

Fungal infections of the skin a guide for GPs

Fungal infections of the skin are a common diagnostic and therapeutic problem seen in general practice. Over-the-counter availability of all antifungal preparations has increased the need for GPs to be aware of partially treated or inappropriately treated fungal infections.

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The recent allocation of all topical antifungals to an over-the-counter (OTC) availability has led to increasing numbers of patients presenting to GPs incompletely treated or incorrectly diagnosed as having 'ringworm' or 'tinea'. In addition, the growing number of people who are immunosuppressed has added to the reservoir of anthropophilic or human-based fungal infection. There is a need, therefore, for GPs to be aware of the difficulties in diagnosing fungal infections of the skin, the important aspects of effective topical treatment and when to use systemic treatments.

What are the forms of fungal skin infections?

Traditionally, dermatophyte infection of the skin has been subdivided by body region. Tinea capitis and tinea corporis are now less common, with tinea pedis, tinea unguium and tinea cruris being the most common forms of fungal infection seen in everyday practice.

Tinea capitis

Ringworm of the scalp caused by the animal dermatophyte, *Microsporum canis*, – typically with

broken off hairs and scale at the base (Figure 1) and fluorescing under Wood's ultraviolet light – is much less common than it used to be. It still occurs, however, in prepubertal children.

In most western urban environments, *Trichophyton tonsurans* is the most common cause of scalp ringworm, occurring in both children and adults. Although it may be associated with hair loss, this is not always the case, and psoriasiform scaling may be the most obvious manifestation (Figure 2). Worldwide its incidence is highest in the black population, and it is the most common form of scalp ringworm seen in Australian Aborigines. Although its incidence is increasing in Australia, it has not reached that seen in other western urban environments.

Tinea corporis

Tinea corporis (Figures 3 and 4) is a fungal infection involving the trunk. It can occur as an acute scaling circinate rash in children. In adults it is much more gradual in its evolution and nearly always associated with pre-existing involvement in the groin or natal cleft or involvement elsewhere on the body.

IN SUMMARY

- Increased availability of antifungals means that GPs will see more patients partially treated for, or incorrectly diagnosed with, fungal disease.
- Beware of diagnostic pitfalls, including ring-shaped lesions that usually are not fungal and lesions that are altered by treatment.
- Topical therapy often fails because of insufficient treatment time, inadequate area of application, involvement of hair follicles and difficult-to-treat areas, such as the plantar surface of the foot.
- Rural practitioners should be aware of infection with animal- or soil-based fungi that produce a more dramatic inflammatory reaction in humans (kerion).

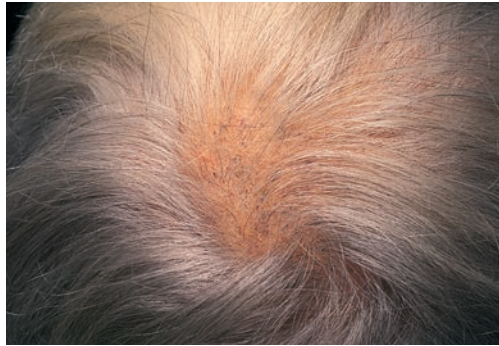


Figure 1 (far left). Tinea capitis in a child caused by *Microsporum canis*.
Figure 2 (left). Tinea capitis in an adult caused by *Trichophyton tonsurans*.



Figure 3 (far left). Tinea corporis.
Figure 4 (left). Tinea corporis with extension from tinea cruris.



Figure 5 (far left). Tinea cruris.
Figure 6 (left). Tinea pedis of the plantar type.

Tinea cruris

Tinea cruris is common in men but relatively rare in women. This seems to be due to the environment provided by the scrotum (Figure 5). Tinea cruris is often associated with:

- topical corticosteroid use
- ineffective use of topical antifungals
- secondary changes, such as infection by other organisms or an irritant dermatitis.

Tinea pedis

Tinea pedis is the most common form of fungal infection in adults and almost always starts with interdigital infection. Infection may extend to involve the rest of the plantar skin, the dorsum near the toes, the instep and the heel. Longstanding



Figure 7. Tinea pedis of the bullous type.

forms often lead to infection of the nails (tinea unguium or onychomycosis).

The more general involvement of the foot may comprise only scaling and minimal erythema (Figure 6); however, vesiculation and even bullae (Figure 7) are quite common in patients who

continued



Figure 8. Onychomycosis of toenails secondary to tinea pedis.



Figure 9. Onychomycosis of fingernails secondary to tinea of the hand.



Figure 10. Extensive tinea in an unusual location.



Figure 11. Kerion in a keen gardener.

have periods of activity, particularly in the warm summer months.

