Brief Report

Dermoscopy of Onycholysis Due to Nail Psoriasis, Onychomycosis and Trauma: A Cross Sectional Study in Skin of Color

Abstract

Background: Clinical differentiation of onycholysis due to various etiologies is difficult task that compels to do invasive investigations to arrive at accurate diagnosis. Wrong diagnosis often leads to treatment failure and physicians and patient's anxiety. Dermoscopic patterns in nail psoriasis, onychomycosis are well established. Here, authors attempted to describe dermoscopic patterns in onycholysis due to psoriasis, onychomycosis and trauma in skin of color. **Methodology**: Study was conducted in a tertiary hospital in Southern India. Ethical clearance and informed consent from patients was obtained. Sixty consecutive patients who attended dermatology outpatient department with onycholysis were included in the study. Nail potassium hydroxide (KOH) study was done in all the cases. Onychoscopy was done with DermLite 3 with ultrasound gel as interface medium. **Results:** Totally 60 patients (42 males; 18 females) with onycholysis were included. Mean age was 37 years (range; 6-68 years). KOH was positive in 22 (36.6%) cases. Onychoscopy showed proximal erythematous rim, red dots, splinter hemorrhages in 23(65.71), 26 (74.28) and 21(60) in nail psoriasis respectively. Spiked and jagged-edges, aurora borealis and ruins pattern (65%) suggestive of onychomycosis were seen in 18(90%), 17 (85%) and 13 (65%) patients respectively. Plain edges without erythema or spikes were noted in 5 (8.33%) in traumatic onycholysis group. **Conclusion:** Onychoscopy is a non- invasive modality to diagnose psoriasis, onychomycosis and traumatic involvement of nail apparatus by demonstrating characteristic patterns. Hence, it also plays an important role in effective management of such cases.

Keywords: *Nail psoriasis, onychomycosis, onychoscopy*

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Introduction

Dermoscopy has been extensively studied for pigmentary, inflammatory and malignant conditions of the skin.[1] Onychoscopy, the dermoscopy of nail unit, plays an important role in the diagnosis of many inflammatory conditions affecting nail apparatus.[2] Onycholysis is a major clinical manifestation among nail diseases in daily dermatological practice. Accurate diagnosis of onycholysis is often difficult because of similar presentations of onycholysis due to various etiologies. Added to this, role of investigations in aiding the diagnosis is limited. Hence we need a tool to distinguish causes of onycholysis and help in the better management of onycholysis. Onychoscopy of nail psoriasis, onychomycosis and trauma is documented in the literature.[2] Presently, such documentation in the patients of skin of color is lacking. Here the author attempted to describe dermoscopic patterns in onycholysis due to onychomycosis, trauma and nail psoriasis in skin of color.

Methodology

The study was conducted from December 2018 to March 2019 after obtaining the institute's medical ethical clearance. During this period, all patients who presented with onycholysis due to psoriasis, nail fungus or traumatic onycholysis were included in the study. Each patient provided written informed consent prior to study inclusion. A total of 60 consecutive patients who attended dermatology outpatient department were included. Detailed history including the age, sex, duration of the disease and family history was noted. Inclusion criteria; patients with onycholysis who were not on any treatment 1 month prior to the study patients, and both finger and toe nails were examined. Patients with diagnosis other than nail psoriasis and dermatophytosis

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and traumatic onycholysis, patients of onycholysis with secondary infection, with systemic diseases and who were immunosuppressed were excluded from the study were excluded from the study.

Dermoscopic examination was done using a Dermlite 3 hand-held dermoscope (3Gen Inc, USA) with Sony camera DSC-W830 (Sony Corp, Japan) to capture the images. Ultrasound gel was employed as the interface medium to visualize convex surface of nail. Samples of debris from proximal border of onycholytic areas were taken for 20% KOH mount in all the cases. In cases where two diagnoses were made, like nail psoriasis with secondary onychomycosis patient was labeled as having disease whose signs were predominantly seen. Nail biopsy was restricted to difficult cases because of low patient acceptance and technical difficulties. Dermoscopic patterns were independently analyzed by two dermatologists (BSA and AG). Based upon the dermoscopic patterns, KOH mount, biopsy findings specific diagnosis and treatment were offered to the patient.

