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Case Report

A case of fungal melanonychia in an immunocompetent individual due to dematiaceous fungi

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Abstract

Dematiaceous fungi, often found in soil and organic debris from both animals and plants, are known to cause cutaneous and subcutaneous infections, particularly in immunocompromised individuals. Although typically saprophytic and considered laboratory contaminants, these fungi can also infect healthy individuals.

Fungal melanonychia, an uncommon manifestation of onychomycosis. We present here a case of fungal melanonychia in a 43-year-old healthy woman with no prior nail trauma, presenting with toenail discoloration. The fungus was identified through direct microscopy and fungal culture. The patient showed clinical improvement following pulsed itraconazole therapy.

Keywords: Melanonychia, Onychomycosis, Dematiaceous fungi

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1. Introduction

Onychomycosis is a fungal infection of the nail caused by dermatophytes, non-dermatophytes, molds, and yeast.[1] It is a prevalent nail plate infection that leads to discoloration, thickening, and detachment from the nail bed.[2] Various clinical patterns of onychomycosis have been recognized. Melanonychia, the most common type of chromonychia, accounts for half of all cases, but fungal melanonychia is the rarest form of onychomycosis. This condition is characterized by dark pigmentation of the nail plate due to melanin production by specific fungi,[3] such as 1.8-hydroxynaphthalene melanin. While melanocytes are present in both the nail matrix and bed, most remain inactive.[4] Melanocyte activation following trauma, infection or inflammation initiates melanin synthesis and then the melanin rich melanosomes are transferred to the differentiating matrix cells through dendrites. These matrix cells migrate distally and eventually become nail plate onychocytes resulting in visible pigmentation of nail plate.[5] Melanin is a significant virulence factor[6] in various fungal pathogens. Typical signs of fungal melanonychia include brown to black bands and subungual hyperkeratosis with or without periungual inflammation. Both dematiaceous and non-dematiaceous fungi, including *Trichophyton*, *Scytalidium*, *Alternaria*, *Curvularia*, and *Exophiala*,[7] can cause fungal melanonychia. Most cases are due to dermatophytes, with a small percentage caused by dematiaceous fungi, which inhabit soil and decaying plant material.[8] These fungi are fast-growing, widely distributed, and often unnoticed in laboratories. They can cause various diseases, particularly in immunocompromised individuals.[9] As saprophytes, these fungi thrive in soil and on healthy skin, necessitating strict diagnostic criteria to confirm their pathogenic role and avoid confusion with commensals or contaminants.[10] So, we hereby report a rare case of fungal melanonychia due to dematiaceous fungi in an immunocompetent individual without any underlying illness.

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2. Case Report

A 43-year-old female visited the OPD with a concern of melanoma as she was presented with pigmentation of the toe nails. She had 6-8 months history of discoloration of both greater and second toe of both the feet. The physical examination of digits revealed diffused melanonychia moving from distal to lateral end occupying more than 50% of the nail plate surface without any onycholysis as clear from the **Figure 1**. The nail plates also showed thickening. The patient denied any nail trauma or dystrophic nail abnormality prior to onset of the present lesion and she was not taking any medication. There was no pain or inflammation and no history of systemic disease. On palpation there was no lymph node enlargement. The laboratory investigations involving complete blood count, liver function test and renal function test was done. The clinical presentation was suggestive of diagnosis of fungal melanonychia, for which mycological analysis of the nail fragment was advised.

