Summarization and comparison of dermoscopic features on different subtypes of rosacea

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Abstract

Background: The dermoscopic features of rosacea have already been reported. However, the current findings are incomplete, and little is known about phymatous rosacea. Hence, this study aimed to summarize and compare the dermoscopic features and patterns of three rosacea subtypes (erythematotelangiectatic [ETR], papulopustular [PPR], and phymatous [PHR]) in the Chinese Han population and to evaluate whether these features differ with patients' genders, ages, and durations.

Methods: Dermoscopic images of 87 rosacea patients were collected in non-polarized and polarized dermoscopy contact modes at 20-fold magnification. Dermoscopic features, including vessels, scales, follicular findings, and other structures, were summarized and evaluated.

Results: The reticular linear vessels and red diffuse structureless areas of ETR were distinctive. For PPR, red diffuse structureless areas, reticular linear vessels, yellow scales, follicular plugs, and follicular pustules were typical dermoscopic criteria. The common dermoscopic features of PHR were: orange diffuse structureless areas, linear vessels with branches, perifollicular white color, orange focal structureless areas, and white lines. The following features statistically differed among the three rosacea subtypes: reticular linear vessels ($P < 0.001$), unspecific linear vessels ($P = 0.005$), linear vessels with branches ($P < 0.001$), yellow scales ($P = 0.001$), follicular plugs ($P < 0.001$), perifollicular white color ($P < 0.001$), red diffuse structureless areas ($P = 0.022$), orange diffuse structureless areas ($P < 0.001$), red focal structureless areas ($P = 0.002$), orange focal structureless areas ($P = 0.003$), white lines ($P < 0.001$), follicular pustules ($P < 0.001$), and black vellus hairs ($P < 0.001$).

Conclusions: The dermoscopic patterns of ETR are red diffuse structureless areas and reticular linear vessels. For PPR, the pattern comprehends combinations of red diffuse structureless areas, reticular linear vessels, yellow scales, follicular plugs, and follicular pustules. Meanwhile, PHR is characterized by remarkable orange diffuse structureless areas, linear vessels with branches, perifollicular white color, orange focal structureless areas, and white lines.

Keywords: Rosacea; Dermoscopic features; Patterns; Summarizations; Comparisons

Introduction

Rosacea is a chronic and inflammatory skin disease affecting the central face with common clinical presentations including flushing, erythema, telangiectasia, papules, pustules, rhinophyma, and ocular involvement. The prevalence of rosacea in the general population ranges from <1% to 22%.[1,2] In the absence of histological or serological markers, the diagnosis and classification of this disease are mainly established on observable characteristics that are derived from the dermatologists' experiences. However, the clinical discrimination of non-typical cases from other similar facial diseases, such as acne vulgaris, seborrheic dermatitis, lupus vulgaris, and perioral dermatitis, might be challenging.[3]

Currently, two classifications systems of rosacea are available. The most updated one is based on patient-tailored analyses of the presented phenotypes and has been extensively used to assess and treat rosacea.[4] Nevertheless, guidelines for the management of rosacea produced by the British Association of Dermatologists that recommended the older rosacea classification system, containing erythematotelangiectatic (ETR), papulopustular (PPR), phymatous (PHR), and ocular characterized by clinical signs, should also be taken into account.[5] Moreover, in clinical practice guidelines and consensus

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of several countries, therapeutic regimens are still guided by the four main rosacea subtypes.[3,6,7] Therefore, an appropriate classification is essential to improve the patients' prognoses. Unfortunately, the classification can be difficult sometimes for the naked eyes, especially for atypical and overlapped cases.

Dermoscopy is a useful non-invasive diagnostic tool for various melanocytic lesions and inflammatory diseases, which can increase diagnostic accuracy.[8-10] Generally, the diagnosis of inflammatory skin diseases depends mainly on clinical appearances. Moreover, in ambiguous cases, dermoscopy can lead to accurate diagnoses and avoid unnecessary biopsy by providing discriminative clues. Recently, the dermoscopic characteristics of ETR and PPR have been investigated, and successful attempts to apply dermoscopy beyond diagnosis have also been reported.[10-13] For example, dermoscopy has been considered an additional assessment tool to record therapeutic effects.[13] However, these reported cases focused only on one rosacea subtype, primarily ETR or PPR, with relatively small numbers of patients. Therefore, the dermoscopic features in these studies are incomplete, and little is known about PHR dermoscopic characteristics.

