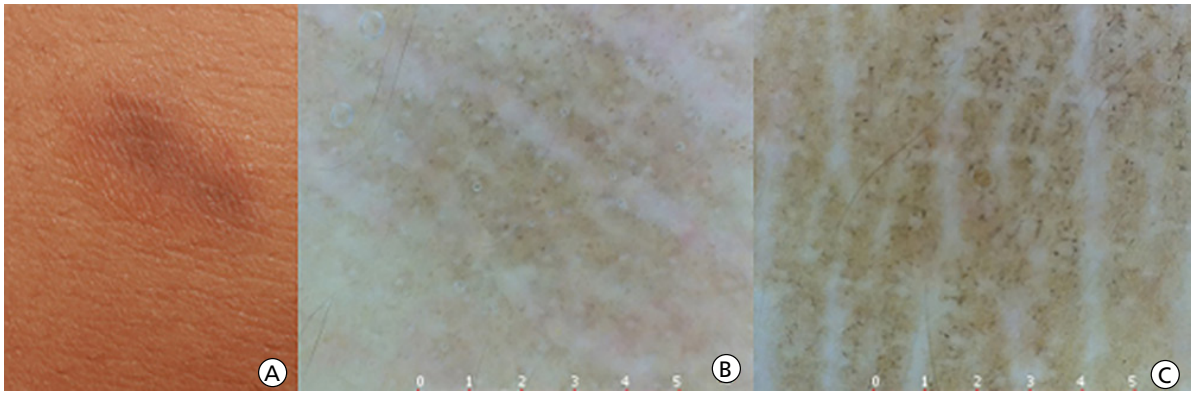

Figure 12. (A) A purple macule on abdomen. (B) Diffuse peppering, perifollicular pigmentation and white dots are seen in a lesion of an SLPP patient in the first visit. (C) The dermoscopic image of the same lesion after four weeks, the pigmentation pattern was changed to reticular pigmentation sparing epidermal furrows. [Copyright: ©2015 Güngör et al.]

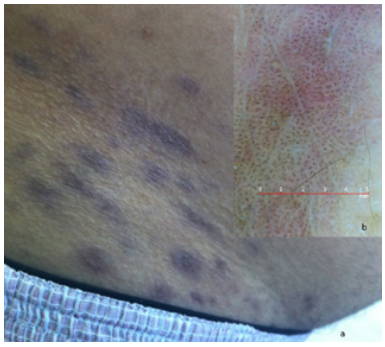

Figure 13. The clinical and dermoscopic image of a ZLPP patient with a two-week history. (A) Purple macular lesions in zosteriform arrangement on the trunk. (B) Diffuse brown globules and perifollicular pigmentation on a yellow-pink background, sparing epidermal furrows. [Copyright: ©2015 Güngör et al.]

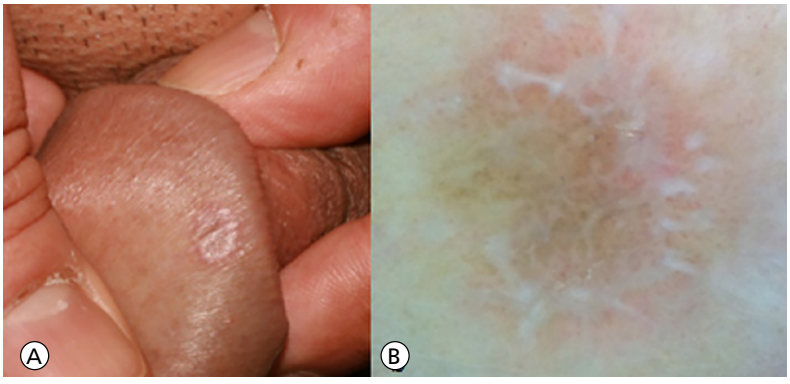

Figure 14. (A) A solitary annular lesion on glans penis. (B) Circular white WS, diffuse homogeneous pigmentation and peripheral red dots on dermoscopic evaluation in a genital annular LP patient. [Copyright: ©2015 Güngör et al.]

