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Report

Onychoscopic evaluation of onychomycosis in a tertiary care teaching hospital: a cross-sectional study from South India

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Abstract

Background Onychoscopy is the dermoscopic evaluation of nail and associated structures. It is useful in identifying the various onychoscopic patterns which act as a link between naked eye examination and nail histopathology and may help in avoiding nail biopsy in unnecessary cases.

Objectives To evaluate the onychoscopic patterns in confirmed cases of onychomycosis.

Methods An observational, prospective, cross-sectional study was performed in 500 patients with symptoms related to the nails and nail folds. Onychomycosis was confirmed in 234 patients by KOH mount/fungal culture/biopsy. These patients underwent dermoscopy with a handheld 20× polarized contact dermoscope (Heine's delta 20 T). The dermoscopic patterns were identified, and their correlation with the clinical subtype of onychomycosis was analyzed.

Results The study included 234 confirmed cases of onychomycosis. The common dermoscopic patterns observed were spikes (43.16%), jagged (29.9%), longitudinal striae (49.1%), linear edge (3.4%), and distal irregular termination (34.6%). The statistically significant findings of distal and lateral subungual onychomycosis (DLSO) were longitudinal striae, spikes, and jagged patterns. The new patterns observed in our study are bluish streaks and globules (8.9%) and bluish gray globules (7.6%) in cases of DLSO which were not statistically significant.

Conclusion Onychoscopy, being handy, inexpensive, and noninvasive, has the potential to reduce the invasive procedures. Statistically significant patterns in DLSO and total dystrophic onychomycosis (TDO) are described in our study. Few new patterns have been described whose significance has to be tested by conducting larger sample size studies.

Introduction

Onychomycosis was derived from the Greek word "onyx", which means nail and "mykes" - fungus. It affects approximately 5% of the population worldwide,[1] and the incidence in India is reported to vary from 0.5 to 5%.[2,3] Among all nail conditions, onychomycosis accounts for 40–50% of onychopathies and about 30% of cutaneous fungal infections.[4,5] The diagnosis is made clinically and can be confirmed by 10–30% KOH examination,[6] fungal culture, using Sabouraud dextrose agar (SDA) or potato dextrose agar (PDA), with or without antibiotics,[7] and/or nail plate biopsy with Periodic Acid Schiff (PAS) staining.

Onychoscopy is the dermoscopic evaluation of nail and associated structures. It aids in identifying the various patterns which act as a link between naked eye examination and nail histopathology, thereby helping us to reduce unnecessary nail biopsies. In this study, we have evaluated the onychoscopic patterns associated with different morphological types of onychomycosis.

Materials and methods

Consecutive patients with symptoms related to the nails and nail folds attending the dermatology outpatient department of our institute, a tertiary care teaching hospital in South India, between November 2015 and May 2017 were studied. Out of 500 clinically suspected cases, 234 patients were confirmed as onychomycosis either by 20% KOH mount/fungal culture, using SDA with cycloheximide, chloramphenicol, and gentamicin/nail plate biopsy with PAS staining. Patients who were on topical and/or systemic antifungal therapy for the past 3 months were excluded from the study. All patients underwent dermoscopy with a handheld 20× polarized contact dermoscope – Heine's delta 20 T. The most frequent dermoscopic patterns were

identified, and their correlation with the clinical subtype of onychomycosis was analyzed.

Data analysis was done using SPSS (Version 23) software. Chi-square was used to test the association between clinical types of onychomycosis and the dermoscopic pattern. A *P*-value <0.05 was considered to be statistically significant.

Results

The study population was comprised of 234 patients with 71 males (30.3%) and 163 females (69.7%). The mean age of patients was 41.73 ± 9.5 years. Among 234 patients, 134 were positive for fungal elements by 20% KOH mount. Among KOH negative patients, 56 showed positivity in fungal culture by SDA, and 44 had nail biopsy with PAS stain results positive for fungal elements. The clinical variants included DSLO (57.6%), TDO (16.2%), proximal subungual onychomycosis (PSO) (2.60%), superficial white onychomycosis (SWO) (2.60%), and endonyx (0.90%). The overlap of DLSO and TDO was seen in 20.1% of cases.

Onychoscopic Findings

Color changes

The various color changes noted in the nail plate included white (41.8%), yellow (57.2%), orange (19.6%), brown (75.2%), and black (33.7%). There was a predominance of the white, yellow, and brown in DLSO. The other changes that were noticed were Aurora pattern (26%), brown dots (18.8%) (Fig. 1), black globules (15.3%), pits (5.5%) (Fig. 2), and splinter hemorrhages (2.5%). However, the above changes were not statistically significant.

