Original Article

Dermoscopic features and algorithm: A guide to detecting premalignant facial pigmented skin lesions

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Abstract

Objective To establish dermatoscopic findings of clinically challenging FPSLs conforming PAK, SK, SL and LM and derive an Algorithm with diagnostic features for detecting Premalignant Facial Pigmented Skin Lesions.

Methods We here in conducted a largest case study a cross sectional analysis of clinically challenging 182 flat FPSLs, evaluated dermoscopic images consistent to pigmented AK, early SK, SL and LM and subsequently biopsied for histopathological evidence. Four major dermoscopic features were appraised: pigment pattern, sharp demarcation, vascular criteria and follicular/epidermal pattern.

Results We derived an Algorithm elucidating diagnostic findings of FPSLs. Pigmented AK on dermoscopy has strawberry pattern in 42% of lesions (pink to red pseudo-network with erythematous background, prominent follicular ostia fenced by a white targetoid halo), while Sharp demarcation (57.15%) and follicular/epidermal pattern (cerebriform pattern 100% of lesions, milia-like cysts, 50%, and comedo-like openings 38.57%) are distinctively observed SK. In SL, homogenous structureless pigmentation is significant entirely (100%). However, in LM predominates pseudonetwork (89.47%), homogenous structureless pigmentation (78%) and vascular patterns while strawberry pattern is observed in (26.31%) of lesions.

Conclusion Dermoscopy is extremely valuable tool for categorisation and diagnosis of different pigmented lesions on face. The patterns described and algorithms used are a perfect guideline for Dermatologists.

Key words
Dermoscopy; Actinic keratosis; Seborrheic keratosis; Solar lentigo; Lentigo maligna.

Introduction

Considering the fact that almost only melanocytic lesions clinically atypical or with dysplastic Clark component, appearing ambiguous on naked eye examination have been benefited utilizing dermoscopy, many a times neglecting trivial details in clinically benign or non-melanocytic lesions has led to early

malignant transformation. Surprisingly, "Facial Pigmented Disorders" require a differing approach to dermoscopic evaluation as majority are non-melanocytic in nature. Secondly, at the face, dermoscopy does not reveal classic patterns characteristically observed elsewhere on the skin due to peculiar histopathologically altered cutaneous morphology attributed by inevitable photodamage.[1] To illustrate, pseudonetwork is distinct to pigmented non-melanocyte facial disorders instead of conventional pigment network, not because of blunted epidermal rete ridges due to photo aging, but because hair follicle ostial openings

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and adnexal structures interrupt homogenous pigmentation.[2-4] Moreover, the eminent "ABCDE rule" cannot be implicated to facial locations.[5] Hence, we found facial pigmented skin lesions (FPSLs) encountered in ethnic skin that constitute a diagnostic challenge to dermatologists are four variants, explicitly, pigmented actinic keratosis (AK), early seborrheic keratosis (SK), solar lentigo (SL) and lentigo maligna (LM). We aimed to establish "Dermoscopic Criteria" and derive an "Algorithm" by analyzing distinguishing dermoscopic features of aforementioned premalignant FPSLs with evident histopathological diagnosis to aid in early corrective detection and improve subsequent management in terms of patient outcome and survival.

Methods

Dermatoscopic snapshots of clinically surreptitious 182 flat Facial Pigmented Skin Lesions were subjected to a cross sectional analysis, followed by subsequent biopsy for histopathological evidence corresponding to pigmented AK, early SK, SL and LM.

The study was conducted abiding declared Fundamentals of Helsinki Principles, upon approval by the medical ethical committee of King Edward Medical University, Mayo Hospital Lahore and steered for six months from Jan till June 2022. 182 patients, 84 males and 98 females precisely were recruited, aged between 18 to 72 years, mean age 52, with recently evolved, and previously untreated Facial Pigmented Skin Lesions.

Non probability consecutive sampling technique was adopted.

Pregnant females and patients under treatment, applying any kind of topical applications e.g. topical retinoids, steroids that theoretically deviate the study result, ones with an active ulcer or bleeding disorder, or having lesions on mucosal surface and were withdrawn.

Patients were clinically and dermoscopically examined for presenting pigmented lesion. Once diagnosed histopathologically, were divided into four groups as Group A: 50 AKs, B: 70 SKs, C: 43 SLs and D: 19 LM.