Statistical analysis

The statistical analysis was performed using SPSS software (version 20; SPSS Inc., Chicago IL, USA). Frequencies were calculated for variables related to clinical and dermoscopic patient characteristics. Continuous variables such as age, duration are described as means ± standard deviations. Discrete variables are shown as percentages. Associations between qualitative variables, such as the presence or absence of specific dermoscopic features, were tested for statistical significance using χ^2 test. A *P*-value of <0.05 was considered to be statistically significant.

Results

Totally 60 patients with onycholysis were included in the study with 42 males and 18 females. The study included 35, 20 and 15 patients nail psoriasis, onychomycosis and nail plate trauma respectively. Duration of onycholysis ranged from 1 month to 60 months (21.6±17.68). Patient age ranged from 4 years to 72 years (mean=37.4 years). Potassium hydroxide preparation for fungal elements was positive in 22 (36.6%) cases. Culture for isolations of fungal species was not carried out in this study. Nail unit biopsy was done in four (6.6 %) cases which showed features of psoriasis.

Out of 35, 34 patients had psoriasis vulgaris and one patient had pustular psoriasis. In patients with clinical diagnosis of nail psoriasis, red dots in the hyponychium and lateral fold were seen in 26 (74.2%) and 24 (68.5%) patients respectively with *P* value <0.001 in both [Figure 1]. Proximal erythematous rim was seen in 23 (65.7%) patients with *P* value <0.001 [Figure 2a-d]. Splinter hemorrhage [Figure 3a-d] was seen as purplish lines [Figure 3a] or blackish-red [Figure 3b] in the nail plate in 21 (60%)

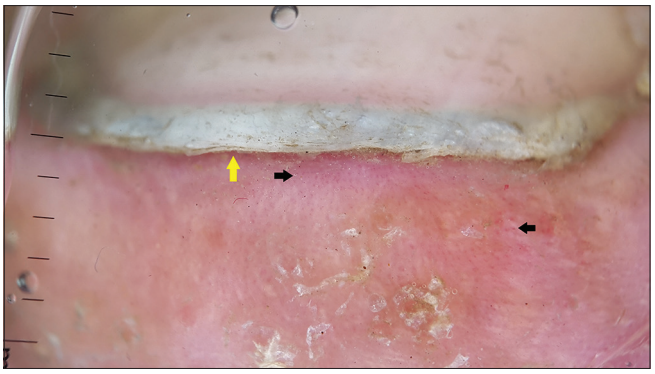

Figure 1: Onychoscopy of nail psoriasis shows onycholysis (yellow arrow) with uniform red dots (black arrows) in the hyponychium on erythematous background

patients. Adherent fabric fibers, which look like thin filamentous structures that entangled to the dystrophic nail unit, were seen in 12 (34.2%) patients [Figure 4]. Deep, coarse pits [Figure 5a and b] and salmon patch [Figure 6a and b] were seen in 14 (40%) and 9 (25.7%) patients respectively. A total of 17(62.8%) patients showed compact subungual hyperkeratosis [Figure 7a and b]. Globose and dilated capillaries with whitish halo were arranged longitudinally at the onychodermal band in 12 cases (34.2%) [Figure 8a-d].

A total of 20 patients with onychomycotic onycholysis were present in this the study. Since onycholysis patients were selected for the study, only distal and lateral onychomycosis were present in the study. Spiked and jagged edges of proximal portion of onycholytic area were the most common finding for onychomycosis [Figure 9a and b] and were observed in 18 (90%) patients with $P < 0.05$. Aurora borealis pattern [Figure 10a and b] and ruins pattern [Figure 11a-d] were seen in 17 (85%) and 13 patients (65%) respectively.