In the present study, we summarized the dermoscopic features and patterns of three rosacea subtypes (ETR, PPR, and PHR) in the Chinese Han population to improve the diagnostic accuracy, perform reasonable classification, and guide optimal therapeutic schedules. Furthermore, we compared the differences in dermoscopic features among subtypes, gender, ages, and durations.

Methods

Study design

This retrospective morphological study was carried out at the China-Japan Friendship Hospital from August 1st, 2020 to October 31st, 2021. All subjects were diagnosed and classified by two experienced associate chief or chief physicians based on diagnostic criteria developed and published by the National Rosacea Society Expert Committee. If there was any disagreement between the two experts, the case was eliminated. The exclusion criteria were: overlapping cases (hard to fit into a certain category); and individuals who had received rosacea treatment within 3 months before enrollment. This study was approved by the Research Ethics Committee of China-Japan Friendship Hospital (No. 2020-130-K83) and followed the *Declaration of Helsinki*. Informed consent was obtained from all patients.

Imaging procedure and evaluation

Dermoscopic images were obtained with a digital dermoscopy system (Medicam 800HD, FotoFinder Systems GmbH, Birbach, Germany) at a 20-fold magnification. Both non-polarized and polarized contact modes were utilized for each case. Minimal pressure was applied to acquire better visualization, and ultrasound gel was used to preserve vessels' morphology when the non-polarized contact mode was employed. Dermoscopic images were taken in areas where lesions were significant and then evaluated by two experienced dermoscopy experts. The two experts were asked to independently complete a predesigned list with various dermoscopic rosacea features. We developed this list based on a review of the published literature[10-12,14-19] and unified terminology according to an expert consensus announced by the International Dermoscopy Society.[20] If necessary, new findings beyond the list could be included. During this process, any discrepancy between the two experts' opinions was settled by a consensus meeting with other experts.

Dermoscopic features evaluated

The following dermoscopic features were evaluated in each subject: vessels including reticular linear vessels, unspecific linear vessels, unspecific dotted vessels, and linear vessels with branches; scales (mainly yellow scales); follicular findings such as follicular plugs, follicular red dots, and perifollicular white color; other structures containing red/pink/orange diffuse structureless areas, brown/orange/red focal structureless areas, white lines, follicular pustules, and white/black vellus hairs. The definitions of dermoscopic features were the same as previously described.[10-12,14-20]

Division of age, gender, and duration

General information including age, gender, and duration was also collected for further analyses. According to the latest age classification methods in China and the World Health Organization, we divided the patients into two groups: $\leq$40 years and >40 years. Moreover, individuals were classified into two groups based on the course of their diseases: $\leq$24 months and >24 months.

Statistical analyses

Statistical Product and Service Solutions version 21.0 (IBM Corp., Armonk, NY, USA) was used for statistical analyses. The continuous data are expressed as means (M) ± standard deviations (SD), and the categorical data as numbers (*N*) and percentages (%). Categorical variables were compared using the χ^2 test. Fisher exact test and continuity correction in the χ^2 test were also used when appropriate. A two-sided P value < 0.05 was considered statistically significant for the χ^2 and Fisher exact tests. A Bonferroni correction adjusted P value < 0.0167 was considered statistically significant for multiple statistical tests within three different subtypes.

Results

General information of the studied population

A total of 87 patients, 29 men and 58 women (mean age 40.0 ± 11.9 years, ranging from 21.0 to 65.0 years), contributed to our investigation. The courses of their diseases lasted from 3.0 to 336.0 months, with an average duration of 42.9 ± 61.1 months. The detailed information regarding the demographic and clinical characteristics of patients is presented in [Table 1].

Table 1: General information of patients.

General information	ETR	PPR	PHR	Total
N	40	30	17	87
Gender				
Male (*n*)	6	10	13	29
Female (*n*)	34	20	4	58
Age (years)				
Mean	38.7	38.8	45.2	40.0
SD	10.4	13.0	12.5	11.9
Duration (months)				
Mean	18.3	24.6	132.8	42.9
SD	20.9	9.00	90.3	61.1

ETR: Erythematotelangiectatic; PHR: Phymatous; PPR: Papulopustular; SD: Standard deviations.