All patients enrolled in the study had demographic data recorded, were clinically evaluated beginning from history to evolution of facial pigmented lesion, with attention to smoking, occupations, outdoor activities, relative sun exposure, preceding relevant history of medical and corrective dermatologic surgical procedures including photosensitive skin reactions, dermabrasion and laser surgery, and inquired for current medication as steroid or retinoid. Facial lesions were clinically examined for parameters as site, size, shape, color and surface. A variation in size from 7mm to 26mm with faint to dark shades of brown color inharmoniousness was perceived. Pictorial evidences were gathered using a DSLR camera with a uniform and invariable light setting.

Dermoscopy Patients clinically examined and photographed, underwent Dermoscopy (Dermlite DL4) to ascertain dermoscopic features conforming to pigmented AK, early SK, SL and LM on the face. We accessed four dermoscopic features: pigment pattern (network, dots/globules, pseudonetwork, negative network, and homogenous structureless pigmentation), sharp demarcation, follicular or epidermal pattern (milia-like cysts, comedo-like openings, cerebriform pattern) and vascular pattern (coma shaped vessels, hairpin vessels, crown vessels, arborizing vessels, linear vessels, branched

vessels, glomerular vessels, lacunae and dotted vessels).

Dermatoscopic features were scored positive once digitally evaluated and received by a consensus of at least 2 of the 3 observers (dermatology personnel).

Histopathological Diagnosis Facial pigmented

lesions were subjected to a 4mm punched biopsies, submerged into 10.0% buffered formalin, processed to paraffin embedded blocks and sections of 4 micron dense glass slide mounts were equipped for hematoxylin and eosin staining to render gold standard histopathological diagnosis and subsequent sorting of patients into the aforementioned studied groups. In order to endorse proficient assessment of the findings, slides were coded entirely and blindly reviewed.

Data was analyzed utilizing computer SPSS 20.0 for Windows and Microsoft excel version 7 and was focused for statistical description as mean, median, range, frequency (total number of cases) and relative frequencies. Chi-square test was functioned for numerical calculations and p value ≤0.05 were reflected statistically significant. However, pairwise comparisons of the relative frequency of occurrence of dermatoscopic features in the studied population were weighed using Fisher's exact test.

Results
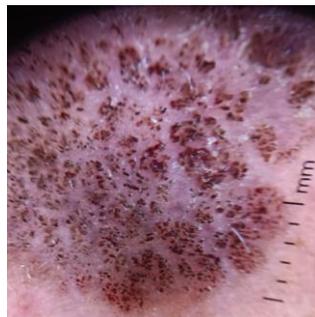
Frequency of dermoscopic features of Facial Pigmented Skin Lesions in studied groups is shown in **Table 1**.

Actinic Keratosis Pigmented Actinic Keratosis (AK) lesions in group A revealed prominent pigment pattern (described as pseudonetwork in 54%, dots and globules in 48%, and homogenous structureless pigmentation in 48% of the lesions) and vascular pattern (perifollicular/crown pattern in 42% of lesions). These findings on are histopathologically correlated as irregular dense melanin expression in basal keratinocytes and melanocytes along with appearance of melanophages in papillary dermis (**Figure 1**).

Seborrheic Keratosis In group B-early Seborrheic Keratosis (SK), we found predominant follicular/epidermal pattern (cerebriform pattern in 100% of lesions, milia like cysts in 50%, and comedo like openings in 38.57%) and sharp demarcation (57.15% of lesions). However, more significantly, fissures, fingerprint like structures called "fat fingers," all histologically signifying hyperkeratosis, epidermal acanthosis, pseudohorn cysts with variance in keratinocytes melanization (**Figure 2**).

Solar Lentigo In Solar Lentigo (SL) group C Lesiona, structureless homogenous pigmentation was observed entirely (100%). However sharp demarcation was apparent in only 21% of SL lesions in our study (**Figure 3**).

Figure 1

Figure 2

Figure 3

Table 1 Frequency of dermoscopic features of Facial Pigmented Skin lesions in studied groups.

