Original Article

Utility of Dermoscopy in the Diagnosis of Erythroderma: A Cross-Sectional Study

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Abstract

Background: It is difficult to diagnose the underlying cause of erythroderma on mere clinical presentation. The role of dermoscopy in diagnosing erythroderma secondary to various etiologies is evolving. **Aim and Objectives:** This study aimed to observe the dermoscopic features of erythroderma secondary to different cutaneous disorders and compare them with clinical features and histopathology. **Materials and Methods:** Twenty-nine consecutive patients of erythroderma were enrolled in the study. Dermoscopy was performed on every case using a Heine Delta II Dermatoscope with 10x magnification in polarized mode. A histopathological examination was conducted to confirm the diagnosis. **Results:** Eight patients were diagnosed with psoriasis, five with endogenous eczema, four with pityriasis rubra pilaris (PRP), three with pustular psoriasis, two with drug rash secondary to antitubercular therapy, two with dermatophytic infection, one patient each of atopic dermatitis, crusted scabies, pemphigus foliaceous, drug reaction with eosinophilia and systemic symptoms, and mycosis fungoides. Characteristic dermoscopic features were observed in erythroderma due to psoriasis, PRP, pustular psoriasis, endogenous eczema, scabies, and dermatophytosis. Differentiation of other disorders based on dermoscopy alone was difficult, and clinico-histopathological correlation was crucial to reach a diagnosis. **Conclusion:** Dermoscopic features of classical patterns of skin disorders are preserved even in the corresponding erythrodermic or unstable stage. Dermoscopic features of erythroderma secondary to psoriasis, pustular psoriasis, PRP, endogenous eczema, scabies, and dermatophytosis are clearly differentiating, whereas the dermoscopic features in other causes of erythroderma are overlapping. Thus, dermoscopy can be a good screening tool in the clinical assessment of erythroderma.

Keywords: *Dermoscopy, eczema, erythroderma, exfoliative dermatitis, pityriasis rubra pilaris, psoriasis*

Introduction

Erythroderma is an inflammatory skin disease with redness and scaling that affects 90% or more of cutaneous surface.[1] Determining the underlying cause of erythroderma at the initial presentation is often difficult. Clinico-histopathological correlation is essential to reach a conclusive diagnosis, but there is often a time delay before the histopathology report is obtained. Subtle clues on dermoscopy can help in recognizing the underlying etiology of erythroderma. Thus, dermoscopy is evolving as an important diagnostic tool to bridge the time gap between the emergency presentation of erythroderma and its histopathological confirmation. This can help in starting the disease-specific treatment at the earliest.[2]

There has been little research evaluating the utility of dermoscopy for the diagnosis of the underlying etiology of erythroderma. Existing literature is predominantly based on case reports or case series. Hence, we undertook this prospective, observational study to assess the role of dermoscopy as a bedside and noninvasive tool in the differentiation of erythroderma secondary to various underlying conditions.

Materials and Methods

This was an observational, cross-sectional hospital-based study conducted on 29 consecutive patients of erythroderma presenting to the dermatology inpatient department of a tertiary care hospital in North India from August 2019 till March 2022. The clinical diagnosis was based on the standard definition of erythroderma.[1] The institute's ethics

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committee clearance was obtained before undertaking the study.

After obtaining written informed consent from the patients or guardian, a detailed history and clinical examination of skin, hair, and nails were conducted in each case and clinical photographs were taken. Dermoscopy was performed on every patient using a Heine Delta II Dermatoscope with 10x magnification in polarized mode. Dermoscopic features were noted broadly under the following headings: 1) background color, 2) distribution, amount, and color of scales, 3) presence or absence and arrangement of vessels, and 4) any other specific feature. A histopathological examination was conducted on the skin biopsy specimen from the area where the dermoscopic examination showed maximum features to confirm the diagnosis.