Tinea pedis is rarely a symptomatic problem in childhood, although recent epidemiological investigations have questioned this. Childhood involvement may be an indication of a familial predisposition to dermatophyte infections, presumed to be a selective immunological defect.

Onychomycosis (tinea unguium)

The most common form of onychomycosis is distal toenail onychomycosis occurring in association with adjacent tinea pedis (Figure 8). A similar pattern of involvement on the fingernails is nearly always associated with adjacent tinea of the hand (Figure 9). Affected nails become whitish, brittle and crumbling, with underlying subungual hyperkeratosis.

How are fungal skin infections diagnosed?

Careful history taking is most helpful in diagnosing fungal infections of the skin. Patients may suggest the diagnosis themselves, noting the slow extension of the advancing outer border of the lesion with a tendency for central clearing, even in an unusual location (Figure 10). Lesions may show some follicular involvement in the clearing area.

Don't be put off by a history of failure to clear with repeated use of antifungal agents. As discussed below, inadequate treatment associated with the use of OTC preparations may be the explanation.

Diagnosis is best confirmed by direct microscopy of samples of the affected keratin, whether it be scale from the body or scale from the nail or scalp. For most areas, scrapings of affected scale from

the advancing outer border yields the highest number of positive results. For the scalp, affected hairs and scale should be taken. The current trend is towards removing the scalp scale with a toothbrush, particularly when involvement of the hair is not extensive. For nails, both the apparently infected nail and the underlying nailbed debris should be sampled, the more proximal the better.

What are the pitfalls in diagnosis?

Ring-shaped lesions that are not tinea

Most ring-shaped lesions are not tinea. Common annular lesions that are misdiagnosed as tinea include:

- discoid eczema
- the 'herald patch' in pityriasis rosea
- granuloma annulare
- psoriasis.

Ringworm 'rings' expand, whereas discoid eczema and pityriasis rosea tend to start 'big' and stay that way. A 'trial' of antifungal therapy is not recommended as partial treatment can impair correct diagnosis.

Tinea lesions altered by treatment

The appearance of tinea lesions can be altered by treatment. A classical example is tinea incognito in the groin caused by strong topical corticosteroid application. Regular use of an emollient may remove most of the scales in other areas too.

Fungal kerion

A very inflamed swelling that looks like a bacterial infection but does not respond to antibacterial therapy may be a fungal kerion. This is usually caused by an animal-based ringworm infecting a human, particularly around the head and neck (Figure 11). Rural practitioners should consider this possibility if presumed infective lesions are not responding to one week's appropriate antibiotic therapy. Hair and hair follicles are often involved, as with staphylococcal infection.

The diagnosis of fungal kerion (by demonstration of a positive scraping of an infected hair or some surface scale) may be difficult, and a trial of oral antifungal therapy may be justified. Specialist referral is often required as treatment may be prolonged, and destruction of deeper structures may lead to significant scarring.

Frequent relapsers

The small subgroup of patients whose skin infection recurs includes inadequately treated patients who are often self-treated. In such cases, examination of fungal scrapings is warranted to confirm the diagnosis.

Patients with a familial susceptibility to fungal infection or who are otherwise immunosuppressed may relapse despite apparently adequate OTC topical and/or systemic therapy. This group needs specialist referral.

What is the appropriate treatment? General measures

General treatment measures for fungal skin infections include isolation of likely infective sources and eradication if possible. For example, clean shower recesses to remove fungal spores and discard closed footwear if practical. Carpets in households seem to aid the spread of tinea pedis from one family member to another,

Derm), econazole (Dermazole, Pevaryl Topical), ketoconazole (Daktagold, Nizoral Cream) and bifonazole (Canesten Once Daily Bifonazole Cream, Mycospor)

- the allylamine, terbinafine (Lamisil Cream/Dermgel).

The disadvantage of using topical agents is the difficulty associated with compliance. Patients often fail to continue treatment once symptoms disappear. It is also difficult to see where to apply the cream once the inflammatory signs of infection have disappeared.

All patients should be aware of the need to use treatment for the minimum recommended time despite the absence of signs and symptoms. They should apply the treatment beyond the outermost margins of the lesions. There is a relative advantage for fungicidal and faster acting topical preparations, such as terbinafine.

Recommended minimum treatment times for topical agents include two weeks for interdigital tinea and four weeks for tinea cruris, tinea pedis and localised tinea corporis. When systemic treatment is used concurrently, the topical agents need to be applied only until scale and crust disappear. This helps to reduce infectivity to other individuals.

When is systemic therapy indicated?

