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Original Article

Role of Dermoscopy in the Assessment of Onychomycosis

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ABSTRACT

Background: Onychomycosis is a common fungal infection of the nail caused by dermatophytes, non-dermatophytic molds, and yeasts, often presenting with varied clinical patterns that may mimic other nail disorders. Conventional diagnostic methods such as potassium hydroxide (KOH) examination and fungal culture, though standard, are time-consuming and may yield false-negative results. Dermoscopy (onychoscopy) has emerged as a rapid, non-invasive diagnostic tool that can aid in early detection and assessment of disease severity.

Objective: To evaluate the role of dermoscopy in the assessment of onychomycosis by identifying characteristic onychoscopic features, correlating them with clinical severity, and comparing findings with conventional diagnostic methods.

Methods: This cross-sectional observational study was conducted in the Department of Dermatology, Venereology and Leprosy at a tertiary care center over a period of 6 months. A total of 76 patients with clinically suspected onychomycosis fulfilling inclusion criteria were enrolled. Detailed history and clinical examination was done, followed by dermoscopic evaluation of the most severely affected nail using a handheld dermatoscope. Nail samples were collected for KOH mount and fungal culture. Onychoscopic features such as spiked pattern, jagged proximal edge, longitudinal striae, chromonychia, subungual hyperkeratosis, and ruins aspect were recorded. Disease severity was assessed using the Onychoscopy Severity Index (OSI). Statistical analysis was performed to determine correlations between dermoscopic findings, clinical severity, and mycological results.

Results: Among 76 patients, the mean age was 32.0 ± 14.75 years with slight male predominance (53.9%). Mixed onychomycosis (26.3%) was the most common subtype. Longitudinal striae (65.8%) and spiked pattern (63.2%) were the predominant dermoscopic features, with overall dermoscopy positivity of 89.5%. KOH and culture were positive in 57.9% and 52.6% of cases, respectively, while either test was positive in 80.3%. Significant correlations were observed between dermoscopic findings, clinical subtypes, and disease severity ($p < 0.05$).

Conclusions: Onychoscopy is a valuable, rapid, and non-invasive diagnostic adjunct in onychomycosis, with potential utility in early diagnosis and severity assessment. It may help guide clinical decision-making while awaiting confirmatory laboratory investigations.

Keywords*: Onychomycosis; Onychoscopy; Dermoscopy; Nail disorders; Diagnostic accuracy.*

INTRODUCTION

Onychomycosis is a common fungal infection of the nail unit caused by dermatophytes, non-dermatophytic molds, and yeasts[1]. It accounts for a significant proportion of nail disorders encountered in dermatological practice and has a reported prevalence of approximately 0.5–5% in India[1,2].

Accurate and early diagnosis of onychomycosis is essential, as treatment typically involves prolonged systemic antifungal therapy, which may be associated with adverse effects and requires confirmation before initiation[5]. However, the condition often mimics other nail disorders such as psoriasis, lichen planus, and traumatic dystrophy, making clinical diagnosis challenging[5].

Conventional diagnostic methods include direct microscopic examination using potassium hydroxide (KOH) mount, fungal culture, and histopathological examination with periodic acid–Schiff staining[12]. Although these techniques are considered standard, they are limited by variable sensitivity, time consumption, and the possibility of false-negative results[12,13].

The condition may present with diverse clinical patterns such as distal lateral subungual onychomycosis, proximal subungual onychomycosis, superficial onychomycosis, and total dystrophic onychomycosis[7,8].

In recent years, dermoscopy of the nail, also known as onychoscopy, has emerged as a valuable non-invasive, rapid, and office-based diagnostic tool[9,10]. It allows visualization of subsurface morphological features not visible to the naked eye. Characteristic onychoscopic features described in onychomycosis include spiked or jagged proximal edges, longitudinal striae, chromonychia, subungual hyperkeratosis, distal irregular termination, and the "ruins" pattern[9–11]. These features have shown promising correlations with specific clinical subtypes and may aid in differentiating onychomycosis from other nail disorders[9,10].

Furthermore, dermoscopy may provide insights into the extent and severity of nail involvement. The Onychomycosis Severity Index (OSI), which incorporates parameters such as area of involvement, proximity to the nail matrix, presence of dermatophytoma, and degree of subungual hyperkeratosis, offers a standardized method for grading disease severity[14]. However, there is limited literature correlating dermoscopic findings with severity indices and mycological confirmation, particularly in the Indian population[6].

Given these considerations, the present study aims to identify characteristic onychoscopic patterns, correlate them with clinical severity, and compare dermoscopic findings with conventional diagnostic methods such as KOH mount and fungal culture.

METHODS

Study Design and Setting

This was a cross-sectional observational study conducted in the Department of Dermatology, Venereology and Leprosy at Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, after obtaining approval from the Institutional Ethics Committee.