Results

The study group comprised 29 clinically diagnosed and histologically confirmed cases of erythroderma. There were 10 females and 19 males with ages ranging from 18 to 89 years. According to the clinico-histopathological profile of the patients, they were divided into the following groups: eight patients with the diagnosis of psoriasis, five patients with endogenous eczema, four patients with pityriasis rubra pilaris (PRP), three patients with pustular psoriasis, two patients with drug rash secondary to antitubercular therapy (ATT), and two patients with dermatophytic infection. There was one patient each with erythroderma secondary to mycosis fungoides (MF), drug reaction with eosinophilia and systemic symptoms (DRESS), crusted scabies, atopic dermatitis (AD), and pemphigus foliaceous. The mean duration of the disease was 3 ± 1.4 months. Looking at the presenting complaints, all 29 patients complained of pruritus, followed by chills and rigors in 14 (48.27%) patients. All patients were receiving some form of topical and/or systemic treatment for the underlying cutaneous disease from local practitioners before presenting to the hospital for admission. The dermoscopic features found in the lesions of patients are listed in Table 1.

Discussion

Erythroderma shows an annual incidence of 1–2 per 1,00,000 population in the adult age group.[3] Innumerable cutaneous and systemic disorders can present with erythroderma. The most common cause of erythroderma seems to be the exacerbation of a preexisting chronic dermatosis, with psoriasis and eczema contributing to the majority of the cases.[4-7] Other causes are infections, drug reactions, infestations, malignancies, and idiopathic.[8-10]

The diagnosis of erythroderma is simple, but determining the underlying cause solely based on clinical features can be challenging. To date, the gold standard investigation for confirmation of erythroderma is histopathology, but this confirmation is often delayed. Dermoscopy is widely used in dermatology practice and has both diagnostic and prognostic significance in various cutaneous disorders. We undertook this study to see whether the dermoscopic features of classical skin disorders are retained even in erythroderma and correlate with the histopathological features. We will discuss our observations under the following headings:

Psoriasis

Dermoscopic examination of chronic plaque psoriasis displays diffuse, silvery-white, loosely adherent scales with regularly distributed red dots on a homogenous erythematous background.[11] The red dots histologically correspond to the vertically oriented, dilated, and looped vessels of the dermal papillae. The regular distribution of the vessels is explained by the regular acanthosis and papillomatosis in the epidermis, resulting in even elongation of rete ridges. Similarly, the dermoscopic pattern of erythrodermic psoriasis has also been described as regularly arranged dotted vessels on a fairly homogeneous reddish background with white scales.[12,13] Our patients of erythrodermic psoriasis showed a uniformly erythematous background with plenty of diffusely distributed silvery-white scales corresponding to hyperkeratosis and acanthosis histopathologically and regularly distributed dotted or glomerular vessels representing the dilated dermal capillaries [Figure 1a]. This proves that dermoscopic features of plaque-type psoriasis are retained in erythrodermic psoriasis as well. Of all the dermoscopic features, regularly distributed dotted or glomerular vessels give a direct clue toward a diagnosis of psoriasis.

Pustular psoriasis

The pustular variant of psoriasis constitutes about 1% of all clinical cases of psoriasis.[14] Its progression to erythroderma is uncommon. Lallas *et al.* have described the dermoscopic findings in pustular psoriasis as yellow globules (pustules) and crusts along with dotted vessels and white scaling.[15] Our patients with erythroderma secondary to pustular psoriasis presented with high-grade fever. They had widespread pustules with lakes of pus on erythematous and tender skin. Dermoscopy showed yellowish globules (corresponding to neutrophilic abscesses in the epidermis on histopathology), sparse white superficial scales (due to hyperkeratosis of stratum corneum) on an erythematous background, and regularly distributed red dots around the micropustules (corresponding to tips of dilated and tortuous dermal capillaries on histopathology) [Figure 1b]. The distribution of micropustules was non-follicular. This is in accordance with the previous reports of dermoscopy in pustular psoriasis.[16] The regular red dots found around the micropustules on the erythematous background are typical of pustular psoriasis, which differentiates it from erythrodermic psoriasis.