Dermoscopic features of ETR

The most prominent ETR characteristic was reticular linear vessels (frequency of 85.0%), followed by red diffuse structureless areas ($n = 24$, 60.0%). Unspecific linear vessels were detected in 14 (35.0%) patients and dotted vessels in 10 (25.0%). Yellow scales were observed in 9 (22.5%) cases. Follicular findings included follicular plugs ($n = 10$, 25.0%), follicular red dots ($n = 4$, 10.0%), and perifollicular white color ($n = 5$, 12.5%). Other structures and their frequencies were as follows: pink diffuse structureless areas ($n = 8$, 20.0%), orange diffuse structureless areas ($n = 8$, 20.0%), brown focal structureless areas ($n = 13$, 32.5%), red focal structureless areas ($n = 9$, 22.5%), orange focal structureless areas ($n = 3$, 7.5%), white lines ($n = 7$, 17.5%), follicular pustules ($n = 4$, 10.0%), white vellus hairs ($n = 20$, 50.0%), and black vellus hairs ($n = 5$, 12.5%).

Dermoscopic features of PPR

Regarding PPR, typical reticular linear vessels were identified in 29 (97.7%) subjects, unspecific linear vessels in 3 (10.0%), and dotted vessels in 6 (20.0%). Yellow scales were detected in 19 (63.3%) cases. Follicular findings included follicular plugs ($n = 27$, 90.0%), follicular red dots ($n = 10$, 33.3%), and perifollicular white color ($n = 10$, 33.3%). For other structures, the most common feature was follicular pustules ($n = 20$, 66.7%). Other features included red diffuse structureless areas ($n = 21$, 70.0%), pink diffuse structureless areas ($n = 5$, 16.7%), orange diffuse structureless areas ($n = 4$, 13.3%), brown focal structureless areas ($n = 13$, 43.3%), red focal structureless areas ($n = 15$, 50.0%), orange focal structureless areas ($n = 4$, 13.3%), white lines ($n = 13$, 43.3%), white vellus hairs ($n = 15$, 50.0%), and black vellus hairs ($n = 17$, 56.7%).

Dermoscopic features of PHR

In the PHR subtype, vessels structures were not primary. In this subtype, the most salient vessel disturbances were linear vessels with branches ($n = 10$, 10/17), followed by unspecific linear vessels ($n = 9$, 9/17), reticular linear vessels, and unspecific dotted vessels (both $n = 7$, 7/17). Yellow scales were detected in 4 (4/17) cases. For follicular findings, both follicular plugs and perifollicular white color were found in 12 (12/17) cases, and follicular red dots in 3 (3/17). The other structures were as follows: red diffuse structureless areas ($n = 5$, 5/17), orange diffuse structureless areas ($n = 12$, 12/17), brown focal structureless areas ($n = 3$, 3/17), red focal structureless areas ($n = 1$, 1/17), orange focal structureless areas ($n = 8$, 8/17), white lines ($n = 13$, 13/17), follicular pustules ($n = 3$, 3/17), white vellus hairs ($n = 8$, 8/17), and black vellus hairs ($n = 4$, 4/17). Typical dermoscopic images are shown in [Figures 1–3].

Comparisons of dermoscopic features among the three rosacea subtypes

The differences in reticular linear vessels ($P < 0.001$), unspecific linear vessels ($P = 0.005$), linear vessels with branches ($P < 0.001$), yellow scales ($P = 0.001$), follicular plugs ($P < 0.001$), perifollicular white color ($P < 0.001$), red diffuse structureless areas ($P = 0.022$), orange diffuse structureless areas ($P < 0.001$), red focal structureless areas ($P = 0.002$), orange focal structureless areas ($P = 0.003$), white lines ($P < 0.001$), follicular pustules ($P < 0.001$), and black vellus hairs ($P < 0.001$) were statistically significant among the three subtypes. The multiple comparisons revealed that reticular linear vessels were more common in ETR and PPR, unspecific linear vessels were more common in ETR and PHR, while linear vessels with branches were distinctive for PHR. Yellow scales were more frequent in PPR. On the other hand, follicular plugs in PPR and PHR did not differ ($P = 0.118$), but the percentages in these two types were higher than in ETR ($P < 0.001$ and $P = 0.002$, respectively). Orange diffuse structureless areas presented the highest percentage in PHR, and the differences between PHR and ETR, and PHR and PPR were statistically significant (both $P < 0.001$). Follicular pustules were more frequent in PPR, the differences between ETR and PPR ($P < 0.001$), and PHR and PPR ($P = 0.002$) were statistically significant [Table 2].