Five patients in traumatic onycholysis group showed plain proximal edges [Figure 12a-d] with indentations of onycholytic area in 4 (80%) patients. Two (40 %) patients demonstrated splinter hemorrhages.

Six nail biopsies were done out of which four were consistent with psoriasis and two were diagnosed as onychomycosis. Different frequencies of dermoscopic patterns in three groups are depicted in the Table 1.

Discussion

Dermoscopy is a non-invasive diagnostic technique which is used for evaluating non-pigmented and pigmented lesions.[3] It is also helpful in the diagnosis of nail lesions wherein it is referred to as onychoscopy.[4] Psoriasis is an inflammatory condition of the skin which frequently involves nails. Onychoscopy helps in the accurate diagnosis of nail psoriasis. It shows regular red dots of uniform size in hyponychium and lateral folds that represent dilated capillary network when it is viewed from the perpendicular

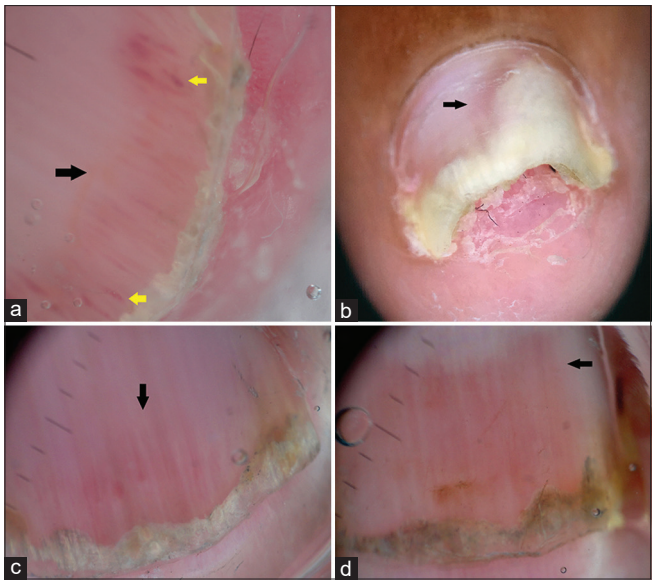

Figure 2: Onychoscopy of nail psoriasis shows erythematous band or rim (black arrows) at the proximal portion of onycholytic area. Few splinter hemorrhages are appreciated (panel a, yellow arrows). Note the white superficial scales in panels a and b

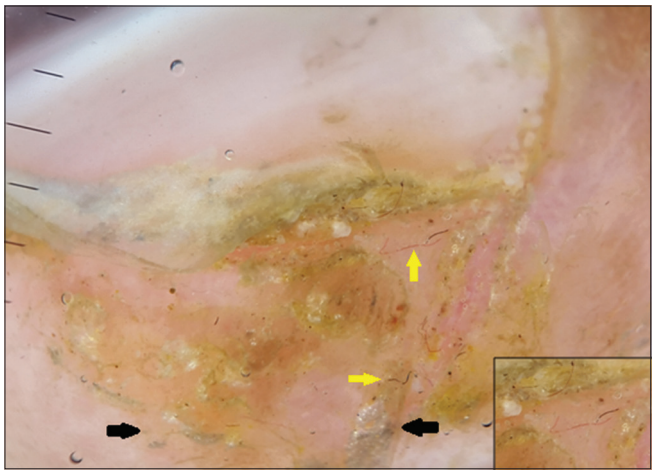

Figure 4: Onychoscopy of nail psoriasis shows subungual hyperkeratosis with onycholysis. Red and black filamentous structures are adherent fabric fibres (yellow arrows). Note the white scales (black arrows)