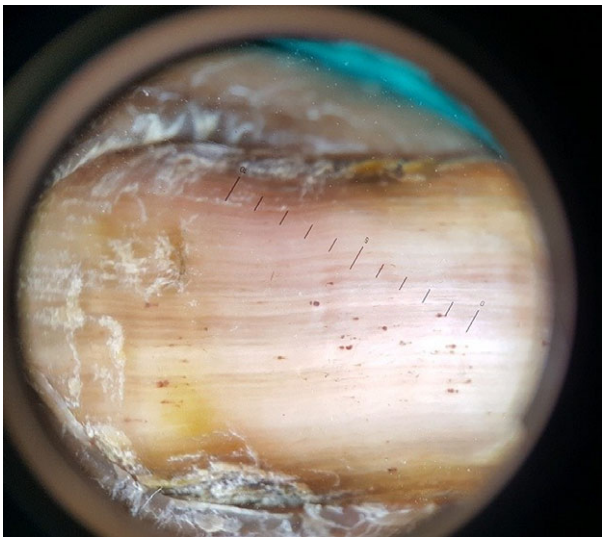

Figure 1 Black dots seen due to subungual hemorrhage

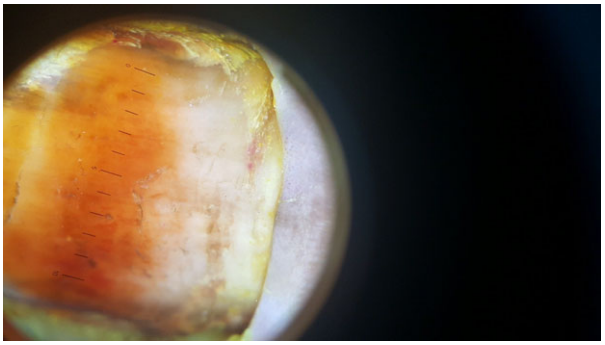

Figure 2 Orange discoloration of nail plate with coarse pits

Special patterns

The most common pattern noted was longitudinal striae (49.1%) (Fig. 3), followed by spiked pattern (43.16%) (Fig. 4), distal irregular termination 81 (34.6%) (Fig. 5), jagged pattern (29.9%) (Fig. 6), and linear edge in 8 (3.4%) (Fig. 7).

New dermoscopic findings

These include bluish streaks (Fig. 8) and globules (8.9%) (Fig. 9) and brownish-black pigmentation with longitudinal lines at the periphery (7.6%) (Fig. 10) in DLSO. These findings were not found to be statistically significant.

All dermoscopic findings and their correlation in different clinical types of onychomycosis are mentioned in Tables 1 and 2.

Discussion

In our study, 'longitudinal striae' was the predominantly observed pattern (62.2%) in DLSO, which is in accordance with the available literature.[8,9] The presence of "longitudinal striae" is thought to be the manifestation of invasion of dermatophytes

