A Review of the Diagnosis and Management of Fungal Skin and Nail Infections

D’Arcy Little, MD, CCFP, Lecturer and Academic Fellow, Department of Family and Community Medicine, University of Toronto, Toronto, ON.

SKIN DISORDERS

Fungal Skin Infections

Normally, the dryness and regular shedding of the skin’s keratin layer prevents microbial colonization. However, skin trauma, irritation or maceration may provide a route of infection. Microsporum, Trichophyton and Epidermophyton species are the most common fungal causes of skin infections. However, non-dermatophyte fungi such as Malassezia furfur in tinea (pityriasis) versicolor and Candida species, in conditions such as perleche, vulvovaginitis or balanitis, are also potential causes.

The physical examination is often classical in patients with a dermatophytosis. The superficial skin inflammatory response is usually greater at the edge of the lesion with evidence of central clearing. This feature helps distinguish dermatophytooses from other papulosquamous eruptions such as psoriasis and lichen planus, which tend to be more uniform. However, previous topical corticosteroid use can alter this typical appearance. The location of the lesion is also a diagnostic clue—dermatophytooses do not cause mucosal involvement, whereas candidal infections can.

There are several diagnostic methods available for dermatophyte infections. Potassium hydroxide microscopy can be used to visualize the characteristic fungal hyphae and confirm the diagnosis. Fungal culture is slow and expensive but is useful to confirm the diagnosis, especially of onychomycosis when long-term treatment is being considered. Wood’s (ultraviolet) light may be useful for diagnosing tinea (pityriasis) versicolor, which fluoresces a pale yellow-white. Most other dermatophytes in North America do not fluoresce.

Tinea Corporis

Tinea corporis, commonly known as ringworm, commonly presents as single or multiple annular scaly lesions with central clearing and an elevated inflammatory edge. The border may contain pustules or papules. Itching may also be present. The suspected clinical diagnosis can be confirmed with potassium hydroxide (KOH) examination of skin scrapings taken from the active edge of the lesion. Several differential diagnoses must be entertained, including nummular eczema, pityriasis rosea, Lyme disease, tinea versicolor and psoriasis. Treatment involves the use of topical antifungal creams and decreasing excessive skin moisture. More widespread infections may require systemic treatment.

Tinea Cruris

Frequently referred to as jock itch, this dermatophyte infection of the groin is more frequent in men and is often associated with tinea pedis. Risk factors include high temperature, high humidity and occlusion from wet or tight-fitting clothing. Classically the infection involves the medial thighs proximally and may extend to the buttocks and abdomen, but the scrotum tends to be spared. Frequently there is maceration and pustules or vesicles at the edge of a red, scaling lesion with raised edges. The
Fungal Skin and Nail Infections

condition must be distinguished from candidal intertrigo, erythrasma, mechanical intertrigo and seborrheic dermatitis.4,5 Treatment includes topical antifungals. Adjunctive treatment with a low-dose corticosteroid may be beneficial for the first few days.1 Keeping the affected area dry is critical to avoid recurrence.

**Tinea Pedis**

Tinea pedis is commonly referred to as athlete’s foot. The interdigital form is the most common presentation and involves fissuring, maceration and scaling of the interdigital spaces of the lateral toes. The condition is commonly associated with itching and burning. The infection may be complicated by streptococcal cellulitis.1 Treatment includes application of antifungal cream in the web spaces. Systemic therapy may be needed for persistent cases. Twice-daily topical terbinafine results in both a higher as well as quicker cure rate than twice-daily clotrimazole.6,7 Topical terbinafine is also more cost-effective than imidazole or ciclopirox cream.8 If cellulitis is a complication, a systemic or topical antibiotic against streptococcus is needed.1 The prevention of reinfection involves treating infected nails, disinfecting footwear, wearing absorbent socks and wearing non-occlusive shoes.1