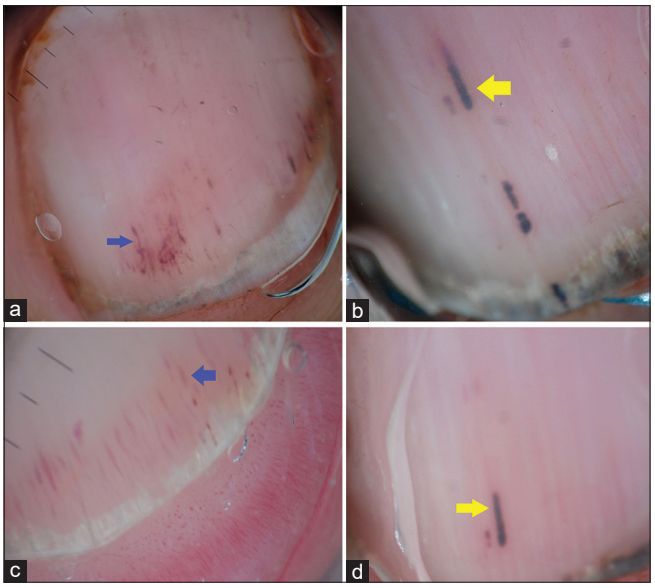

Figure 3: Onychoscopy of nail psoriasis shows splinter hemorrhages. Panels (a and c) demonstrate slender, filamentous, and linear with bulbous end vessels (blue arrows) which are bright pink in color suggestive of recent rupture of nail bed capillaries. Panels (b and d) reveal linear, dark red or purple (yellow arrows) vessels indicative of older injury to the capillaries. Uniform red dots are very well appreciated in the hyponychium (panel c)

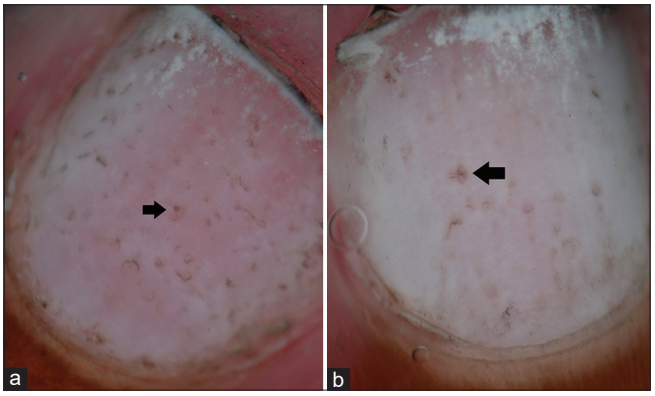

Figure 5: Onychoscopy of nail psoriasis shows deep, irregular coarse pits (black arrows) on the nail plate (panels a and b). Haphazard arrangement is well appreciated

distance. Under high magnification (100-400x), vessels appear as elongated, tortuous, and convoluted capillaries. These lesions correlate with disease severity and response to treatment.[5]

Red dots in hyponychium in psoriatic nail were the most common finding in our study in contrast to previous reports in which splinter hemorrhage and irregular nail pits were commonly observed. This disparity is probably due to variation in the duration of lesions. Red dots were not seen in onychomycosis and traumatic onycholysis. This implies that red dots are specific in onycholytic nail psoriasis.[5] Splinter hemorrhages in psoriatic nail represent the extravasation of the red blood cells in the nail bed and appear as thin dark red to purplish longitudinal streaks.[6] As capillaries are arranged longitudinally on the nail bed, extravasated blood runs along the grooves after the rupture of capillaries. This results in linear shape of the hemorrhages. Color varies from dark red in older to bright pink in newer hemorrhages. They are linear to fusiform in shape. With higher magnifications, minute pinpoint to serpentine elongated hemorrhages can be seen. Their presence in both onychomycosis and traumatic onycholysis suggests that splinter hemorrhages are not specific for psoriasis.[2,4] In this study the difference between the groups was statistically significant. This is probably due to the smaller sample size.