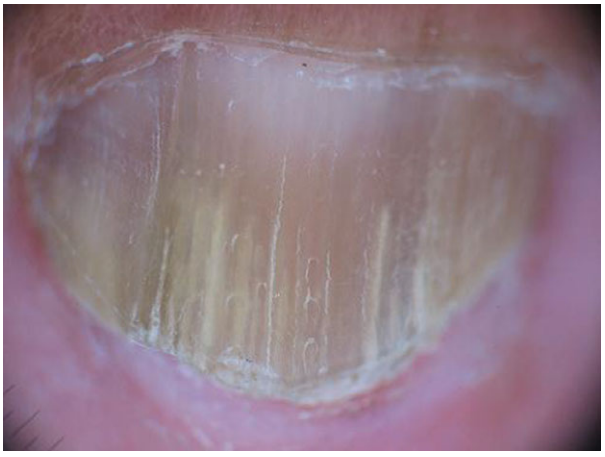

Figure 3 Longitudinal striae, of various colors in the onycholytic nail plate

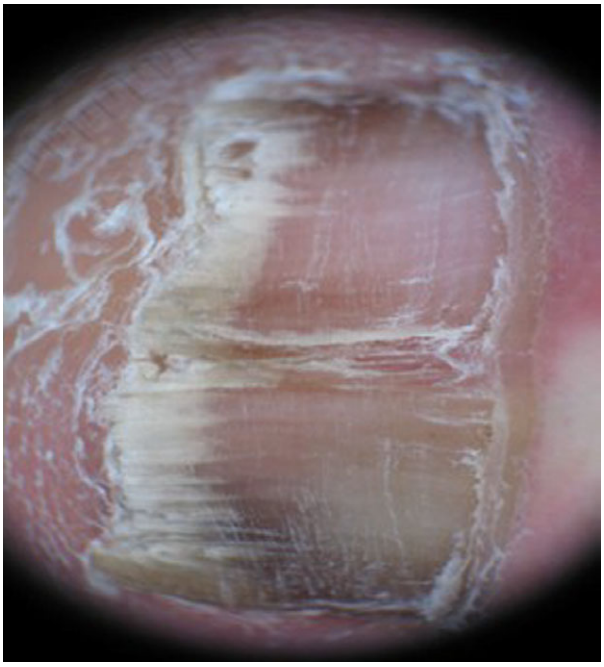

Figure 4 Spiked pattern, indentations at the proximal edge of the area with onycholysis

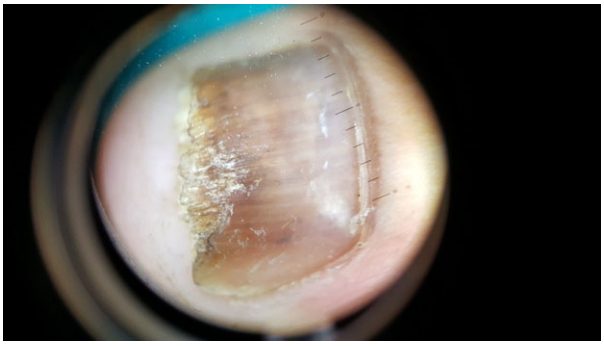

Figure 5 Distal irregular termination corresponds to the distal pulverization of the nail plate

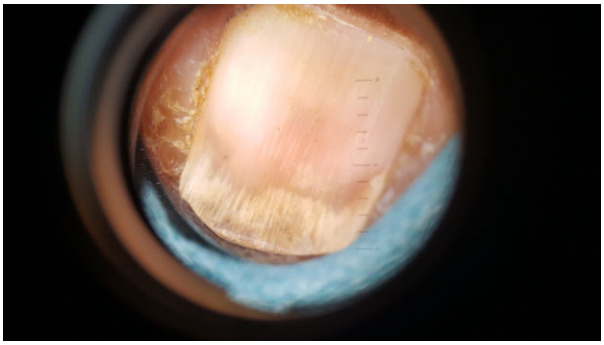

Figure 6 Jagged pattern, seen at the proximal margin of the onycholytic area

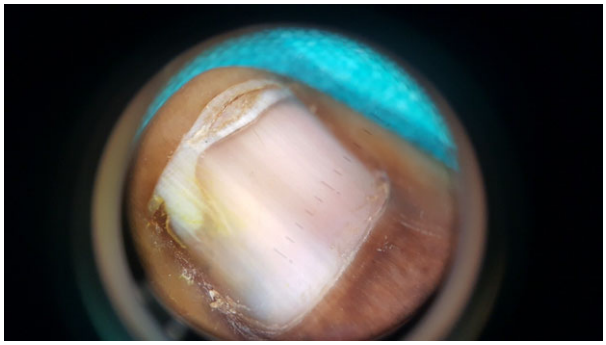

Figure 7 Linear edge, a smooth linear demarcation without indentations

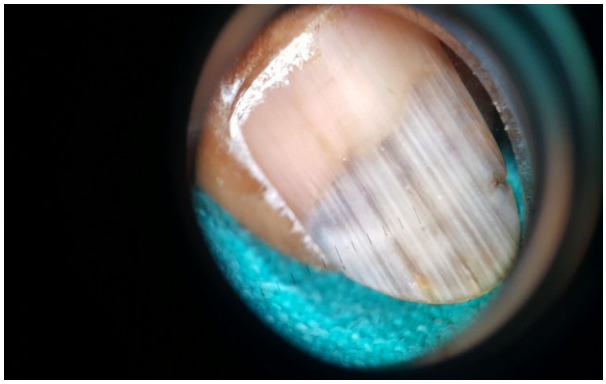

Figure 8 White and blue streaks

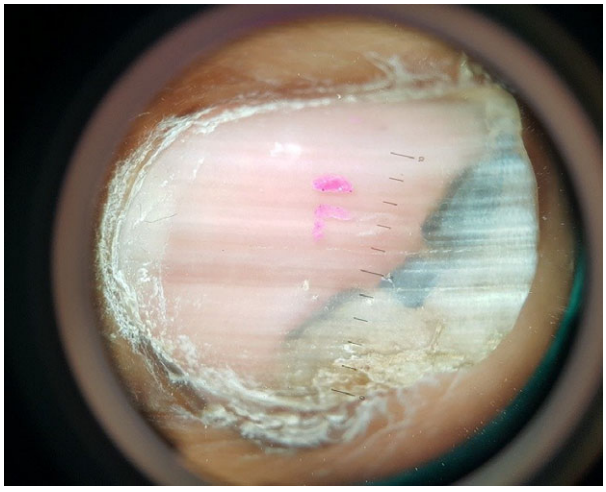

Figure 9 Blue globules

along the nail plate, and the discoloration may be because of colony formation, flakes, or subungual debris.[9,10] Yadav TS *et al.*,[11] described white, irregular streaks demarcating the area of onychomycosis with the normal nail in cases of DLSO. In