Systemic therapy is indicated in the following situations:

- cases of tinea capitis
- tinea affecting the nails (sometimes nail removal combined with topical agents may be effective for one or two nails, but oral therapy is usually the treatment of choice)
- tinea involving more than one body region simultaneously
- tinea corporis when the lesions are particularly extensive
- tinea pedis when there is extensive involvement of the plantar surface of the foot or there is blistering
- continued failure of topical therapy for a localised infection.

hence the need for active treatment and for infected persons to avoid walking around barefooted. It is important to restrict sharing of towels and footwear by patients who have tinea cruris and pedis.

Topical agents

Topical agents have the following advantages:

- they are free of systemic side effects
- they reduce the risk of spread of infection
- they are relatively inexpensive and easily obtained.

Examples of topical agents include:

- the topical azoles, such as clotrimazole (Canesten, Clonea, Clotreme, Clozole, Tinaderm Extra Cream), miconazole (Daktarin, Fungo Powder/Solution, Leuko Fungex Antifungal Cream/Powder/Spray, Monistat

Table. Systemic treatment of superficial fungal infection*

Infection	First line therapy	Alternative therapy
Tinea capitis	Griseofulvin 500 mg/day for 6–8 weeks	Itraconazole 100–200 mg/day for 4–6 weeks, or terbinafine 250 mg/day for 4–6 weeks
Tinea corporis (unresponsive to topical therapy)	Griseofulvin 500 mg/day for 4–6 weeks	Ketoconazole 200 mg/day for 4 weeks, or itraconazole 100 mg/day for 4 weeks, or terbinafine 250 mg/day for 4 weeks
Tinea cruris (unresponsive to topical therapy)	Griseofulvin 500 mg/day for 4 weeks	Ketoconazole 200 mg/day for 2 weeks
Tinea pedis (plantar type)	Griseofulvin 500 mg/day for 12 weeks	Terbinafine 250 mg/day for 2 weeks, or itraconazole 100 mg/day for 4 weeks
Tinea unguium (onychomycosis)	Terbinafine 250 mg/day for 6 weeks (fingernails) or 3 months (toenails)	Griseofulvin 500 mg/day for 6 months (fingernails) or 12 months (toenails), or itraconazole 200 mg/day for 6 weeks (fingernails) or 3 months (toenails), or 400 mg/day for one week each month for 3 months

* Dosages are for adults.

Which systemic agent should be used?

The recommended use of systemic anti-fungals for the different types of tinea is shown in the Table. GPs should acquaint themselves with the prescribing information for all of these drugs, particularly concerning adverse effects, drug interactions and monitoring suggestions. Such detail is beyond the scope of this paper.

Griseofulvin

Griseofulvin (Fulcin, Griseostatin, Grisovin) is the systemic treatment of choice for fungal infections of the skin, with the exception of onychomycosis. However, drug interactions, previous sensitivity to the drug, or adverse effects (such as headache, rash or gastrointestinal disturbance) may limit its use. It may also interact with alcohol. Treatment times tend to be longer than that with the other oral antifungals as it is fungistatic rather than fungicidal.

Ketoconazole

Ketoconazole (Nizoral) was the first of the oral azoles and is not used much today for the treatment of fungal skin

infections. It is, however, quite effective for all forms of ringworm in the skin. In addition, despite the risk of hepatic damage, it is a potential alternative when griseofulvin is contraindicated, except when long term treatment is anticipated – for example, for tinea unguium.

Fluconazole

Fluconazole (Diflucan), a triazole, is very effective for all forms of tinea infection but rarely used for this indication in Australia. It does show potential in treating resistant cases of onychomycosis and tinea capitis.

Itraconazole

Itraconazole (Sporanox) is also a triazole that is very effective against all dermatophyte infections. It has been used extensively for onychomycosis and in patients with an immune deficit. It carries a much lower risk of hepatic damage than does ketoconazole.

Terbinafine

Terbinafine (Lamisil Tablets), an allylamine compound unrelated to the azoles, is fungicidal and effective against all forms

of fungal skin infection. It is currently the drug of choice for onychomycosis and is a useful second line drug for tinea capitis when griseofulvin is ineffective or unable to be used. Nausea, loss of taste and adverse skin reactions are all relatively uncommon side effects.

Conclusion

The increasing prevalence of immunosuppression and the large and growing reservoir of people with partially treated or untreated fungal infections in Australia are being counterbalanced by a therapeutic array of more effective topical and systemic antifungal drugs. It is important to diagnose effectively and treat early fungal infections of the skin to minimise involvement of areas of chronic infection, such as the nails. This is best achieved by GPs:

- familiarising themselves with the diagnostic difficulties
- confirming other than the most straightforward cases by mycological examination of fungal scraping
- emphasising patient compliance as an essential part of effective therapy. **MT**