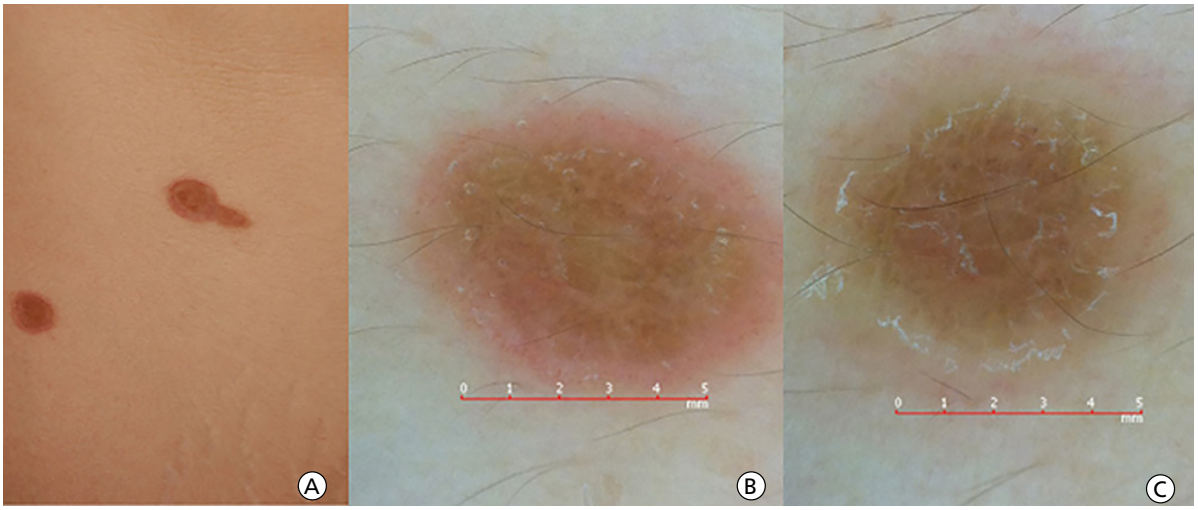

Figure 15. Clinical and dermoscopic images of an annular atrophic LP patient with a two-week history. (A) Numerous 0.5-1.5 cm annular plaques on the trunk. (B) Central diffuse homogeneous cloud-like pigmentation, peripheral homogeneous vascular patterns and peripheral red dots are seen at the first visit before treatment. (C) The dermoscopic image of the same lesion after four weeks of topical steroid treatment. The vascular pattern has disappeared, but central homogeneous cloud-like pigmentation persists. [Copyright: ©2015 Güngör et al.]

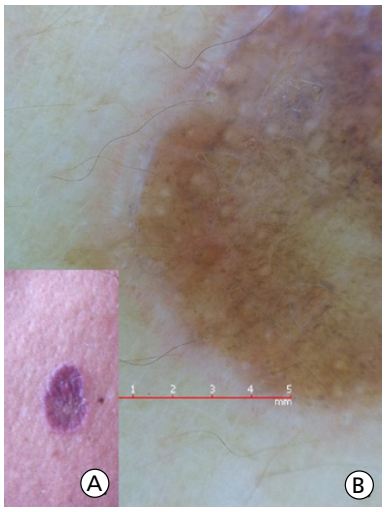

Figure 16. Clinical and dermoscopic image of an annular atrophic LP patient with a two-month history. (A) An annular plaque with central pigmentation on the patient's back. (B) Linear white annular WS, perifollicular-annular pigmentation on a brown background is seen upon dermoscopic examination. [Copyright: ©2015 Güngör et al.]

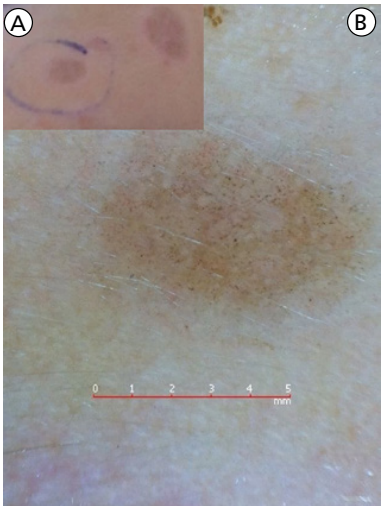

Figure 17. (A) Brown macular lesions on the forehand of an LP actinicus patient with a four-week history. (B) Diffuse peppering without WS upon dermoscopic examination. [Copyright: ©2015 Güngör et al.]

grouped as peripheral dots in six lesions (12%), diffuse dots in six lesions (12%), peripheral peppering in three lesions (6%), diffuse peppering in three lesions (6%), perifollicular-annular pigmentation in four lesions (8%), linear pigmentation in two lesions (4%), reticular pigmentation in one lesion (2%), circular pigmentation in one lesion (2%), cobblestone pigmentation in two lesions (4%), peripheral homogeneous cloud-like pigmentation in one lesion (2%), and diffuse homogeneous cloud-like pigmentation in one lesion (2%). Brown and yellow background colors were observed, with brown seen more frequently. Dermoscopic images of RLP are shown in Figures 3B, 4B, 6B, 15C.