Comparisons of dermoscopic features between different gender, age, and duration groups

Between females and males, we detected statistical differences for reticular linear vessels ($P = 0.021$), unspecific linear vessels ($P = 0.046$), linear vessels with branches ($P = 0.002$), orange diffuse structureless areas ($P = 0.021$), orange focal structureless areas ($P = 0.032$), and white lines ($P = 0.034$). Only reticular linear vessels were common in females while other features were more found in males. Follicular red dots ($P = 0.015$) were more frequent in patients ≤40 years, and follicular pustules ($P = 0.035$) were more frequent in ones >40 years. Linear vessels with branches ($P < 0.001$), follicular plugs ($P = 0.018$), orange diffuse structureless areas ($P = 0.009$), and black vellus hairs ($P = 0.035$) were more common in patients with a disease course of >2 years [Table 2].

Summarization of the dermoscopic patterns of the three rosacea subtypes

The representative dermoscopic pattern of ETR was red diffuse structureless areas and reticular linear vessels. For PPR, the typical dermoscopic pattern was the combination of red diffuse structureless areas, reticular linear vessels, yellow scales, follicular plugs, and follicular pustules.

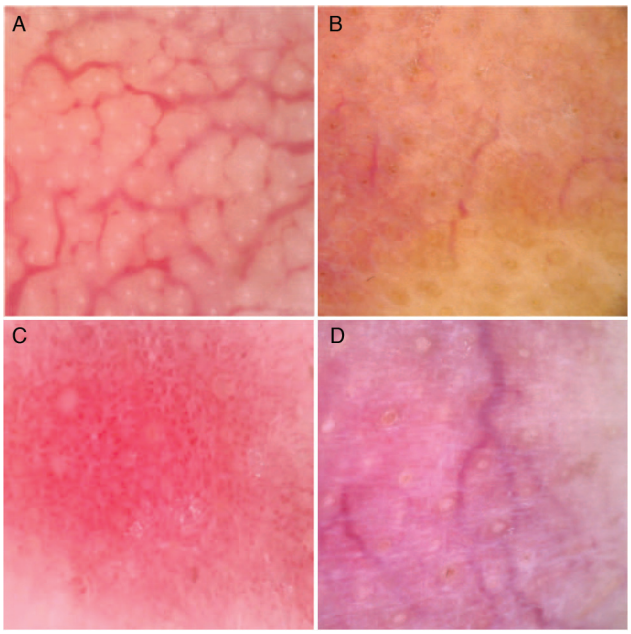

Figure 1: Common vessels of rosacea in dermoscopy. (A) Reticular linear vessels characteristically arranged in polygonal networks; (B) unspecific linear vessels; (C) unspecific dotted vessels in a patchy distribution; and (D) linear vessels with branches.

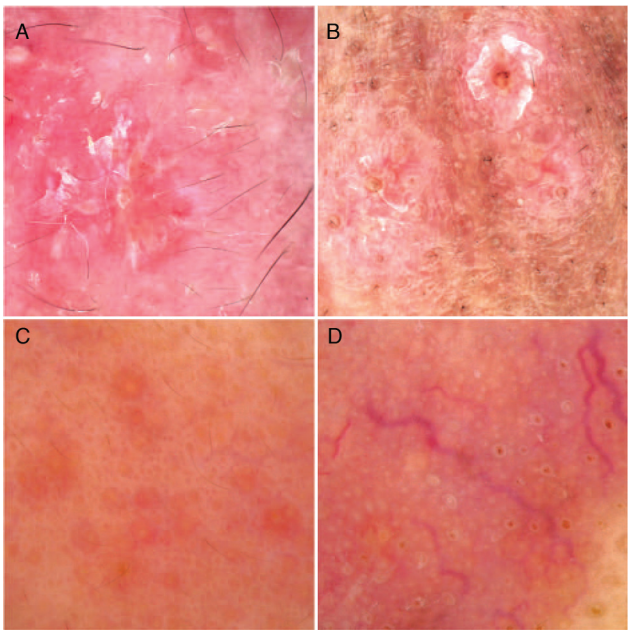

Figure 2: Typical scales and follicular findings of rosacea in dermoscopy. (A) Yellow scales; (B) follicular plugs; (C) follicular red dots; and (D) perifollicular white color.