	Actinic keratosis Number: 50	*Seborrheic keratosis Number: 70*	*Solar Lentigo Number: 43*	*Lentigo Maligna Number: 19*
Sharp demarcation	9 (18.00%)	40 (57.15%)	9 (21.00%)	0 (0%)
Pigment Pattern				
Network	3 (6.00%)	3 (4.28%)	6 (13.95%)	0 (0%)
Dots/globules	24 (48.00%)	12 (17.14%)	6 (13.95%)	10 (52.0%)
Pseudonetwork	27 (54.00%)	3 (4.28%)	18 (41.86%)	17 (89.47)
Homogenous Structureless	24 (48.00%)	6 (8.57)	43 (100%)	15 (78.0%)
Network	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Follicular Epidermal patterns				
Milia-like cysts	0 (0%)	35 (50.0%)	0 (0%)	3 (15.0%)
Cerebriform pattern	0 (0%)	70 (100%)	0 (0%)	3 (15.0%)
Comedo-like openings	9 (18.0%)	27 (38.57%)	0 (0%)	3 (15.0%)
Vascular patterns				
Coma Shaped	9 (18.0%)	9 (12.85%)	0 (0%)	7 (36.84%)
Arborizing	3 (6.0%)	3 (4.28%)	9 (20.93%)	4 (26.31%)
Hairpin	6 (12.0%)	21 (31.0%)	0 (0%)	0 (0%)
Perifollicular (crown)	21 (42.0%)	0 (0%)	0 (0%)	4 (26.31%)
Branched	12 (24.0%)	12 (17.14%)	3(6.97%)	3 (15.0%)
Linear	6 (12.0%)	6 (6.85%)	3(6.97%)	3 (15.0%)
Lacunae (red lagoons)	6 (12.0%)	0 (0%)	0 (0%)	3 (15.0%)
Glomerular	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Globular (dotted)	9 (18.0%)	0 (0%)	0 (0%)	0 (0%)

Table 2 The relative frequency of occurrence of dermoscopic features using Fisher's test.

Dermoscopic features	*Groups*				*The statistical significance of differences (P) between groups*					
	AK	*SK*	*SL*	*LM*	*AK-SK*	*AK-SL*	*AK-LM*	*SK-SL*	*SK-LM*	*SL-LM*
Sharp Demarcation	18.0%	57.15%	21.0%	0%	0.005	>0.05	-	0.013	-	-
Dots and globules	48.0%	17.14%	13.95%	52.0%	0.017	0.015	>0.05	>0.05	0.037	0.03
Pseudonetwork	54.0%	4.28%	41.86%	89.41%	<0.001	>0.015	0.033	<0.001	<0.001	0.007
Homogenous structureless pigmentation	48%	8.50%	100%	78.0%	<0.001	<0.001	>0.05	<0.001	<0.001	0.007
Milia-like cysts	0%	50.0%	0%	15.0%	>0.05	-	>0.05	-	0.019	-
Fissure	0%	100%	0%	15.0%	>0.05	-	>0.05	-	<0.001	-
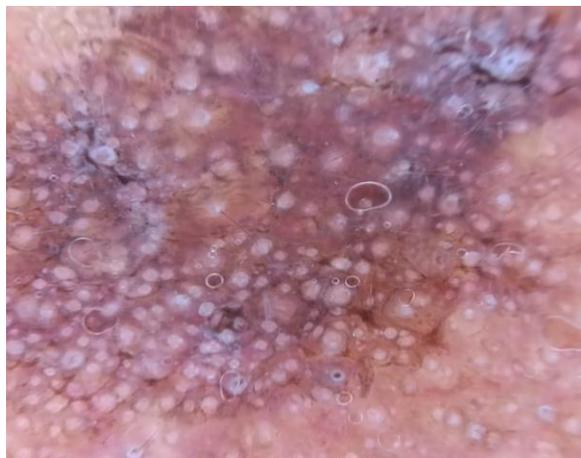
Figure 4

Lentigo Maligna LM lesions (group D), also known as Hutchinson's melanotic freckle, were mainly encountered in elderly, knowing that they hold a high malignant potential, exhibited more than three dermoscopic features. Vascular pattern (comma 36.84%, arborizing vessels 26.31, strawberry pattern 26.31 mainly) was diverse **(Figure 4)**. More than one vascular patterns in each lesion were evident as linear vessels 15%, lacunae 15% branched vessels 15% instead of one characteristic pattern. Moreover, regarding pigment component aiding timely LM

detection, we detected pseudonetwork 89.47%, pigment dots and globules 52%, homogeneous structureless pigmentation 78%, which encodes identifying 3 features of classic criteria by Schiffner *et al*.[6] Furthermore, studies revealed Pralong *et al*.[7] focused vascular pattern in LM as presence of dense vascular network, target-like patterns and red rhomboidal structures at relatively higher frequency, yet additional studies need to be conducted to gather diagnostic vascular dermoscopic criteria considering the fact that LM holds a high potential of melanoma transformation. Histopathologically, LM showed proliferation of atypical melanocytes arranges as confluent rows or nests in basal layer of epidermis.