Table 1: Dermoscopic findings in the study population stratified as per the underlying etiology

No.	Etiology	Background color	Pattern of scaling	Color of scale	Character of scale	Vessel distribution	Vessel character	Special signs
1	Psoriasis (*n*=8) [Figure 1a]	Homogenously erythematous (*n*=4), Homogenously pinkish (*n*=4)	Diffuse (*n*=8)	Silvery white (*n*=8)	Loose (*n*=8)	Regularly distributed red vessels (*n*=8)	Dotted (*n*=5) Glomerular (*n*=2) Globular (*n*=1)	
2	Pustular psoriasis (*n*=3) [Figure 1b]	Homogenously erythematous (*n*=2), Homogenous light red (*n*=1)	Scant (*n*=2) Scant, peripheral (*n*=1)	White (*n*=1) Silvery white (*n*=2)	-	Regular (*n*=3)	Dotted (*n*=2) Globular (*n*=1)	Yellow-white areas of micropustules (*n*=3)
3	Pityriasis rubra pilaris (*n*=4) [Figure 1c]	Reddish-orange (*n*=4) with orange structureless areas (*n*=2), islands of non-erythematous (sparing) skin (*n*=3)	Scant (*n*=4)	Branny (*n*=3) Gray-white (*n*=1)	Loosely adherent (*n*=4)	Scattered (*n*=3) Irregular (*n*=1)	Dotted (*n*=4)	Whitish keratotic plug with central hair (*n*=4) surrounded by yellowish and erythematous skin, (*n*=2), Perifollicular scaling (*n*=1)
4	Endogenous eczema (*n*=5) [Figure 2a]	Dull erythematous (*n*=4) Faint pinkish (*n*=1)	Diffuse (*n*=1) Focal (*n*=4)	Whitish yellow (*n*=5) with serocrusts (*n*=2), yellow clods (*n*=1)	Loose (*n*=5)	Scattered (*n*=3) Clustered (*n*=2)	Dotted (*n*=5)	
5	Atopic eczema (*n*=1) [Figure 2b]	Dull erythematous	Patchy	Whitish	Semi-adherent	Patchy	Dotted	Red clods
6	Drug rash due to ATT (*n*=2) [Figure 2c]	Brownish (*n*=2)	Diffuse (*n*=2)	Yellow to white (*n*=1), Grayish (*n*=1)	Loose (*n*=2)	-	-	
7	Mycosis fungoides (*n*=1) [Figure 3a-c]	Dull erythematous with bluish-gray globules and structureless white areas in a patchy distribution	Patchy	White	Loose		Combination of dotted and irregular vessels	
8	Scabies (*n*=1) [Figure 4a]	Pinkish-white (blue arrow)	Patchy	White (black arrow)	Loose	-	-	Numerous dark-brown triangular structures and contrail (burrow) (delta wing sign)
9	Pemphigus foliaceous (*n*=1) [Figure 4b]	Skin colored to mildly erythematous (blue arrow)	Patchy	Grayish, thick crusts	Adherent	In the vicinity of lesions	Irregular elongated blood vessels	Pigment globules
10	DRESS (*n*=1) [Figure 4c]	Dull erythematous (blue arrow)	Scant (black arrow)	Whitish	Semi-adherent	Diffuse	Purpuric dots	
11	Dermatophytosis (*n*=2) [Figure 5a-c]	Dull erythematous (*n*=2) (blue arrow)	Along skin creases (*n*=2)	Grayish (*n*=1) Grayish-brown (*n*=1)	Loose (*n*=1) Semi-adherent (*n*=1)	Not appreciated (*n*=2)	Not appreciated (*n*=2)	Brown clods

ATT=Antitubercular treatment; DRESS=Drug reaction with eosinophilia and systemic symptoms