Regarding PHR, the prominent dermoscopic pattern included orange diffuse structureless areas, linear vessels with branches, perifollicular white color, orange focal structureless areas, and white lines [Table 3].

Discussion

Rosacea diagnoses are usually performed by medical history and physical examinations, which might be difficult due to the clinical manifestations' similarities to

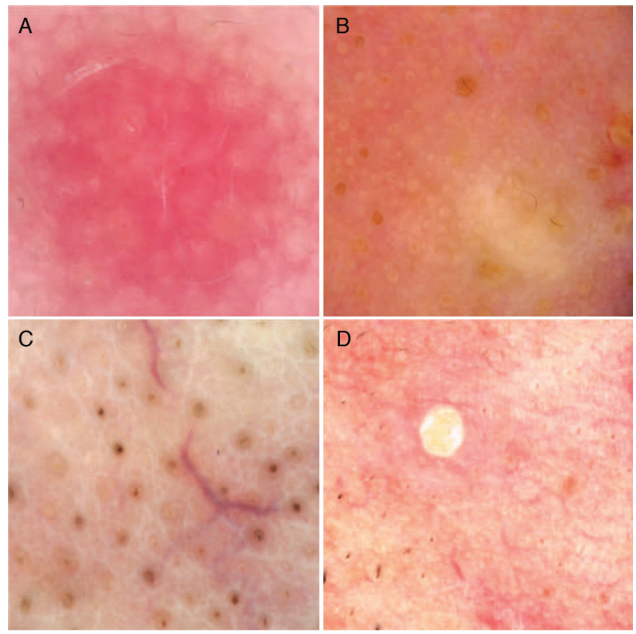

Figure 3: Other structures of rosacea in dermoscopy. (A) Red focal structureless areas; (B) orange focal structureless areas; (C) white lines; and (D) follicular pustules.

several skin conditions. Dermoscopy, a non-invasive technique that allows real-time and *in vivo* examination of various skin diseases, has been used to distinguish rosacea from its visual analogs.[8-19,15,21,22] Therefore, a comprehensive understanding of the dermoscopic features of rosacea is crucial to guide clinical practice. However, the dermoscopic characteristics of PHR have not been thoroughly investigated. In the present study, we described and compared the dermoscopic findings of rosacea in 87 patients. We observed some new dermoscopic features of rosacea beyond what has been previously reported.

Reticular linear vessels, named vascular polygons and regarded as a specific feature of ETR in previous studies, were the most remarkable dermoscopic finding in our current work. However, its overall incidence was far lower than that of preceding reports.[10] This discrepancy might be due to the presence of some patients at the early stage of rosacea in our study when linear vessels did not arrange in a typically reticular manner. Additionally, this might explain why linear vessels were common in ETR. The morphology of these vessels reflects major pathophysiologic alteration of intense vasodilatation.[21] Besides, the red diffuse structureless areas were equal to former red backgrounds, corresponded to erythema clinically and telangiectasia pathologically, and were more common in ETR and PPR.

Moreover, Lallas[19] believed that PPR has less prominent vascular alterations and more evident follicular disturbances. However, in our present study, reticular linear vessels were the most frequent dermoscopic findings in PPR. This difference might be caused by the sample size. Additionally, follicular findings were more prominent in PPR compared with ETR, consistent with previous

Table 2: Summarization and comparison of dermoscopic features in different rosacea subtypes, genders, ages, and durations.