Study Participants

A total of 76 adult patients (≥18 years) presenting with clinical features suggestive of onychomycosis and willing to provide informed consent were included in the study. Patients who had received topical antifungal treatment within the preceding 3 months, those with nail changes due to non-infective causes such as psoriasis, lichen planus, or trauma, and patients with systemic conditions causing nail dystrophy were excluded.

A detailed history, including duration of disease, associated symptoms, comorbidities, history of trauma, personal hygiene practices, and prior treatment, was obtained. All findings were recorded in a predesigned case record form.

Clinical Examination

A thorough clinical examination of all fingernails and toenails was performed after cleansing with alcohol. The number of nails involved, laterality, and type of onychomycosis—distal lateral subungual, proximal subungual, superficial, total dystrophic, or mixed—were documented. Clinical photographs of the affected nails were captured and stored for analysis.

Onychoscopy

Onychoscopic evaluation was performed using a handheld dermatoscope (DermLite DL5) at 10× magnification. A single representative nail, preferably the most severely affected, was selected for examination in each patient. Both polarized and non-polarized modes were used as required, with ultrasound gel serving as the interface medium.

Onychoscopic features assessed included spiked pattern, jagged proximal edge, longitudinal striae, subungual hyperkeratosis, chromonychia, distal irregular termination, ruins aspect, leukonychia, and lamellar microsplitting. Images were captured and documented systematically.

Sample Collection for Direct Microscopy and Culture
Samples were collected from the most affected area of the nail after cleansing with alcohol to minimize contamination. Depending on the clinical presentation, nail clippings, nail plate scrapings, and subungual debris were obtained.

One portion of the specimen was subjected to direct microscopic examination using 20% potassium hydroxide (KOH) mount to identify fungal elements such as hyphae, spores, or yeast cells. The remaining sample was inoculated onto Sabouraud dextrose agar with and without cycloheximide and incubated at 25–37°C. Cultures were examined periodically for up to 4 weeks before being considered negative.

Outcome Measures
The primary outcome measures included the frequency and pattern of dermoscopic findings in clinically diagnosed cases of onychomycosis and their correlation with clinical severity and laboratory results.

Disease severity was assessed using the Onychomycosis Severity Index (OSI), which included parameters such as the extent of nail involvement, proximity to the nail matrix, presence of dermatophytoma, and degree of subungual hyperkeratosis. Based on OSI scoring, cases were categorized as mild, moderate, or severe.

Statistical Analysis
All data were entered into Microsoft Excel and analyzed using statistical software SPSS. Quantitative variables were expressed as mean ± standard deviation, and qualitative variables were expressed as frequencies and percentages.
Associations between dermoscopic findings, clinical subtypes, and mycological results were analyzed using the Chi-square test. A p-value of <0.05 was considered statistically significant.

RESULTS
Demographic Profile
A total of 76 patients with clinically suspected onychomycosis were included in the study.

The mean age of the study population was 32.0 ± 14.75 years. The majority of patients belonged to the 21–30 years age group (35.5%), followed by those aged <20 years (21.1%).

There was a slight male predominance, with 41 males (53.9%) and 35 females (46.1%), yielding a male-to-female ratio of 1.17:1.

Clinical Profile
The mean duration of disease was 34.6 ± 16.5 months, indicating a chronic course in most patients.

The mean number of nails involved per patient was approximately 8 nails, reflecting extensive disease involvement.
Toenail involvement was more common (98.7%) compared to fingernail involvement (86.8%).

With respect to laterality, bilateral involvement was the most common (47.4%), followed by right-sided (26.3%) and left-sided (26.3%) involvement.

Clinical Types of Onychomycosis
The most common clinical subtype observed was mixed onychomycosis (26.3%), followed by proximal subungual onychomycosis (19.7%), distal lateral subungual onychomycosis (18.4%), and superficial white onychomycosis (18.4%). Total dystrophic onychomycosis (17.1%) was the least common subtype.

Dermoscopic Findings
Onychoscopic evaluation revealed multiple characteristic features. The most frequently observed dermoscopic finding was longitudinal striae (65.8%), followed by spiked pattern (63.2%), chromonychia (59.2%), and jagged proximal edges (55.3%).

Other commonly observed features included distal irregular termination (52.6%) and subungual hyperkeratosis (50.0%). Less frequent findings included ruins aspect (39.5%), lamellar splitting (28.9%), and leukonychia (23.7%).

Overall, dermoscopy was positive in 89.5% of cases, defined by the presence of at least one characteristic dermoscopic feature.

Mycological Results
Direct microscopic examination using KOH mount was positive in 44 patients (57.9%), while fungal culture was positive in 40 patients (52.6%).