Salmon patch occurs due to focal onycholysis appears as orange to red area that varies both in size and shape. It is because of nail bed parakeratosis.[6] In this study, these

Table 1: Frequency of onychoscopic patterns in onycholysis due to psoriasis, onychomycosis and trauma

Findings	Nail psoriasis (*n*=35)	Onychomycosis (*n*=20)	Traumatic onycholysis (*n*=5)	Chi-square	*P*
Red dots in hyponychium	26 (74.28)	0	0	32.77	0.001*
Red dots in lateral fold	24 (68.57)	0	0	28.57	0.001*
Proximal erythematous rim	23 (65.71)	0	0	26.64	0.001*
Splinter hemorrhage	21 (60)	1 (5)	2 (40)	14.0	0.001*
Adherent fabric fibers	12 (34.28)	3 (15)	2 (40)	1.466	0.113
Deep pits	14 (40)	0	0	17.75	0.001*
Salmon patch	9 (25.714)	0	0	7.56	0.002*
Prominent onychodermal band	12 (34.28)	0	0	15.79	0.001*
Subungual hyperkeratosis	17 (48.57)	5 (25)	0	5.12	0.01*
Spiked and jagged edges	0	18 (90)	0	51.43	0.001*
Aurora borealis	0	17 (85)	0	47.44	0.001*
Ruins pattern	0	13 (65)	0	33.19	0.001*
Plain edges without erythema	0	0	4 (80)	47.14	0.001*

*Statistically significant

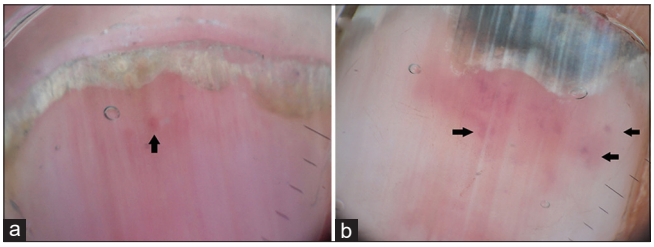

Figure 6: Onychoscopy of nail psoriasis shows salmon patches as reddish areas (black arrows) on the nail plate in the proximal portion of onycholysis (panels a and b). Note the red color of the salmon patches in contrast to the skin types 1, 2, and 3 in which they appear as yellowish-red areas

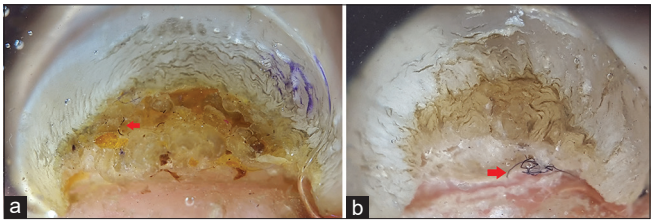

Figure 7: Onychoscopy of nail psoriasis shows subungual hyperkeratosis which is lifting the nail plate (panels a and b). Note the yellow to whitish- yellow discoloration of hyperkeratotic material. Adherent fabric fibres are well appreciated in the form of blue and black filamentous structures (red arrows)

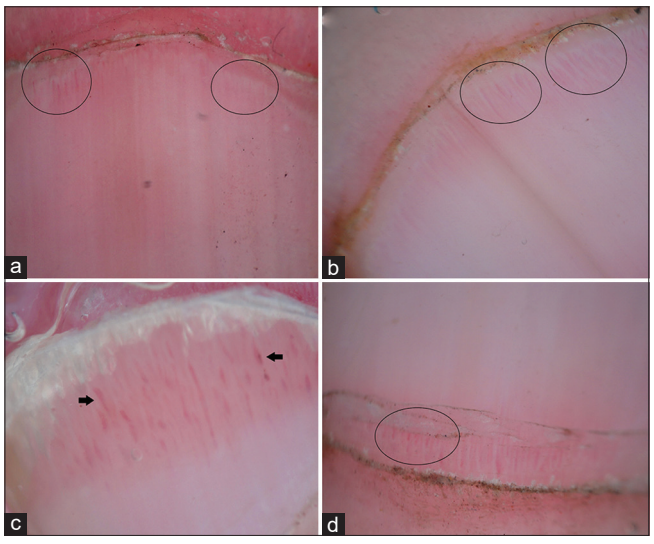

Figure 8: Onychoscopy of nail psoriasis shows dilated, globose and stout capillaries in the erythematous rim at onycholytic area (panels a-d). Whitish halo (circles) is appreciated surrounding the capillaries. Panel c reveals few splinter hemorrahges (black arrow)