Dermoscopic features	Subtypes				Gender				Age (years)				Duration (months)			
	ETR ($N=40$)	PPR ($N=30$)	PHR ($N=17$)	*P* value	Male ($N=29$)	Female ($N=58$)	*P* value	95% CI	≤40 ($N=48$)	>40 ($N=39$)	*P* value	95% CI	≤24 ($N=49$)	>24 ($N=38$)	*P*-value	95% CI
Vessels																
Reticular linear vessels	34 (85.0)*	29 (97.7)†	7 (7/17)	<0.001	19 (65.5)	51 (87.9)	0.021	0.087–0.784	38 (79.2)	32 (82.1)	0.791	0.284–2.434	43 (87.8)	27 (71.1)	0.061	0.967–8.816
Unspecific linear vessels	14 (35.0)‡	3 (10.0)†	9 (9/17)	0.005	13 (44.8)	13 (22.4)	0.046	1.080–7.326	16 (33.3)	10 (25.6)	0.487	0.568–3.698	12 (24.5)	14 (36.8)	0.244	0.220–1.404
Unspecific dotted vessels	10 (25.0)	6 (20.0)	7 (7/17)	0.306	11 (37.9)	12 (20.7)	0.121	0.877–6.260	11 (22.9)	12 (30.8)	0.468	0.257–1.741	12 (24.5)	11 (29.0)	0.807	0.306–2.072
Linear vessels with branches	0*	0‡	10 (10/17)	<0.001	8 (27.6)	2 (3.5)	0.002	2.093–54.367	3 (6.3)	7 (17.9)	0.173	0.073–1.269	0	10 (26.3)	<0.001	1.122–1.641
Scales																
Yellow scales	9 (22.5)‡	19 (63.3)†	4 (4/17)	0.001	10 (34.5)	22 (37.9)	0.817	0.339–2.186	18 (37.5)	14 (35.9)	>0.999	0.446–2.576	16 (32.7)	16 (42.1)	0.380	0.277–1.604
Follicular findings																
Follicular plugs	10 (25.0)* ‡	27 (90.0)	12 (12/17)	<0.001	17 (58.6)	32 (55.2)	0.821	0.467–2.837	27 (56.3)	22 (56.4)	>0.999	0.424–0.329	22 (44.9)	27 (71.1)	0.018	0.135–0.816
Follicular red dots	4 (10.0)*	10 (33.3)	3 (3/17)	0.056	4 (13.8)	13 (22.4)	0.403	0.163–1.881	14 (29.2)	3 (7.7)	0.015	1.304–18.723	10 (20.4)	7 (18.4)	>0.999	0.388–3.327
Perifollicular white color	5 (12.5)*	10 (33.3)	12 (12/17)	<0.001	12 (41.4)	15 (25.9)	0.219	0.787–5.202	13 (27.1)	14 (35.9)	0.485	0.266–1.652	12 (24.5)	15 (39.5)	0.164	0.198–1.248
Other structures																
Red diffuse structureless areas	24 (60.0)	21 (70.0)‡	5 (5/17)	0.022	13 (44.8)	37 (63.8)	0.111	0.186–1.142	25 (52.1)	25 (64.1)	0.284	0.256–1.446	31 (63.3)	19 (50.0)	0.275	0.728–4.075
Pink diffuse structureless areas	8 (20.0)*	5 (16.7)	0	0.13	3 (10.3)	10 (17.2)	0.53	0.140–2.192	9 (18.8)	4 (10.3)	0.368	0.571–7.141	10 (20.4)	3 (7.9)	0.135	0.761–11.755
Orange diffuse structureless areas	8 (20.0)*	4 (13.3)‡	12 (12/17)	<0.001	13 (44.8)	11 (19.0)	0.021	1.299–9.279	14 (29.2)	10 (25.6)	0.811	0.461–3.090	8 (16.3)	16 (42.1)	0.009	0.099–0.725
Brown focal structureless areas	13 (32.5)	13 (43.3)	3 (3/17)	0.207	8 (27.9)	21 (36.2)	0.477	0.253–1.779	14 (29.2)	15 (38.5)	0.493	0.269–1.615	15 (30.6)	14 (36.8)	0.648	0.309–1.834
Red focal structureless areas	9 (22.5)*	15 (50.0)†	1 (1/17)	0.002	11 (37.9)	14 (24.1)	0.213	0.734–5.023	11 (22.9)	14 (35.9)	0.235	0.208–1.357	13 (26.5)	12 (31.6)	0.639	0.308–1.989
Orange focal structureless areas	3 (7.5)*	4 (13.3)	8 (8/17)	0.003	9 (31.0)	6 (10.3)	0.032	1.229–12.373	5 (10.4)	10 (25.6)	0.087	0.104–1.089	5 (10.2)	10 (26.3)	0.084	0.098–1.029
White lines	7 (17.5)*	13 (43.3)	13 (13/17)	<0.001	16 (55.2)	17 (29.3)	0.034	1.177–7.484	17 (35.4)	16 (41.0)	0.66	0.330–1.882	15 (30.6)	18 (47.4)	0.124	0.203–1.182
Follicular pustules	4 (10.0)‡	20 (66.7)‡	3 (3/17)	<0.001	13 (44.8)	14 (24.1)	0.084	0.990–6.585	10 (20.8)	17 (43.6)	0.035	0.133–0.873	11 (22.4)	16 (42.1)	0.063	0.157–1.009
White vellus hairs	20 (50.0)	15 (50.0)	8 (8/17)	>0.999	11 (37.9)	32 (55.2)	0.173	0.200–1.235	21 (43.8)	22 (56.4)	0.284	0.256–1.409	26 (53.1)	17 (44.7)	0.519	0.596–3.269
Black vellus hairs	5 (12.5)‡	17 (56.7)	4 (4/17)	<0.001	11 (37.9)	15 (25.9)	0.321	0.676–4.543	13 (27.1)	13 (33.3)	0.639	0.296–1.886	10 (20.4)	16 (42.1)	0.035	0.137–0.909