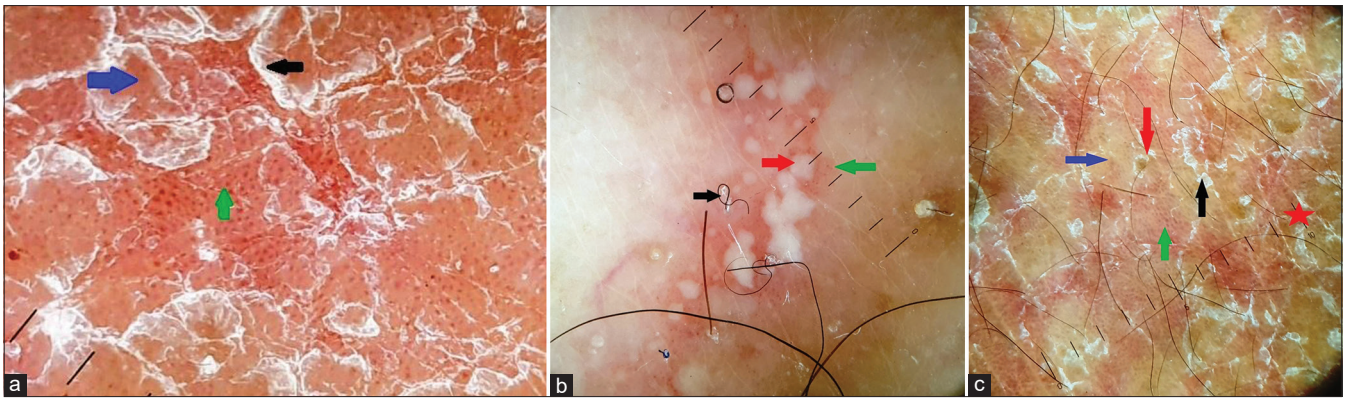

Figure 1: (a) Psoriasis—dermoscopy showing homogenously erythematous background (blue arrow), diffusely distributed silvery-white scales (black arrow), and regularly distributed dotted vessels (green arrow). (b) Pustular psoriasis—dermoscopy showing erythematous background with scant, white scales (black arrow), red dotted vessels (green arrow), and yellowish-white areas of micropustules (red arrow). (c) Pityriasis rubra pilaris—dermoscopy showing reddish-orange background with orange structureless areas or blotches (blue arrow), islands of non-erythematous (sparing) skin, scant scales (black arrow), scattered red dotted vessels (green arrow), whitish keratotic plug with central hair surrounded by yellowish and erythematous skin (red arrow), and perifollicular scaling (red star) (Heine Delta II Dermatoscope, 10x, polarized mode)

PRP

Erichetti *et al.* have described the presence of diffuse whitish scales, many orange blotches, and scattered dotted vessels on a reddish background on dermoscopy in a case of erythrodermic PRP.[12] Important clues observed by the authors were reticular vessels and islands of spared skin. All patients of PRP in our study presented with diffuse orange-red erythema with islands of sparing, branny scales, and follicular keratotic papules. There was a history of cephalocaudal progression in four patients. Palmoplantar keratoderma was seen in two patients. Dermoscopic features in all patients were reddish-orange background with orange structureless blotches and islands of spared (non-erythematous) skin. Scales were sparse, branny, and gray-white in color corresponding to hyperkeratosis on histopathology, and the amount of scaling on dermoscopy in PRP was less as compared to that seen in psoriasis. Patchy dotted vessels were seen in the involved areas. Whitish keratotic plugs with central hair surrounded by yellowish and erythematous skin were seen in some places [Figure 1c]. The perifollicular scaling and keratotic plugs observed on dermoscopy correspond to the hyperkeratosis and parakeratosis in the perifollicular areas along with follicular plugs seen on histopathology. The dotted vessels seen on dermoscopy correspond to the dilation of dermal capillaries observed on histopathology, as explained in the literature.[17] Dermoscopic features of classic PRP are retained in erythrodermic PRP, which helps in differentiating it from psoriatic erythroderma.

Endogenous eczema

The most common dermoscopic findings of eczema described are dotted or pinpoint vessels in a patchy distribution and profuse white-yellow serocrusts (yellow clods) and scaling.[11] The underlying spongiosis is responsible for this dermoscopic pattern and can be confirmed on histopathology. Yellow crusts or scales correspond to dried exudate serum admixed with keratin masses. The dotted vessels appearing in clusters correspond to the dilated capillaries within the irregularly elongated dermal papillae.[11] There are no previous reports describing dermoscopic features of erythroderma due to endogenous eczema. In our study, in the patient with erythrodermic endogenous eczema, we observed dotted vessels of nonspecific distribution over dull erythematous background and yellowish-white scaling or serocrusts on dermoscopy [Figure 2a], which is in accordance with the features reported for the acute stage of eczema.

AD

To our knowledge, a single case of dermoscopy in erythrodermic AD has been published that described the findings as yellow scales or serocrusts (yellow clods), scant white scales, and patchy distribution of dotted vessels on a dull erythematous background.[12] Similar to the findings reported previously, our patient of AD also revealed the dermoscopic features of dull erythematous background, sparse and thin white scales, red structureless areas with pinpoint bleeding spots (red clods), which is a hallmark dermoscopic feature of itching corresponding to scratched skin, and patchy distribution of dotted vessels [Figure 2b]. In comparison with endogenous eczema, dermoscopic features of AD show lichenification (pigmentation and increased skin markings) that suggests chronicity, which is confirmed by histopathology.