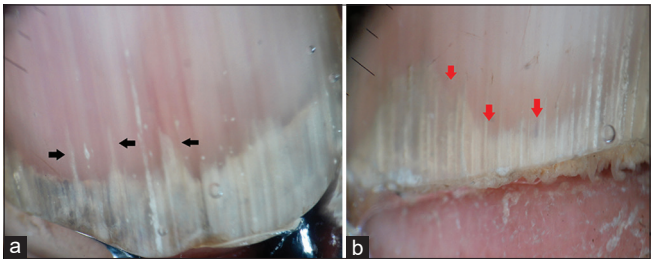

Figure 9: Onychoscopy of onychomycosis shows spikes (black arrows) (panel a) and jagged edges (red arrows) (panel b). Note the absence of erythematous rim at the proximal portion of onycholytic area

appeared as reddish areas in contrast to the skin types 1, 2, and 3. It is not noted in onychomycosis or traumatic onycholysis. Hence, salmon patch is specific to nail psoriasis. It was not mentioned in the similar study by Elfar *et al.*[2] However, studies exclusively on dermoscopy of nail psoriasis report the presence of salmon patch which is characterized by yellowish- red discoloration that appears as irregular translucent areas on the nail plate.[7]

A distinctive erythematous rim was typically observed in nail psoriasis. This is inflammation and dilatation of capillaries in the nail bed at the onychodermal band. Onychoscopy from this area showed fusiform, stout and globose capillaries with white halo. In this study, it was observed only in nail psoriasis group suggesting it was specific to psoriasis. Similar observation was made in the previous studies.[7,8]

A new dermoscopic sign is recently described in the literature. It is called as pseudo-fiber sign which is believed to represents dilated capillaries.[7] However, we differ from

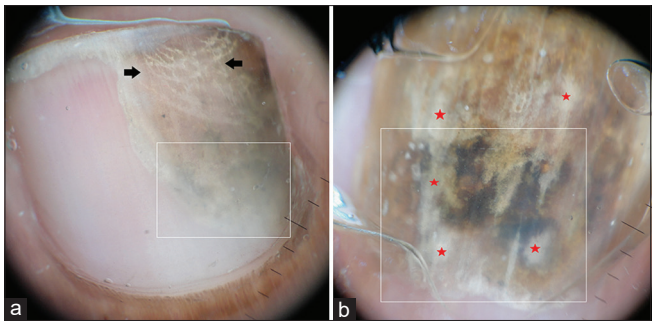

Figure 10: Onychoscopy of onychomycosis shows 'aurora borealis' pattern (white box) in both panels a and b. Filamentous yellow lines (black arrows) and yellow clods and structures (red stars) are suggestive of fungal colonies

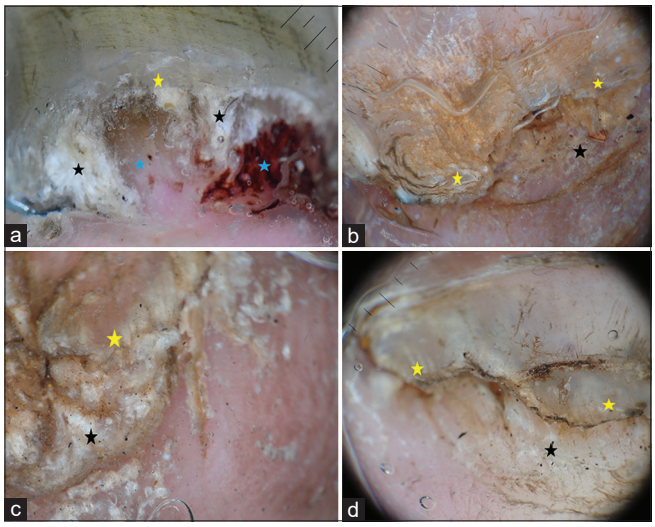

Figure 11: Onychoscopy of onychomycosis shows the 'ruin' pattern (panels a-d) which comprises of crumbled nail plate appearing as dull white to yellowish structures (yellow stars), subungual hyperkeratosis as white structureless areas (black stars) and hemorrhage as red dots and globules (blue stars)