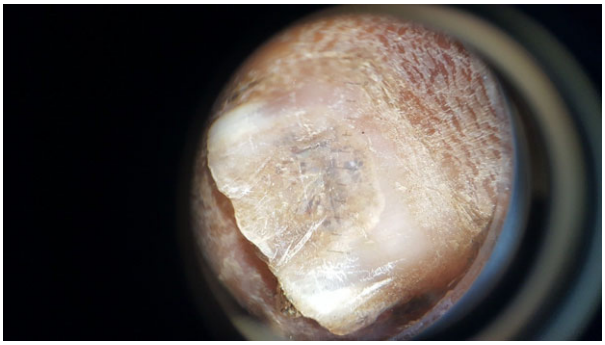

Figure 10 Blue gray globules

addition, our study also showed the presence of longitudinal striae in cases of TDO (10.5%).

Spiked (52.5%) and jagged (29.9%) pattern in our study were predominantly seen in DLSO and were statistically significant. Piracinni BM *et al.*,[8] described the proximal margin of the onycholytic area as jagged edge and the sharp longitudinal whitish indentations directed to the proximal nail fold as 'spikes' exclusively in cases of DLSO. In contrast to our study, Jesus Silva MA *et al.*[9] reported the predominance of spiked pattern in TDO without statistical significance.

The 'linear edge pattern' without any indentations was seen in 3.4% cases with DLSO and were associated with the history of trauma. The presence of the "linear edge" is significantly associated with traumatic onycholysis, and this simple dermoscopic finding can be used to differentiate onychomycosis from traumatic onycholysis.[8,9] However, in our study, the presence of linear edge pattern was seen in DLSO, which may be attributed to trauma preceding onychomycosis.

In TDO the statistically significant pattern observed was 'distal irregular termination' (89.4%). Similar findings are described by Jesus Silva MA *et al.*,[9] who stated that the "distal irregular termination" corresponds to the distal pulverization of the nail plate. Our study also showed the predominance of distal irregular termination in PSO without any statistical significance.

Comparison of our findings in DLSO with available literature is given in Table 3.

The other dermoscopic signs observed were black dots (37.6%), Aurora pattern (26%), brownish-black pigmentation with longitudinal lines at the periphery (16.2%), pits (6%), and splinter hemorrhages (2.5%). None of them were found to be statistically significant. These signs are better visualized with dermoscopy than with the naked eye. The presence of black dots and yellow-orange homogeneous colors of the affected nail plate may be attributed to subungual hemorrhage and the presence of the dermatophytoma.[8]

The new dermoscopic findings noted in our study such as bluish streaks and globules (8.9%) and bluish gray globules (7.6%) in DLSO are not reported till date. However, such findings can occur as a result of subungual hemorrhage secondary to trauma or nail clipping to the affected and dystrophic nails, warranting further evaluation by conducting similar studies involving larger sample size.

Table 1 Dermoscopic findings noted in different clinical types of onychomycosis (n = 234)