Both KOH and culture were positive in 23 patients (30.3%), whereas either test was positive in 61 patients (80.3%), which was considered the diagnostic gold standard.

Diagnostic Comparison
Dermoscopy demonstrated the highest positivity (89.5%) compared to KOH mount (57.9%) and fungal culture (52.6%). This indicates that dermoscopy may serve as a highly sensitive, rapid screening tool in the diagnosis of onychomycosis.

Correlation Between Dermoscopic Findings and Clinical Type
A significant association was observed between specific dermoscopic features and clinical subtypes of onychomycosis. The spiked pattern and jagged proximal edge were more commonly associated with distal lateral subungual onychomycosis, whereas the ruins aspect was predominantly seen in total dystrophic onychomycosis.

These associations were found to be statistically significant ($p < 0.05$).

Correlation Between Dermoscopic Findings and Disease Severity
Based on the Onychoscopy Severity Index (OSI), cases were categorized into mild, moderate, and severe disease.

Features such as subungual hyperkeratosis and ruins aspect were more frequently observed in severe cases, whereas longitudinal striae and spiked patterns were more common in mild-to-moderate disease.

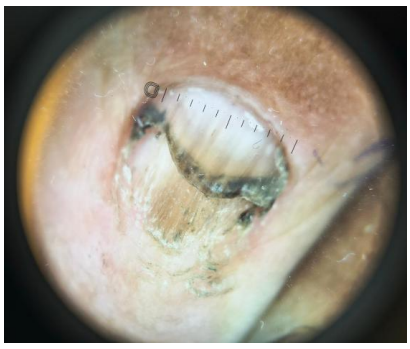
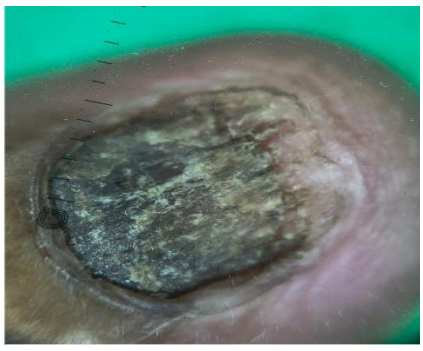
This correlation was statistically significant ($p < 0.05$), indicating that dermoscopy may be useful in assessing disease severity.

Clinical and Mycological Correlation
Higher mycological positivity was observed in cases with total dystrophic and mixed onychomycosis, suggesting that advanced disease is associated with increased fungal load.

However, dermoscopy remained positive even in cases with negative mycological tests, highlighting its role as an adjunct diagnostic tool.

Images



DISCUSSION
In the present study, the majority of patients belonged to the younger age group of 21–30 years, with a mean age of 32.0 years. A slight male predominance was observed, with 53.9% males and 46.1% females. Similar findings have been reported by Kaur R et al.[1], who observed that onychomycosis is more common in young and middle-aged adults, with a male preponderance. Likewise, Gupta AK et al.[2] also reported higher prevalence in males, attributing it to increased

occupational exposure, trauma, and outdoor activities. However, some studies such as Veer P et al.[3] have shown a more balanced gender distribution.

The higher prevalence in younger individuals may be attributed to increased exposure to trauma, occlusive footwear, and humid conditions, facilitating fungal invasion[4].

Toenail involvement (98.7%) was more common than fingernail involvement (86.8%), consistent with Elewski BE et al.[5]. Similar findings have been reported by Das NK et al.[6].

Traditionally, distal lateral subungual onychomycosis is the most common subtype[7,8]; however, mixed patterns were predominant in our study, likely due to delayed presentation.

Dermoscopy revealed characteristic findings such as spiked pattern and longitudinal striae, consistent with Piraccini BM et al.[9] and De Crignis GS et al.[10]. The ruins pattern was associated with advanced disease, as described by Nakamura RC et al.[11].

Dermoscopy showed higher diagnostic positivity compared to KOH and culture, similar to studies by Jesudanam MT et al.[12] and Bhat YJ et al.[13].

Correlation of dermoscopic features with severity further supports findings by Lipner SR et al.[14], suggesting dermoscopy as both a diagnostic and prognostic tool.

Limitations

The present study has certain limitations. It was a single-center study with a relatively small sample size, which may limit the generalizability of the findings. Additionally, histopathological confirmation with periodic acid–Schiff staining was not performed in all cases. Inter-observer variability in dermoscopic interpretation was also not assessed.

CONCLUSION

Dermoscopy (onychoscopy) is a valuable adjunct in the diagnosis and assessment of onychomycosis, demonstrating high sensitivity and significant correlation with clinical subtypes and disease severity. It can serve as a rapid screening tool in routine practice, especially while awaiting confirmatory laboratory results.

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