Drug rash secondary to ATT

The index case was a 50-year-old man in category 1 Directly Observed Therapy Shortcourse (DOTS) ATT. After 7 weeks of ATT, he reported to us with complaints of acute onset of erythema along with severe itching all over the body for the last 7–10 days. Similarly, the second patient was a 45-year-old woman who developed exfoliative dermatitis six weeks after starting therapy for

pulmonary tuberculosis. Dermoscopic examination in both cases revealed diffuse, copious, yellow-to-white scaling over a brownish background. Blood vessels were not visualized [Figure 2c]. Histopathology showed interface dermatitis. We could not find any reports of dermoscopic findings of exfoliative dermatitis secondary to ATT in the literature.

MF

The description of dermoscopic features in erythrodermic MF in the literature is limited. In previous studies, dotted and serpiginous (spermatozoon-like shape) vessels over the whitish-pink background and white scales have been described in erythrodermic MF.[2] A recent study by Lallas *et al.* showed that the dermoscopic pattern in early-stage (non-erythrodermic) MF consists of patchy orangish-yellow areas with overlying white scales and vascular structures in the shape of dotted vessels, short linear vessels, and spermatozoa-like vessels.[15] The patient of erythrodermic MF included in our study presented with erythema, hyperpigmentation, and xerosis with intense pruritus. On dermoscopy, we observed sparse white scales over a dull erythematous background with bluish-gray globules and structureless white areas in a patchy distribution. We did not observe any spermatozoa-like vessels, but a combination of dotted and irregular vessels was seen [Figure 3a and b]. The diagnosis of MF in our case was confirmed histologically by the presence of atypical lymphocytes and epidermotropism [Figure 3c].

Scabies

The dermoscopic hallmark of scabies is the "jet with contrail pattern," consisting of a triangular dark-brown structure, that is, the delta sign combined with whitish scales in a linear or S- or zigzag-shaped arrangement as described by Bollea Garlatti *et al.*[18] The triangular structure represents the parasite, whereas the white scales represent the burrow. Background may not always be erythematous, which represents a local inflammatory reaction. Erythematous background and whitish scales seem to be present only in crusted scabies, while the triangular dark-brown structures are also present in patients of classical scabies. The sensitivity and specificity of dermoscopy to diagnose scabies are 91% and 86%,

