

Nail Fungus (Onychomycosis)

Onychomycosis is a common fungal infection that primarily affects the toenails and is caused by dermatophytes, yeasts, and non-dermatophyte molds. The infection leads to visible nail changes, including discoloration, thickening, and crumbling, which can cause both cosmetic concerns and discomfort. It is particularly prevalent among the elderly and poses a significant dermatological challenge due to its chronic nature and potential for recurrence. This article discusses the pathogenesis, diagnosis, clinical signs, and available treatment options for onychomycosis.

Pathogenesis and Etiology

Onychomycosis is a fungal infection that affects the nails, usually caused by different types of fungi. The most common cause is dermatophytes, such as *Trichophyton rubrum* and *Trichophyton mentagrophytes*. Yeasts like *Candida albicans* and molds such as *Fusarium* and *Scytalidium* can also cause the infection. Dermatophytes typically affect the nail plate, leading to thickened nails, buildup of skin under the nail, and nail discoloration, which is the most common form of the condition called distal subungual onychomycosis (DSO).

Candida onychomycosis, which affects the area around the base of the nail, is more common in people with weakened immune systems, diabetes, or those who frequently expose their hands to moisture, such as healthcare workers or individuals whose jobs require them to keep their hands in water for long periods. Non-dermatophyte mold onychomycosis is less common but is seen more often in people with weakened immune systems.

Clinical Presentation

The clinical signs of onychomycosis can vary depending on the type of infection and the organism responsible. The most common forms of onychomycosis include:

- **Distal Subungual Onychomycosis (DSO):** This is the most common type, starting at the tip of the nail and spreading toward the base. It is characterized by thickening of the nail, yellow or white discoloration, and separation of the nail from the nail bed (onycholysis).
- **Proximal Subungual Onychomycosis (PSO):** Often caused by *Candida* species, this type begins at the base of the nail (proximal nail fold) and spreads outward. It can cause inflammation, redness, and destruction of the nail.
- **White Superficial Onychomycosis (WSO):** This form is marked by white, powdery patches on the surface of the nail, usually caused by dermatophytes.

- **Endonyx Onychomycosis:** In this variant, the fungus infects the nail bed without affecting the nail plate, leading to opaque, discolored nails and a loss of the nail's natural shine.

In addition to visible changes in the nails, patients may experience discomfort or pain, especially if the infection causes thickening and pressure on surrounding tissues. Onychomycosis can also lead to cosmetic concerns, causing social embarrassment and psychological distress for many individuals.

Diagnosis

The diagnosis of onychomycosis relies on clinical examination and is supported by laboratory testing. While signs such as nail thickening, discoloration, and crumbling suggest onychomycosis, they are not enough to confirm the condition, as they can also be seen in other nail disorders like psoriasis or trauma.

- **Microscopic Examination and Culture:** Nail scrapings or clippings are collected from the affected area and examined under a potassium hydroxide (KOH) preparation to identify fungal elements. Cultures may also be taken to identify the specific organism causing the infection.
- **Fungal PCR (Polymerase Chain Reaction) and DNA Sequencing:** These advanced molecular methods provide higher sensitivity and specificity in identifying fungal species, particularly in complex cases or when standard cultures don't yield conclusive results.
- **Wood's Lamp Examination:** Although less commonly used today, this method can sometimes help detect fungal infections, such as tinea unguium, by observing fluorescence under UV light.

Treatment Options

The treatment of onychomycosis aims to eliminate the fungal infection, restore nail appearance, and prevent recurrence. The approach to treatment depends on the type of fungus, the severity of the infection, and the patient's overall health. The primary treatment options include topical treatments and systemic antifungal therapies.

- **Topical Treatments:**
 - **Topical Antifungals:** Mild to moderate cases of onychomycosis are often treated with antifungal creams or solutions, such as terbinafine (Lamisil), ciclopirox (Penlac), and efinaconazole (Jublia). These are applied directly to the affected nails but may not be as effective for more extensive infections or those involving the nail matrix.
 - **Topical Combination Therapy:** Combining topical antifungals with other substances, such as urea, may improve the ability of the antifungal to penetrate the nail and improve treatment outcomes.
- **Systemic Antifungal Therapy:**

- **Oral Antifungals:** For moderate to severe cases, oral antifungal medications like terbinafine and itraconazole (Sporanox) are commonly prescribed. Terbinafine is the first-line treatment due to its high success rate, especially for distal subungual onychomycosis.
- **Fluconazole:** This oral antifungal is effective against yeast infections, though it is less commonly used for dermatophyte-related onychomycosis.
- **Griseofulvin:** Once a standard treatment, griseofulvin is now considered a second-line option because more effective alternatives like terbinafine are available.
- **Laser Therapy:** Laser treatments, such as Nd:YAG laser, are emerging as alternatives, especially for patients who cannot tolerate oral antifungals or for recurrent infections. The laser targets fungal cells in the nail and surrounding tissue, using thermal energy to destroy the fungus.
- **Nail Avulsion and Surgical Treatment:** In cases of severe or persistent infections, surgical removal of the affected nail may be necessary to allow better antifungal treatment penetration. This can involve partial or total nail removal, followed by topical antifungal therapy to promote healing and prevent recurrence.

Prevention and Prognosis

Preventing onychomycosis involves maintaining good foot hygiene, such as keeping nails clean and dry, avoiding tight shoes, and using antifungal powders or sprays in public spaces like swimming pools, gyms, and locker rooms. People with diabetes or weakened immune systems are at higher risk and should take extra precautions to avoid infection.

The prognosis for onychomycosis largely depends on early and effective treatment. Prompt intervention can help prevent further nail damage and improve the cosmetic appearance of the nails. While oral antifungal medications offer the highest cure rates, the infection can often recur, particularly in individuals with diabetes or compromised immune systems. For these patients, ongoing treatment or maintenance therapy may be required to prevent relapse.

Conclusion

Onychomycosis is a common fungal infection that can significantly affect a patient's quality of life. Although advances in diagnostic methods and treatment options, including oral antifungals and laser therapy, have improved outcomes, recurrence of the infection remains a major challenge. Long-term management may be necessary for patients, especially those at higher risk of reinfection. Ongoing research into more effective treatments and preventive strategies is essential for better managing this chronic condition and improving patient care.

References

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