reports.[12,15,22] A previous study indicated that follicular scales (included as yellow scales in the present study) should be regarded as a diagnostic criterion for rosacea since they were statistically correlated with persistent erythema.[23] The follicular pustules correspond to the superficial accumulation of neutrophils outside the follicle.[1] We also found that red focal structureless areas and follicular red dots were evident in PPR, which might correspond to histologically prominent perivascular (red focal structureless areas) and perifollicular (follicular red dots) inflammatory infiltrate in the superficial and mid-dermis.[1]

To our knowledge, this study contained the largest PHR sample to date. We also showed for the first time that linear vessels with branches were specific to PHR with a purple or dark red hue. Unspecific linear vessels appeared continually in this rosacea subtype, but they were wider and darker compared to ETR. Other new findings were perifollicular white color and white lines. Perifollicular white color might histologically correspond to perifollicular fibrosis and white lines might be related to dermis thickening and fibrosis.[20] Follicular plugs were also evident in PHR. Most plugs were yellow and corresponded to keratotic material and/or sebum in dilated follicular infundibula.[12] Lallas[10] suggested that the presence of orange-yellowish areas implied granulomatous rosacea (GR). This feature was detected for all subtypes in our current study, indicating that some GR cases might experience missed or delayed diagnosis.

Furthermore, we statistically highlighted the diversity of rosacea dermoscopic features in different subtypes. Reticular linear vessels appeared more in ETR and PPR, and unspecific linear vessels in ETR and PHR. Meanwhile, PHR could be distinguished by branched vessels and yellow scales were more frequent in PPR. Regarding follicular findings, alterations were more present in PPR and PHR. Follicular plugs were more evident in PPR but the perifollicular white color in PHR. Red and orange were frequent background colors in rosacea. Especially, red was more common in ETR and PPR, while orange was in PHR. The red color represents superficial dermal inflammation and vessel ectasia, and orange mainly occurs in granulomatous skin diseases.[24] These differences might be derived from histopathological discrepancies among the three rosacea subtypes. On the other hand, the multiple comparisons indicated that these differences were not so significant. Thus, larger sample sizes might further confirm our hypothesis.

The dermoscopic characteristics of ETR were more common in females and the characteristics of PHR in males. This phenomenon might be due to women being more concerned about cosmetic appearance and, therefore, more likely to seek medical help. Delayed diagnosis in males can lead to disfigurement with disease progression, including PHR.[25] Meanwhile, an advanced disease caused by delayed diagnosis and treatment might account for the fact that PHR dermoscopic features tended to occur in patients with a disease course longer than 2 years. Moreover, follicular red dots were more frequent, while follicular pustules were less frequent in young patients. Both

Table 3: Dermoscopic patterns of the three rosacea subtypes and typical dermoscopic features of related differential diagnosis.