Comparison of strawberry pattern in actinic keratosis and lentigo maligna The term "Strawberry-pattern" is described as distinctive dermatosopic appearance of Facial Actinic Keratosis encompassing erythema revealing marked pink to red pseudonetwork with large hazy vessels coursing between hair folliles and prominant follicular openings filled with keratotic plug, at times surrounded by a white targetoid halo. Despite being dermoscopically polymorphous AK and LM had Strawberry Pattern in 42% and 26.31% of lesions, respectively.

The "strawberry pattern" in AK is differentiated from LM in a way that it is more constant and mixed with pseudonetwork (54%) in AK where as in LM, is widely covered by pseudonetwork (89.47%), homogenous structureless pigmentation (78%) and other vascular patterns (coma shaped 36.84%, arborizing vessels 26.31% mainly).

Evaluation of the obtained data revealed, out of 16 studied features 6 that implicated statistically substantial appearance in the studied population were sharp demarcation, pigment dots and globules, pseudonetwork, homogenous

structureless pigmentation, milia-like cysts, and cerebriform structures. (P <0.05 using chi-squared test).

Sharp Demarcation has been observed in 57.15% of SK lesions, 21% of SL and 18% of AK cases, therefore, regarded as the utmost persistent and substantial dermoscopic feature in SK compared to AK and SL, utilizing Fisher's exact test ($P=0.005$ and $P=0.013$ respectively).

Pigment dots and globules appeared in 52% of LM cases, 48 % of AK, 17.14% of SK, and 13.95% of SL cases respectively, with no statistically significant difference between AK and LM, hence less likely to be reflected as noticeable distinguishing criterion. Moreover, its expression in SK and SL was too weak to be considered diagnostic, despite the presence of statistically significant difference between AK and SK; AK and SL ($P = 0.017$ and $P = 0.015$), as well as between LM and SK; LM and SL ($P = 0.037$ and $P = 0.03$).

Pseudonetwork was observed in all of the contemplated pigmented dermatoses, configuring 89.47% of LM, 54% of AK, 41.86% of SL, and 4.28% of SK cases respectively.

Homogenous structureless pigmentation was pragmatic in entire SL cases 100%, whereas constituted 78% of LM, 48% AK and 8.57% of SK cases respectively, therefore, considered statistically significant in all studied dermatoses ($P < 0.05$). However, it is still more persistently observed in SL and LM ($P=0.007$) in comparison to SK ($P < 0.001$).

Millia like cysts were divulged in 50% of SK and 15% of LM cases, with a statistically significant difference (P <0.019) and can be accounted as a differentiating dermoscopic criterion of SK. However, cerebriform structures were the most specific of SK detected in 100% of cases, regardless of being observed in LM as
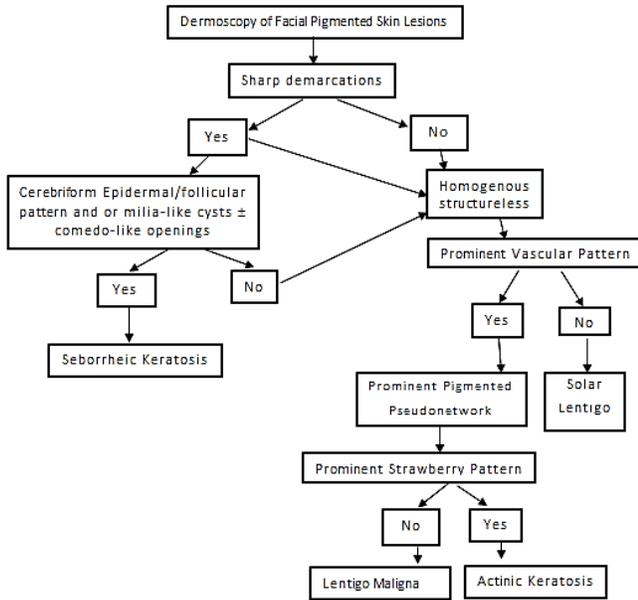
Figure 5

well, though a few (15%) (P< 0.001).