Discussion

The results show that different WS, pigment, and vascular patterns can be seen according to the LP variant, lesion localization, and disease duration. But there are certain patterns that can be categorized for particular LP variants. Even in the active and early phase, Wickham striae (WS) patterns and vascular patterns are not observed in LPP (including LPPI, ZLPP, and SLPP) and LP actinicus lesions, but pigment patterns are seen in all LPP and LP actinicus lesions. Different pigment patterns can be seen in the different lesions of the same LPP patient at the same time; moreover different pigment patterns can be seen in the same lesions at different visits. The variable dermoscopic patterns show the dynamic course of LP disease. But in LPP lesions, perifollicular/annular, linear, and cobblestone pigment patterns are seen both at the first visit and after steroid treatment. As we demonstrated before, pigment patterns on dermoscopic examination correspond to dermal melanophages and pigment incontinence, which can be resistant to anti-inflammatory therapy because of the absence of the inflammatory cells [4]. The pigment pattern of the SLPP lesion changed from 'diffuse peppering' pattern to "reticular" pattern in four weeks, suggesting that the 'peppering' pigment pattern is seen in the early phase of the disease and pro-

gresses to the 'reticular' pattern over the course of time. We assume that the "reticular" pigment pattern is an incomplete and moderate form of the "perifollicular/annular" pattern that manifests as half circular fine pigmentation instead of annular dark pigmentation and the combination of these half-circular fine pigmentations gives the image of "reticular" pigmentation. In some LPP lesions, the pigment pattern was absent in skin furrows, which has not been mentioned before in the literature. We suggest that the skin furrows are not exposed to friction, which could be the reason for the absence of pigmentation.

WS is commonly seen on dermoscopic examination in CLP lesions and it corresponds to hypergranulosis histologically [3-6]. WS disappears after treatment, suggesting that we can use it as an activation marker in LP lesions. In AGLP lesions, WS is seen at a lower rate compared to CLP lesions. Interestingly, "invisible WS" is also seen in AGLP patients. The lower rate of WS and invisible WS may be due to the acute attack of the inflammatory cells in AGLP and inadequate time to progress to hypergranulosis. Conversely, vascular patterns are seen at a higher rate in AGLP compared to CLP, which may also be due to the rapid onset of the lesions. WS is classically seen as white crossing lines on dermoscopic evaluation and defined as "reticular pattern WS" [3,5]. In our study, we detected nine additional WS patterns beyond the "classical reticular" pattern. Leaf venation, circular, and radial streaming patterns were previously defined by Tan et al [7]. In the current study, leaf venation WS pattern was not detected, but circular and radial streaming WS patterns were detected similar to the Tan et al. study. We defined additional WS patterns as linear, globular, perpendicular, veil-like structureless, and a combination of these patterns. Reticular WS pattern is commonly seen in CLP but not that often in AGLP and LPp lesions. This can be due to distinct histopathological features in LP variants.

We found white dots in LPP, LPp, RLP, and CLP with decreasing frequency. We interpret white dots as follicular openings surrounded by dermal melanophages. The absent of white dots in AGLP may be due to the absence of pigment patterns in AGLP. We observed yellow dots in CLP lesions, which corresponds to hyperkeratosis and acanthosis histopathologically.

In RLP lesions, WS was totally absent while pigment patterns were frequently seen. This shows that WS is seen in active lesions and disappears with treatment, but pigment patterns resist treatment. They can even appear during late stages in spite of treatment. Figures 3 and 4 show that WS disappears but pigment patterns appear after treatment.

In early AALP lesions, peripheral homogeneous vascular patterns and central homogeneous pigmentation were seen; after treatment, vascular patterns disappeared but pigment patterns persisted upon dermoscopic examination (Figure 15). Seven lesions from two untreated, late- stage AALP patients showed circular, peripheral, white WS, and homogeneous pigmentation (Figure 16). These findings show that vascular structures in early phases can disappear via treatment, but they transform to WS without treatment.

In LPp of the scalp, dermoscopic patterns differ according to disease duration. WS patterns are prominent in early lesions, but pigment patterns are prominent in long-duration disease. Veil-like structureless WS pattern is the main WS pattern in LPp lesions, unlike in CLP lesions.

We also observed co-existence of different LP types in three patients. Three patients had CLP lesions on the extremities and trunk, plus LPPI lesions on flexural regions. As we reported one of these patients previously [4], we believe that LPPI is a variant of CLP, but the course of the lesions differs due to friction, resulting in histopathological-clinical-dermoscopic differences from CLP lesions. As seen in Figure 2, though all lesions appear at the same time, dermoscopic patterns differ according to localization. In histological examination, hyperkeratosis and hypergranulosis are absent, but pigment incontinence is prominent in inverse LP lesions, resulting in pigment pattern prominence and WS absence in dermoscopic examination.

In conclusion, we described the dermoscopic images of LP, LP variants, and regressive LP lesions. We believe that dermoscopic evaluation can be useful both in the diagnosis and follow up of LP.

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