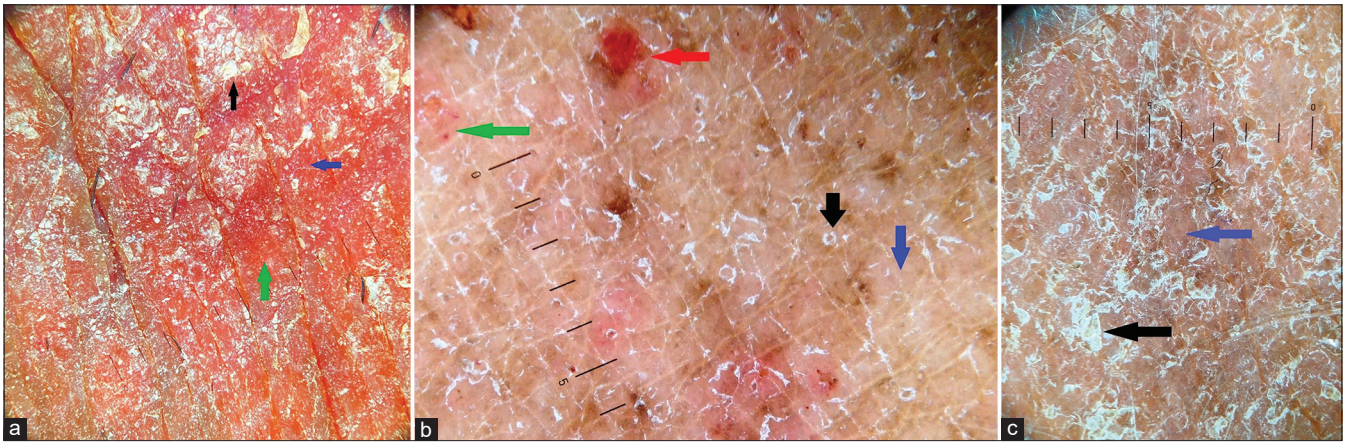

Figure 2: (a) Endogenous eczema—dermoscopy showing dull erythematous background (blue arrow), combination of white and yellow scaling and serocrusts (black arrow), and randomly distributed dotted vessels (green arrow). (b) Atopic eczema—dermoscopy showing dull erythematous background (blue arrow), sparse white scales (black arrow), patchily distributed dotted vessels (green arrow), and red structureless areas with pinpoint bleeding spots (red arrow). (c) Drug rash due to ATT—dermoscopy showing brownish background (blue arrow) and diffuse, copious, yellow-to-white scales (black arrow) (Heine Delta II Dermatoscope, 10x, polarized mode)

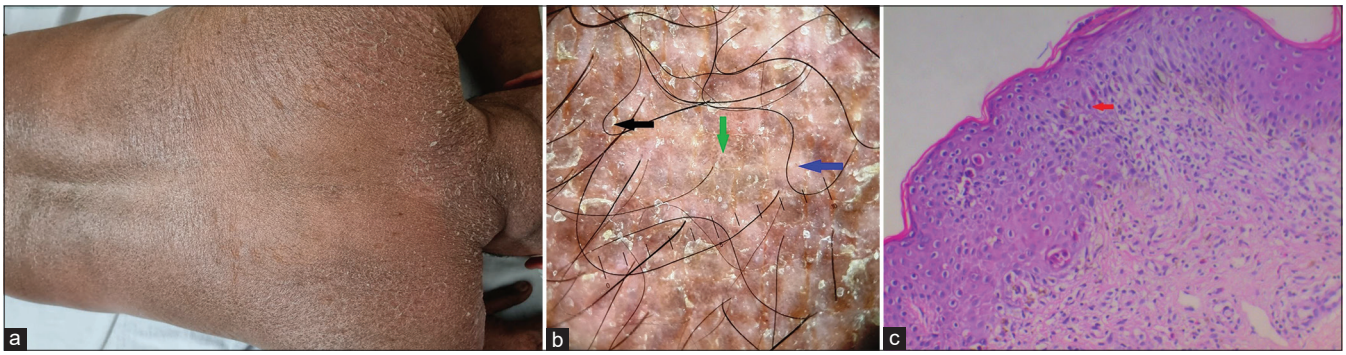

Figure 3: Mycosis fungoides—(a) clinical image, (b) dermoscopy showing dull erythematous background with bluish-gray globules and structureless white areas in a patchy distribution (blue arrow), sparse white scales (black arrow), and combination of dotted and irregular vessels (green arrow) (Heine Delta II Dermatoscope, 10x, polarized mode), and (c) histopathology showing epidermotropism (red arrow) (H&E, 40x)

respectively. Our patient of erythrodermic scabies had multiple excoriated papules and pustules along with thickening and fissuring of the skin. Dermoscopy showed a pinkish-white background along with numerous dark-brown triangular structures and white scales [Figure 4a]. We did a potassium hydroxide (KOH) mount of the skin scrapings of the patient, and it demonstrated the *Sarcoptes scabiei* mite under a microscope.

Pemphigus foliaceous (PF)

PF is an autoimmune bullous disease characterized by flaccid bullae, scaling, and crusting mostly in seborrheic distribution. Progression to erythroderma is uncommon and has been estimated to occur in about 6% of PF cases.[19] Dermoscopic findings of lesions of pemphigus foliaceus described in the literature include brownish-pink background with black or gray dots and brown or gray rim with peripheral erythema. Nonspecific crusting and scattered hemorrhagic inclusions along with irregular elongated blood vessels in the vicinity of the lesions have also been described.[20] The dermoscopy of our case showed an skin colored to mildly erythematous background with erosions, thick grayish-white crusts (due to acantholysis), pigment globules, and irregular blood vessels [Figure 4b]. Histopathologically, the diagnosis was confirmed as pemphigus foliaceus by the presence of hyperkeratosis, acantholysis in the granular layer, and inflammatory infiltrate in the dermis.

