FUNGAL INFECTION OF THE NAIL

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Fungal infection of the nails is known as onychomycosis. Onychomycosis occurs commonly with increasing age. It may affect one or more nails of the fingers or toes but most often involves the great toenail.

Onychomycosis accounts for about 40 to 50 percent of nail dystrophies[1]. It is not purely a cosmetic problem as it can have significant negative effects on patients' emotional, social, and occupational wellbeing. Affected patients may experience diminished self-esteem and embarrassment in social and work situations.

Three different types of fungi may cause nail infections; either alone or in combination. These are dermatophytes, yeasts and non-dermatophyte moulds.

Tinea unguium refers to fungal infection of the nail plate caused specifically by dermatophytes. Dermatophytosis accounts for 90% of onychomycosis of the toenails and at least 50% of fingernail infections. These organisms produce an enzyme called keratinase, which allows them to invade keratinised tissue. Their keratophilic nature restricts their pathogenesis to the hair, skin and nails.

Dermatophytes, therefore, do not usually invade the deeper tissues of the body and cause mainly superficial infection. The most common type of dermatophyte affecting the nails is Trichophyton rubrum. Other dermatophytes include T. mentagrophytes, Epidermophyton and Microsporum.

Candida infection of the nail plate generally follows paronychia and starts near the nail fold / cuticle. The proximal nail fold appears red and swollen with damage to the cuticle. White, yellow, green or black discolouration appears on the surrounding nail and spreads. The nail may lift off the nail bed and is tender.

RISK FACTORS:

- Presence of Tinea pedis or Tinea manuum
- Immunosuppression (HIV, Diabetes Mellitus, advanced age, medications)
- Nail trauma including nail biting
- Hyperhidrosis
- Poorly fitting shoes
- Extensive use of broad spectrum antibiotics
- Increased use of damp spaces (gym, swimming pool) by large number of people
- Peripheral vascular disease.

Moulds causing nail infection include Scopulariopsis brevicaulis and Fusarium species.

Fungi may be transmitted via direct contact with an infected person or fomite (upholstery, clothing, etc). All types of fungi may spread from the nail to surrounding tissues or vica versa. Tinea unguium often results from untreated tinea pedis or tinea manuum.

Fungal infection of the nail may start proximally, distally or laterally as a whiteyellow streak or patch. Scaling under the nail may occur. This is called subungual hyperkeratosis and may spread to affect the whole nail. Onycholysis may ensue where the distal edge of the nail lifts off the nail bed. Crumbling and complete destruction of the nail may be the end result.

Children have a lower prevalence of onychomycosis as their nails grow faster and have a smaller surface area for invasion. They also have a lower prevalence of tinea pedis, which lowers their risk of nail infection.

It is not always possible to diagnose onychomycosis on appearance alone as clinical features of fungal nail infection may mimic a number of other nail disorders. Investigation may be necessary to confirm the diagnosis, identify the organism and select the most appropriate treatment.

Expense, prolonged duration and potential adverse effects of treatment are all motivating factors to obtain confirmatory diagnosis of fungal nail infections.

Nail specimens should be taken for microscopy, culture and/or histology prior to initiation of any anti-fungal agent in order to successfully identify fungus.

A potassium hydroxide (KOH) preparation may be used as a simple bedside screening test that may confirm the presence of fungus. A solution of 20% KOH is most commonly used. The discoloured surface of the nail should be scraped and some debris may be removed from under the free edge of the nail.

Samples are placed on a glass slide with KOH solution and gently heated over a Bunsen burner. The solution will slowly dissolve the nail cells, allowing fungal cells to be visualised. The slide should be examined under 40x magnification.

The presence of hyphae confirms the diagnosis of fungal infection. Nail scrapings should be sent to the laboratory in a sterile container if microscopy and culture are to be performed in the laboratory. Fungal culture allows the causative organism to be identified. It takes up to 3 weeks to obtain a result.

A negative mycological result does not rule out onychomycosis, as direct microscopy may be negative in up to 10% of cases and culture in up to 30%. It is preferable to routinely send specimens for direct microscopy and culture. The most sensitive diagnostic method is histologic examination of the clipped, distal free edge of the nail and attached subungual debris with Periodic acid-Schiff (PAS) stain[1].

As several nail disorders are indistinguishable from fungal infection of the nail, the following differential diagnoses should be considered:

- Psoriasis
- Mechanical injury
- Melanoma / nail bed tumour
- Bacterial infection of the nail.

Lichen planus, alopecia areata and eczema may also produce nail changes.

Psoriasis is the most common disorder to mimic onychomycosis. In psoriasis, nail involvement is usually accompanied by typical psoriatic skin lesions. However, in some cases skin lesions may be absent. A diagnosis of psoriasis is more likely in the presence of pitting on the nail surface and salmon-coloured areas of the nail referred to as the "oil drop" sign.

Green or black discolouration of the nail is usually an indicator of bacterial infection with the gram-negative organism, Pseudomonas aeruginosa.

TREATMENT

Fungal infection of the nails can be difficult to eradicate, with toenail infection having a lower cure rate. This is due to the hard, protective nail plate, which may limit absorption of topical agents, the slow growth rate of nails, and sequestration of pathogens between the nail bed and nail plate4.

Management includes topical therapy, oral anti-fungal agents and, more recently, laser treatment.

Topical monotherapy may be sufficient to reduce or cure the infection if less than 50% of the nail is affected, if less than 3 nails are involved and if the nail matrix is not involved5. Topical anti-fungal agents may be combined with systemic antifungal medication for improved efficacy. Cure usually requires an oral antifungal for several months. Topical lacquers are usually applied once a week.

They should be applied to a cleaned nail after it has been roughened with an emery board. Extra lacquer should be applied under the distal edge of the nail.

Oral therapy is needed when the criteria for topical monotherapy are not met. Non-drug management for onychomycosis is also recently available and avoids the adverse events of systemic antifungals. Lasers can elicit fungicidal effects and laser studies to date do provide preliminary evidence of clinical improvement in toenail onychomycosis6, however, cure rates reported do not exceed those found with traditional therapies. Laser options include Nd:YAG laser, Ti:Sapphire modelocked laser and Diode Laser. MC

References available on request.