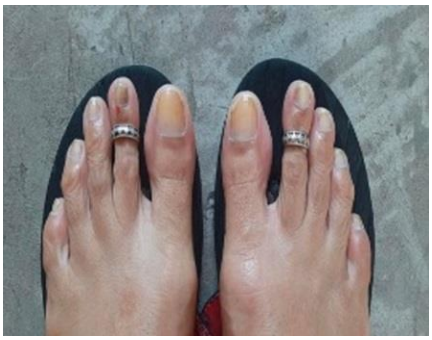

Figure 1: Clinical Picture of the diseased nail showing discoloration

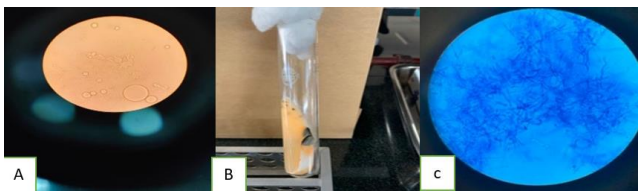

Figure 2: a: Direct microscopy of the diseased nail showing branched septate hyphae (KOH 40% at 400X); **b:** Fungal culture of the diseased nail on SDA; **c:** LPCB staining of the fungal growth on SDA showing septate hyphae with conidia.

The subungual scraping of the lesion with the help of sterile scalpel was done to obtain the sample which was collected in a dry black paper. One portion of the sample was put in 40% KOH and other part was used for fungal culture. For fungal culture two tubes of SDA were inoculated, one with cycloheximide and other without cycloheximide. Both the tubes were incubated at 25^0C for 15 days. For final identification lactophenol cotton blue staining was done from the fungal growth obtained on the SDA. KOH wet mount revealed numerous branching hyphae (**Figure 2**a). No growth occurred on SDA with cycloheximide, but blackish-brown colonies with hairy growth were observed on SDA without cycloheximide (**Figure 2**b). LPCB staining showed branched septate hyphae with conidia (**Figure 2**c).

3. Discussion

Melanonychia results from increased melanin deposition in the nail matrix. Studies, such as those by Simona et al presented in their study that majority of the pigmented disturbances from the nails are due to fungal infections and/or subungual hematomas that are benign lesion with esthetic injury only.[11] Melanocytic proliferation is observed with benign and malignant pigmented lesions. Melanocytic activation is associated with many etiologies including chronic local trauma, dermatological conditions, endocrine disorders, iatrogenic causes, infection, medications, nutritional deficiencies, pregnancy and being related racially. In some circumstances of fungal melanonychia fungi can synthesize the melanin pigment.[12] Accurate mycological diagnosis guides antifungal treatment and prevents complications.[13] Identification of the fungal agents directs the treatment plan, as well as prognosis. KOH preparation of the nail fragments revealed fungal hyphae with branching. Fungal culture on SDA with cycloheximide yielded no fungal growth whereas on SDA without cycloheximide fungal growth was obtained. KOH preparation and fungal culture both combines to increase the sensitivity of diagnosis to 85.8%.[14]

Most cases involve dermatophytes, but a few are due to other fungi, highlighting the need for precise fungal cultures to identify the etiological agent. Fungal melanonychia should be differentiated from subungual melanoma, a severe condition, as they can appear similar. In cases of fungal melanonychia, determining the specific fungal species is critical. Melanonychia is often mistaken for subungual melanoma due to similar clinical presentations, including brown-black pigmentation and heterogenous patterns.[15] However, the presence of fungi can be confirmed through KOH preparation and fungal cultures, enhancing the sensitivity of diagnosis to approximately 85.8%. While most fungal melanonychia cases are caused by dermatophytes, dematiaceous fungi can also be involved, necessitating careful analysis to ensure accurate identification and appropriate treatment.[16] The challenge posed by dematiaceous fungi lies not in their isolation and identification but in the assessment of their pathogenic role. The patient received oral pulse itraconazole at a dose of 400 mg/day/week for four months, resulting in complete remission of the lesion. Pulsed therapy with itraconazole has been effective in treating fungal infections, particularly onychomycosis, due to its ability to concentrate in the nail bed and maintain antifungal activity over an extended period.

4. Conclusion

This case underscores the importance of considering fungal melanonychia in the differential diagnosis of melanonychia. Accurate mycological identification is crucial to guide

appropriate antifungal therapy and prevent the misdiagnosis of subungual melanoma. Given the potential for serious health implications, distinguishing between fungal melanonychia and subungual melanoma is essential for effective treatment and patient outcomes. This report highlights the need for heightened awareness and careful diagnostic practices in cases presenting with nail discoloration.

5. Conflict of Interest

None.

6. Source of Funding

None.

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