DRESS

The patient included in our study was a known case of epilepsy on oral phenytoin (300 mg/day) for the past 6 weeks. She presented with complaints of fever (high grade), jaundice, and generalized erythematous eruption for 15 days. At the onset, the eruption was maculopapular, which desquamated in the next 3 days and progressed to erythroderma. She had leukocytosis with eosinophilia. The dermoscopic features described for DRESS by Rossi *et al.* include erythema, scaling, purpuric dots, and black dots or necrotic areas.[21] Similarly, the findings in our patient were purpuric dots and black structureless areas (necrotic keratinocytes on histology) with scant white scaling over an dull erythematous to brownish background [Figure 4c]. The diagnosis was confirmed histopathologically, which showed parakeratosis, acanthosis, spongiosis, and predominantly lymphocytic dermal inflammatory infiltrate and focal interface dermatitis with apoptotic keratinocytes.

Dermatophytic infection

Dermoscopic examination of lesions of dermatophytic infection shows brownish-to-black dots, globules, and superficial whitish scales (parakeratosis) in the active margin of the lesions. The color of dots and globules varies with the duration of the lesion. Lesions with shorter duration demonstrate red to reddish-brown dots corresponding to dilated vessels and globules representing serous discharge with hemosiderin on reddish background, whereas dark-brown to black globules and dots representing serous discharge with melanin are observed in lesions of longer duration. Minimal and profuse white scales along the creases of skin are observed in lesions of shorter and longer duration, respectively.[22] Our patient presented with diffuse erythema and scaling along with the presence of active well-demarcated border at a few places [Figure 5a]. On dermoscopy, sparse whitish scales were seen mainly along skin creases over a dull erythematous background with scattered brown clods [Figure 5b]. Blood vessels