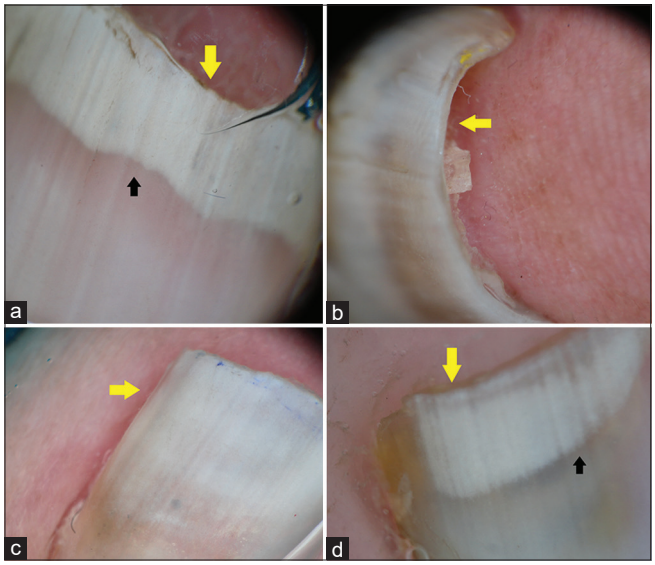

Figure 12: Onychoscopy of traumatic onycholysis shows separation of nail plate from the nail bed (yellow arrows). Note the absence of erythematous rim, spikes, red dots or subungual hyperkeratosis (panels 1-d). Plain edge (black arrows) at the proximal portion of onycholytic areas is well appreciated

their description. Authors suggested these fibers were seen at the hyponychium and also in areas of separation of nail bed and nail plate which we believe is a site for fabric adherence due to ragged and dystrophic nail. Also in our study such fibers were found distal to ragged cuticle, lateral and distal edges of dystrophic and onycholytic plate making adherence of fabric fiber more likely. As the nail plate is devoid of vasculature, the appearance of vessels in the nail bed is a theoretical possibility but we observed that these fibers could be removed and manipulated with forceps and nail clippers. Also, other investigations and techniques like manipulation, ultrasound scan and biopsy were not done to confirm "pseudo" nature of the sign.[9] Hence, the authors believe this is analogous to the adherent fabric fiber described by Rosendahl *et al*, wherein fibers get attached to the excoriated or ulcerated surface of the cancerous skin lesions.[10] We affirm that these filamentous structures are nothing but fabric fibers and not the venous or arterial ends of capillaries. To reinforce our viewpoint, Elfar *et al* did not mention this sign in a similar kind of study.[2] Further elucidation and exploration is warranted to confirm this sign by conducting studies involving larger sample size and involving patients of various ethnic background.

Pits appear as irregular depressions surrounded by whitish halo. Deep pits represent parakeratosis of the nail matrix. Parakeratotic cells interfere with normal keratinization and when cells fall off, they leave behind depressions in the nail bed.[6] They are irregular, course and deep. Pits have whitish discoloration at the borders, especially when ultrasound gel is used as interface medium. This gives leukonychia appearance in dermoscopy.[8] However, whitish color in the pits was noted in our study. Pits were not observed in onychomycosis and traumatic onycholysis. Hence these are specific to psoriasis.

Diffuse subungual hyperkeratosis was noted in nail psoriasis and onychomycosis. Accumulation of scales underneath the nail plate results in the detachment and upliftment of nail plate. It is seen in both onychomycosis and nail psoriasis. Subungual hyperkeratosis in nail psoriasis shows compact and diffuse hyperkeratosis.[2] There was no much difference in the dermoscopic appearance of subungual hyperkeratosis in different types of skin.