**Tinea Unguium (Onychomycosis)**

Tinea unguium is a dermatophyte infection of the nail and is a subset of onychomycosis (Figure 2). Onychomycosis may also be caused by yeast and molds.1,9 Risk factors for tinea unguium include aging, diabetes, poor-fitting shoes and tinea pedis.1 Because only 50% of nail dystrophies are caused by fungus, the diagnosis should be confirmed with KOH preparation or fungal culture and histology prior to treatment.2 This is reasonable due to the fact that treatment of onychomycosis requires expensive, prolonged treatment (three to four months for fingernail infections, and four to six months for toenail infections).1,2,10,11 Traditionally, onychomycosis treatment has been difficult. Topical agents have a low rate of efficacy. Cure rates with ciclopirox nail lacquer used daily over 48 weeks range from 29–47%.12 Oral griseofluvin must be continued for 12–24 months.1 It has a narrow spectrum complicated by the need for long courses and a high relapse rate.2 Oral ketoconazole is more effective, but is associated with a risk of hepatotoxicity.2,13 Treatment of fungal nail infections may not always be necessary since the toxicity and expense of oral medications may outweigh their benefit. Triazole and allylamine antifungal agents have largely replaced these other agents.2 Terbinafine (Lamisil) and itraconazole (Sporanox) are the most widely used (Figure 1). They are improvements in that they offer prompt penetration of the nail and nail bed and persist in the nail for months after discontinuing therapy. In addition, they are generally safe.2,14,15 However, both terbinafine and itraconazole are metabolized by the liver, and potential drug interactions must be considered.2 Adverse

### Figure 1:

**Clinical Presentation and Treatment of Tinea Corporis**

Ringworm lives on the dead tissue of skin, hair, and nails. It commonly presents a single or multiple annular, scaly lesion with central clearing and an elevated, inflammatory edge. The border may contain pustules or papules.

### Treatment involves the use of topical antifungal creams

<table>
<thead>
<tr>
<th>Allylamines</th>
<th>Terbinafine (Lamisil) a 1% cream or solution used once or twice daily.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imidazoles</td>
<td>Clotrimazole (Lotrimin) a 1% cream, solution or lotion used once or twice daily.</td>
</tr>
<tr>
<td></td>
<td>Ketoconazole a 1% cream used once daily.</td>
</tr>
<tr>
<td></td>
<td>Nizoral a 1% shampoo used twice weekly.</td>
</tr>
<tr>
<td></td>
<td>Miconazole (Micatin) a 2% cream, spray, lotion or powder used twice daily.</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Ciclopirox (Loprox) a 1% cream or lotion used twice daily.</td>
</tr>
<tr>
<td></td>
<td>Tolnaftate (Tinactin) a 1% cream, solution or powder used twice daily.</td>
</tr>
</tbody>
</table>
Figure 2: Clinical Presentation and Differential Diagnosis of Tinea Unguium

- Thickening and discoloration of nail and separation of nail plate
- Transverse layering and splitting of nail

Fungal hyphae (KOH stain)

- Nail plate
- Cuticle
- Lunula
- Hyponchium
- Nail root
- Nail matrix

dermatophyte bacteria
effects of terbinafine include headache, rash, and GI upset. Terbinafine has been implicated in the treatment of cholestatic hepatitis, blood dyscrasias and Stevens-Johnson syndrome. Liver enzymes and a CBC should be obtained prior to drug initiation and every four to six weeks during treatment. Liver enzyme monitoring is also recommended every four to six weeks for itraconazole treatment. Mycological and clinical cure rates for toenail infections are similar for 12 weeks of treatment with itraconazole (200mg per day) and terbinafine (250mg per day). Itraconazole can also be used in “pulse” therapy (200mg taken twice daily for one week per month, with the treatment repeated for two to three months). This has a success rate similar to continuous therapy and liver enzyme monitoring is not required.

**Conclusion**

This article has reviewed the basics of fungal skin and nail diagnosis and treatment.

No competing financial interests declared.

**References**