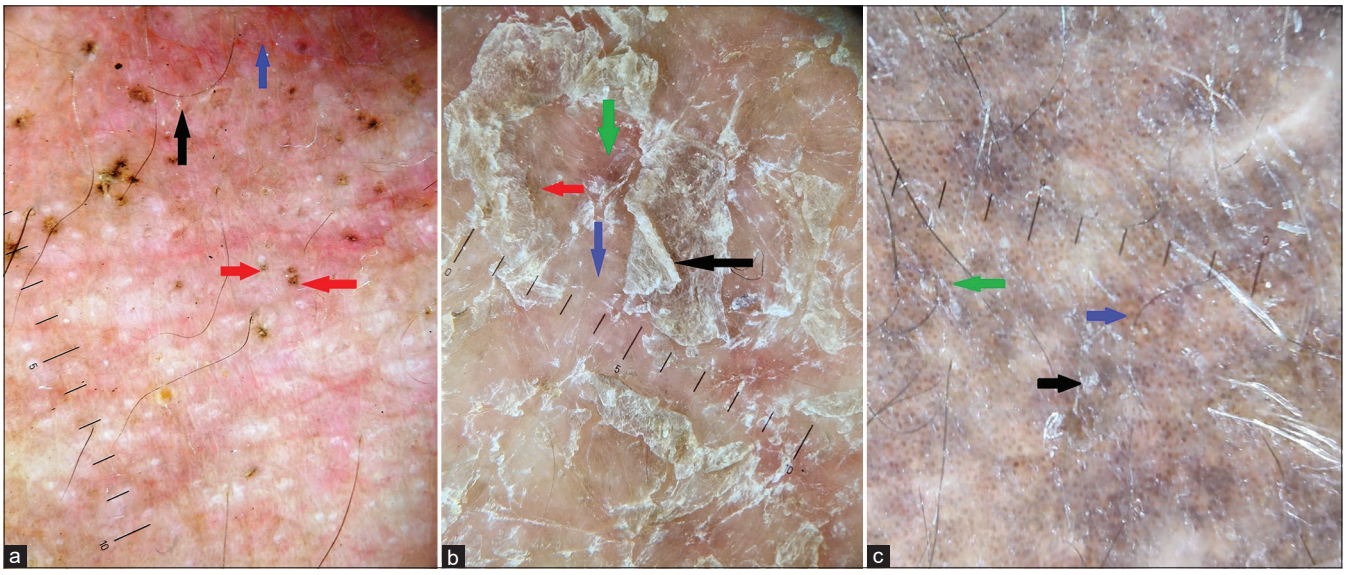

Figure 4: (a) Scabies—dermoscopy showing pinkish-white background (blue arrow), sparse white scales (black arrow), and numerous dark-brown triangular structures with contrail (burrow) (delta wing sign) (red arrow). (b) Pemphigus foliaceous—dermoscopy showing skin-colored to mildly erythematous background (blue arrow), grayish, thick crusts (black arrow), irregular blood vessels (green arrow), and pigment globules (red arrow). (c) DRESS—dermoscopy showing dull erythematous background (blue arrow), scant white scales (black arrow), and purpuric dots (green arrow) (Heine Delta II Dermatoscope, 10x, polarized mode)

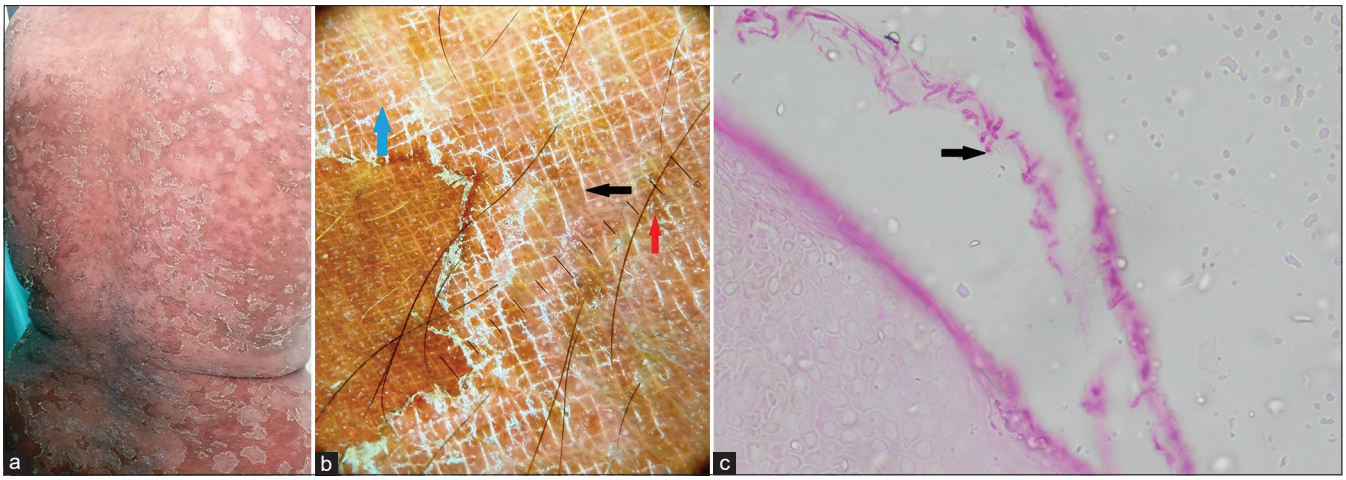

Figure 5: Dermatophytosis—(a) clinical image, (b) dermoscopy showing dull erythematous background (blue arrow), sparse scales scattered along skin creases (black arrow), and brown clods (red arrow) (Heine Delta II Dermatoscope, 10x, polarized mode), and (c) histopathology showing fungal hyphae between two zones of stratum corneum (sandwich sign) (black arrow) (H&E, 40x)

were not appreciated. The diagnosis was confirmed on histopathological examination, which showed the classical sandwich sign, that is, fungal hyphae between two zones of stratum corneum [Figure 5c].

Conclusion

Our study found that the dermoscopic features of classical patterns of skin disorders are preserved even in the corresponding erythrodermic or unstable stage. The dermoscopic features of erythroderma secondary to psoriasis, pustular psoriasis, PRP, endogenous eczema, scabies, and dermatophytosis are clearly differentiating, whereas the dermoscopic features in other causes of erythroderma are overlapping and histopathological correlation is must for confirmatory diagnosis in these cases. Thus, dermoscopy is an excellent bedside examination for early diagnosis of the cause of erythroderma and helps in initiating disease-specific treatment at the earliest.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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