Diseases	Typical dermoscopic features
Three subtypes of rosacea	
ETR	Red diffuse structureless areas, reticular linear vessels
PPR	Red diffuse structureless areas, reticular linear vessels, yellow scales, follicular plugs, and follicular pustules
PHR	Orange diffuse structureless areas, linear vessels with branches, perifollicular white color, orange focal structureless areas, and white lines
Other differential skin diseases	
Seborrheic dermatitis	Dotted vessels in a patchy distribution and fine yellowish/whitish scales[10]
Discoid lupus erythematosus	Early lesions: follicular plugging (yellow clods) perifollicular whitish halo, and white scales Mature lesions: blurred, telangiectatic, arborizing vessels; white structureless areas; and hyperpigmentation[29]
Acne vulgaris	Comedones: Erythematous periphery; dilated, roundish, central pore filled with a brown-yellow plug[30] Inflammatory lesions: erythematous roundish areas with central white-yellowish structure[31]
Lupus vulgaris	Yellow to golden-colored background, fine focused telangiectasias, milia-like cysts, and whitish reticular streaks[32]
Malar lesion of SLE	Reddish/salmon-colored follicular dots surrounded by white halos, branched vessels, white scaling, dotted and network-like vessels[18]
Facial psoriasis	Evenly distributed red dots or globules over a pale red erythematous background along with white scales[33]
Contact dermatitis	Allergic: intense erythema, vesicles or pustules, orange-yellowish patchy areas and crusts, dense dotted and linear vessels; Irritant: moderate erythema, sporadic vesicles, sparse vessels structures[34]

ETR: Erythematotelangiectatic; PPR: Papulopustular; PHR: Phymatous; SLE: Systemic lupus erythematosus.

features reflect the presence of perifollicular inflammations[20] and were not enough to conclude that dermoscopic alterations differed between young and mid-aged people.

Finally, we summarized recognizable dermoscopic features and patterns of the three rosacea subtypes to achieve early diagnosis and avoid further aggravations, inadequate treatment, greater morbidity, and loss of sight in ocular rosacea. Here, we present the dermoscopic differential diagnosis of rosacea from other clinically confusing facial conditions [Table 3]. All these illnesses are inflammatory skin diseases and have characteristic alterations in vessels morphology and distribution, scale color and distribution, follicular findings, and other structures, including color and morphology, besides some specific clues under dermoscopy.[20] The identification of this crucial dermoscopic information can increase the diagnostic accuracy and confidence level of physicians.[26]

Recently, a new treatment recommendation for rosacea determined that therapeutic regimens should be based on the patient phenotype, such as persistent erythema, telangiectasia, papules, or pustules.[27] Nevertheless, we found follicular pustules in ETR under dermoscopy. Therefore, dermoscopy could highlight the presence of papules and pustules even if they were clinically undetectable. Hence, we suggest that, if possible, treatment selection should be based on dermoscopic features rather than phenotypes derived from the naked eye alone. Furthermore, dermoscopy has been recognized as a promising tool to predict and monitor the therapeutic outcomes of rosacea patients.[27] For example, significant improvements of dermoscopic features, such as scales, vessels, and follicular findings, were detected after a combination of effective systemic and intense pulsed light treatments in a PPR patient,[28,35] and baseline protruding follicular plugs were associated with a better response to topical ivermectin therapy.[28]

Our current study also has some limitations. First, we did not conduct histopathological examinations. Thus, correspondences between dermoscopic findings and histopathological changes remained unclear. Besides, although our sample size was the largest to date, the overall number of cases was still small, especially for PHR. Therefore, a higher number of patients should be recruited in future studies.

Conclusion

Dermoscopy is a non-invasive, applicable, and recipient tool for the diagnosis and classification of rosacea. The main dermoscopic features of ETR are vessels changes with a pattern of red diffuse structureless areas and reticular linear vessels. The dermoscopic features of PPR are combinations of vessels changes and follicular findings with a pattern of red diffuse structureless areas, reticular linear vessels, yellow scales, follicular plugs, and follicular pustules. Meanwhile, PHR is characterized by remarkable orange diffuse structureless areas, linear vessels with branches, perifollicular white color, orange focal structureless areas, and white lines.

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