Algorithm- A guide to dermoscopic diagnostic features of facial pigmented skin lesions
Configuring the data, we derived an Algorithm with diagnostic characteristics on Dermoscopic examination of Pigmented Lesions on Facial Skin, for early corrective detection **(Figure 5)**.

Discussion

Conclusively, SK is specific of demarcation, while follicular/epidermal pattern is a prominant trait amidst rest of characteristics, considerably because of its predelicted anatomic location in epidermis. SK is one of the most common pigmented lesions that demonstrate "Chaos" by modified pattern analysis, exhibiting asymmetrical color and structure and clinically mimicking pigmented cancers including deadliest of Melanoma. Considering the fact that milia like cysts though invoke a display of "stars in the sky" in SK, at times observed in several other dermatosis including Basal cell carcinoma, Melanocytic Nevi, even AK, hence, their presence alone or with comedo like openings are

insufficient for a conclusive diagnosis of SK. As fascinating as it may sound, it is "Fissures" (invaginations or sulci) heading "Fat Fingers" for flat SK while "Cerebriform appearance" in Hypertrophic SK, regarded as paramount diagnostic dermatosopic facet while detecting one.

We hereby found that AK in early stages exhibits vascular pattern, prominent as numerous perifollicular crowns. "Strawberry pattern" (vascular pseudonetwork) signifies reticulation, when coexists with pigment pattern, denotes peculiar facial skin framework which is devoid of rete ridges instead contains abundant closely located follicular infundibula, dots and globules, and homogenous structureless pigmentation.[8-10] However, presence of pseudonetwork in AK at times can be confusing with LM.

As a matter of attention, Pigmented AK is conspicuously clinically and dermoscopically similar to LM, undoubtedly rendering a diagnostic challenge. According to Pock *et al.* (2007),[11] black dotes or blotches indicative of pigmented atypical melanocytes in LM were exhibited by pigmented keratinocytes in pigmented AK. Striking gray dust appearance reflecting clustered melanophages had a similar presentation in both pigmented AK and LM. Certainly, pigmented pseudonetwork can be alike in either infirmities, precisely, an atypical pseudo network pronounced as varied, dark brown to tan bizarre holes and meshes representing an unequal descent in neoplastic melanocytes completely obliterating hair follicles,[6,9,12,13] is absolutely indicative of LM.[14] Secondly, slate gray to dark brown dots and globules are profound, uniformly arranged in pigmented Actinic Keratosis comparative to LM. Furthermore, the existence of distorted pigmented follicular ostia, annular granular black to brown rhomboidal structure are

significant of LM than AK.[6,9]

Pigmented AK and pigmented SK on the face hold a close Dermoscopic differential diagnosis, at times difficult to differentiate. Finger print pattern is recognized in SK. Unlike AK, SK on facial location is differentiated by a typical pigmented pseudonetwork, pseudofollicular openings, and pseudocysts.[9,10,12] However, coinciding SK and AK is a rarely encountered entity.

Dermoscopically, SL is appreciated as exaggerated regular delicate diffuse pigment pattern with substantially modest homogenous structureless feature or thin brown pseudonetwork, at times with slight interrupted focus of fingerprint feature, rarely presenting as moth eaten or with jelly but never a vascular pattern.[15] In some cases, it's not uncommon to find Facial SL clinially mimic pigmented AK.

Conclusion

We derived an "Algorithm" encompassing dermoscopic diagnostic characteristics of Pigmented Skin Lesions on Face to aid in early corrective detection of clinically similar lesions with different biologic behavior, ultimately serve the purpose to improve prognosis in terms of preventing vigorous malignant transformation in photo damaged ethic skin with a focus on Lentigo Maligna notorious for a drastic malignant potential and Actinic Keratosis representative of earliest manifestation of non melanomic skin cancers, with a highest risk of progression to squamous cell carcinoma. Hence, Sharp demarcation with cribriform pattern is specific of Sebhorric Keratosis (SK), while homogenous structureless pigmentation without prominent vascular pattern is distinctive of Solar Lentigo (SL). Pigmented Actinic Keratosis (AK) is described by prominent strawberry pattern. Nonetheless, homogenous structureless

pigmentation and vascular pattern with pseudonetwork are featured in Lentigo Maligna (LM), lacking of prominent strawberry pattern.

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