	DLSO ***n*** **(%)** **135 (57.6%)**	**TDO** ***n*** **(%)** **38 (16.2%)**	**PSO** ***n*** **(%)** **6 (2.6%)**	**SWO** ***n*** **(%)** **6 (2.6%)**	**Endonyx** ***n*** **(%)** **2 (0.9%)**	**DLSO/TDO Overlap** ***n*** **(%)** **47 (20.1%)**
Discoloration						
White	56 (41.8%)	0	0	6 (100%)	2 (100%)	34 (72.3%)
Yellow	78 (57.7%)	13 (34.2%)	0	0	1 (50%)	12 (25.5%)
Orange	22 (16.2%)	19 (50%)	1 (16.6%)	0	0	4 (8.5%)
Brown	82 (60.7%)	21 (55.2%)	5 (83.3%)	0	0	19 (40.4%)
Black	46 (34%)	14 (36.8%)	3 (50%)	0	0	16 (34%)
Aurora pattern	45 (33.3%)	0	0	0	0	16 (34%)
Black dots	26 (19.2%)	4 (10.5%)	0	0	0	14 (29.7%)
Black globules	27 (17%)	0	0	0	0	9 (19.1%)
Bluish globules	16 (11.8%)	0	0	0	0	5 (10.6%)
Bluish gray globules	13 (9.6%)	0	0	0	0	5 (10.6%)
Pits	11 (8.1%)	0	0	0	0	2 (4.2%)
Splinter hemorrhage	5 (3.7%)	0	0	0	0	1 (2.1%)
Longitudinal striae	84 (62.2%)	4 (10.5%)	3 (50.0%)	2 (33.3%)	2 (33.3%)	20 (42.5%)
Spiked pattern	71 (52.5%)	3 (7.8%)	0	4 (66.6%)	0	23 (48.9%)
Jagged pattern	53 (39.2%)	5 (13.1%)	1 (16.6%)	0	0	11 (23.40)
Distal irregular termination	29 (21.5%)	34 (89.47%)	4 (66.6%)	0	0	14 (29.7%)
Linear edge	5 (3.7%)	0	0	0	0	3 (6.38%)

DLSO, distal and lateral subungual onychomycosis; TDO, total dystrophic onychomycosis; PSO, proximal subungual onychomycosis; SWO, superficial white onychomycosis.

Table 2 Dermoscopic patterns and their correlation with the different clinical types of onychomycosis ($n = 234$)

	Spiked pattern		Jagged pattern		Longitudinal striae		Linear edge		Distal irregular termination	
	101 (43.16%)		70 (29.9%)		115 (49.1%)		8 (3.4%)		81 (34.61%)	
Total	*n* (%)	*P* value	*n* (%)	*P* value	*n* (%)	*P* value	*n* (%)	*P* value	*n* (%)	*P* value
DLSO	71 (52.5%)	0.000*	53 (39.2%)	0.415	86 (62.2%)	0.000*	5 (3.7%)	0.658	29 (21.5%)	0.458
TDO	3 (7.8%)	0.759	5 (13.3%)	0.698	4 (10.5%)	0.719	0	–	34 (89.47%)	0.000*
PSO	0	–	1 (16.6%)	0.798	3 (50%)	0.759	0	–	4 (66.6%)	
SWO	4 (66.6%)	0.719	0	–	2 (33.3%)	0.812	0	–	0	–
Endonyx	0	–	0	–	2 (33.3%)	0.812	0	–	0	–
DLSO+TDO	23 (48.9%)	0.238	11 (23.4%)	0.569	20 (42.5%)	0.362	3 (6.38%)	0.759	14 (29.7%)	0.421

DLSO, distal and lateral subungual onychomycosis; TDO, total dystrophic onychomycosis; PSO, proximal subungual onychomycosis; SWO, superficial white onychomycosis.
*$P < 0.05$ is considered as significant.

Table 3 Comparison of onychoscopic patterns in DLSO with other studies

	Our study	Piraccini BM *et al.*,[8]	Jesus Silva MA *et al.*,[9]	De Crignis G *et al.*,[10]	Yadav TA *et al.*,[11]
Spiked pattern	71 (52.5%)	37 (100%)	17 (43.59%)		21 (58.3%)
Jagged pattern	53 (39.2%)	37 (100%)	–		
Longitudinal striae	86 (62.2%)	32 (86.4%)	42 (44.68%)	296 (88.09%)	
Linear edge	5 (3.7%)	13 (100%) – Cases of traumatic onycholysis	13 (38.24%)		
Distal irregular termination	29 (21.5%)		26 (38.81%)		

Limitations of Study

At present onychoscopy is still a technique to support the diagnosis. Details like type of causative fungus, which is important in deciding treatment, cannot be derived by this method. The dermoscopic findings observed in our study population were not compared with age and sex-matched controls. The study population did not include homogeneous groups of different clinical subtypes of onychomycosis. The onychoscopic patterns studied were extensively limited only to DLSO and TDO. Our study included cases which were KOH/culture/biopsy positive. Nail plate biopsy, which is considered to be the gold standard in the diagnosis of onychomycosis, could not be done for all cases due to feasibility and financial issues.

Conclusions

Our study results show that nail plate dermoscopy may be considered as a simple, quick, and inexpensive technique for increasing the diagnostic accuracy of onychomycosis when mycological investigations are not readily available. It can also be used as a screening technique to differentiate traumatic onycholysis and Tinea unguium as both have overlapping morphological features. The new patterns described in our study have to be tested for significance by conducting larger sample size studies.

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