Onychoscopy plays an important role in the diagnosis of onychomycosis. It demonstrates jagged edges with sharp whitish longitudinal indentations in the proximal portion of the onycholytic area. It is due to proximal progression of dermatophytes with progressive detachment of the nail plate along the horny layer of the nail bed. These are named as spikes.[4]

Spiked and jagged edges were the most common finding in our study, which is similar to study by Bhat *et al*,[11] and in contrast to other studies where longitudinal streak was the most common finding.[12-14] Spikes are due to the nail anatomy and fungal invasion. These are first signs of

fungal invasion in regions of reduced adherence of nail plate to nail bed which is situated in the distal part. Hence invasion of fungus starts in the distal edge of nail plate. Similar longitudinal spikes are seen in onychorrhexis. However, they are situated in the proximal portion of nail unit. It is also reported that linear proximal edge pattern is possible in onychomycosis.[15] None of the patients in this study showed linear edge pattern in onychomycosis. It is probably due to smaller study sample. It should be noted that absence of longitudinal spikes in onychomycosis suggests total dystrophic onychomycosis.[15]

Subungual hyperkeratosis is characterized by the accumulation of scales under the nail plate, which is detached and uplifted. It can be localized or diffuse over the whole width of the nail. It results from excessive proliferation of nail bed/hyponychium keratinocytes. Authors did an extensive study for the presence of fungus in the subungual hyperkeratotic material. Clippings from the hyperkeratotic area were proved to be positive for fungus in microscopic examination and culture.[15] As the fungus invades and progresses proximally, there are indentations on the ventral surface of by the keratinocytes resulting in accumulation of keratotic materials under nail plate. This appears as "ruin pattern" in dermoscopy.[15] Henceforth, if dermoscopy demonstrates "ruin pattern" in subungual hyperkeratotic, it is suggestive of onychomycotic onycholysis. This observation is very useful to diagnose onychomycosis where investigative facilities are not possible and feasible. Also, onychoscopy is useful in assessing patient's compliance and response to treatment.[15] These changes can help distinguish nail psoriasis and other diseases of the nail apparatus.

The second most common finding for onychomycosis was "aurora borealis" pattern which represents area of various colors ranging from greenish-blue to bluish-gray to black to whitish yellow in the onycholytic area. It represents fungal invasion and subungual debris.[13] Greenish hue was not much appreciated in this study which may be related to color of the skin. Chetana *et al* described bluish streaks and globules and bluish gray globules as new dermoscopic observations in onychomycosis.[16] We did not notice such patterns in this study, probably because of small sample size.

In traumatic onycholysis the line of detachment of the plate from the bed is linear, regular and smooth and is surrounded by a normally pale pink bed. The signs of inflammation reduce with time. In long-standing cases onycholytic areas with smooth borders without erythema are seen.[17]

Thus, onychoscopy assists in the clinical differentiation of onycholysis by different etiologies. Here, nail psoriasis, distal, and lateral onychomycosis and traumatic onycholysis demonstrated distinctive and characteristic onychoscopic patterns. Spikes and ridges are specific to onychomycosis and if such patterns are encountered in nail psoriasis, one should treat for the fungus first followed by psoriatic treatment. In traumatic nail onycholysis, although history of injury would be present sometimes patients may not remember the injury. Onychoscopy demonstrates definitive patterns which distinguish other conditions presenting as onycholysis.

A smaller sample size and lack of age and sex matched controls are a major limitation of the study. Correlation of dermoscopic findings with biopsy and fungal culture was other limitation of the study.

Conclusion

Dermoscopy is non-invasive, rapid outpatient department diagnostic method which helps in visualization of structures not visible to naked eye and also assists in differentiating nail psoriasis, onychomycosis and traumatic onycholysis. Onychoscopy acts as a bridge between clinical and histopathological diagnosis obviating need of routine biopsy. Thus, offering a better treatment plan to the patient. More studies with larger sample size, comparison with age and sex-matched individuals and correlation of dermoscopic changes with response to treatment are warranted.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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