Special patient populations: Onychomycosis in the diabetic patient

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There are approximately 14 million persons with diabetes in the United States. These patients must cope with the serious complications of this disease, including neuropathy and impaired circulation (leading to the “diabetic foot” and possible amputation), renal disease, cardiovascular disease, and retinopathy (possibly leading to blindness). Although onychomycosis is no more common in diabetics than in the general population, it poses a greater risk because of the possible sequelae. Most notably, impaired sensation can make many diabetics less aware of minor abrasions and ulcerations on their feet that may be caused by trauma from poor nail grooming or by the nail changes characteristic of onychomycosis. These lesions, in turn, may develop into serious bacterial infections and contribute to the severity of the diabetic foot. Thus there is an important clinical rationale for treating diabetic patients with fungal nail infections. A secondary benefit is the improved self-esteem and enhanced quality of life. (J Am Acad Dermatol 1996;35:S10-S12.)

Diabetes mellitus is a major health problem in the United States. Currently, there are about 14 million persons with this disease and about 600,000 newly diagnosed diabetics enter the health care system each year, more than 90% of whom have non-insulin-dependent, or type II, diabetes. Common complications of diabetes include peripheral neuropathy and impaired circulation, renal disease (including end-stage renal disease), cardiovascular disease, and retinopathy and blindness. In addition, diabetics have altered neutrophil chemotaxis and phagocytosis, as well as impaired cell-mediated immunity. Cutaneous infections in diabetic patients may be associated with abnormal carbohydrate metabolism.

One of the most potentially serious of these complications of diabetics is “the diabetic foot.” A combination of factors contributes to the pathophysiology of the diabetic foot, including peripheral neuropathy resulting in altered sensation, trauma, infection (primarily bacterial), and compromised peripheral circulation causing poor tissue oxygenation and impaired wound healing. More than 50,000 lower extremity amputations are performed on diabetic patients in the United States each year. Fungal nail infections can also, in some patients, contribute to the severity of the diabetic foot. However, before initiating a management strategy, several questions need to be addressed in this population. Namely, what risk does onychomycosis pose in the diabetic patient? Should the treatment of onychomycosis be included in the management of the diabetic foot? And how should onychomycosis in the diabetic patient be treated? These and other related issues are addressed.

ONYCHOMYCOSIS AND INCREASED RISK OF SERIOUS SEQUELAE IN DIABETIC PATIENTS

Several investigators have sought to determine whether the prevalence of onychomycosis is higher in diabetic patients. The consensus is that there is probably not an increased incidence of dermatophyte infections of the nail unit in diabetics, but that Candida infections of the nail and surrounding area (e.g., paronychia) may be more prevalent in diabetics. The important point is that while onychomycosis may not be more common, the potential for serious
sequeleae is probably somewhat greater in diabetics than in nondiabetics.

**ONYCHOMYCOSIS IN DIABETIC PATIENTS WITH PERIPHERAL NEUROPATHY**

Onychomycosis poses the greatest problem in diabetic patients who have impaired sensation in their feet. Just as constrictive footwear can cause pressure necrosis of the skin in patients with improperly fitting shoes, so can thickened, mycotic nails cause pressure necrosis of the nail bed in the diabetic patient (Fig. 1). Sharp, brittle, infected nails can also abrade or gouge the skin on the adjacent toes, and may even pierce the skin (Fig. 2). In both cases, these minor ulcerations are often unrecognized by diabetic patients because of a decrease in sensation. These ulcerations, if left untreated, have the potential to lead to bacterial infection. 8

**OTHER SUPERFICIAL FUNGAL INFECTIONS IN THE DIABETIC HOST**

Onychomycosis is usually associated with tinea pedis (either moccasin-type or interdigital), a condition that should not be ignored in diabetic patients. Tinea pedis may lead to fissures in the plantar and interdigital skin. These fissures can become a portal of entry for bacteria, resulting in deep infections with serious consequences. The use of systemic antifungal drugs to eradicate fungal organisms in the nail may help to prevent recurrent bouts of tinea pedis and thereby reduce the potential for subsequent bacterial infection.

Paronychia in the diabetic deserves consideration, especially when the patient has paresthesia or anesthesia of the foot. A recent study showed that 7.5% of hospital admissions in diabetics were caused by or partially caused by paronychia. 9 Candida species are often the initial organisms involved in paronychia in the diabetic patient, but *Staphylococcus*, *Streptococcus*, and *Pseudomonas* species, and coliform bacilli are frequently cultured from paronychial lesions in the diabetic. 8 In general, a diagnosis based on culture results and swift intervention are highly recommended in this population.

**PSYCHOSOCIAL RATIONALE FOR TREATING ONYCHOMYCOSIS IN DIABETIC PATIENTS**

There are numerous psychosocial reasons for treating diabetic patients with onychomycosis. Elderly diabetics are often obese and may have retinopathy. Many have trouble bending over to examine their feet and may not notice minor abrasions or ulcerations. These patients are often unable to use the nail instruments necessary to maintain healthy and well-groomed nails. Therefore, it is important to treat patients with fungal nail infections, because a normal nail is easier and safer to trim and file than a hyperkeratotic nail that must be forcibly clipped.

In addition, younger diabetics can suffer problems with self-esteem. The low level of self-confidence can be further underminded when the patient becomes embarrassed by the unsightly appearance of the nails. In some cases, this leads patients to avoid going to swimming pools or to the beach, and may restrict social activities. Thus, although the treatment of onychomycosis does not alleviate the patients'
Table I. Treatment of onychomycosis in the diabetic patient

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<tr>
<th>Category</th>
<th>Treatment Options</th>
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</thead>
<tbody>
<tr>
<td>Mechanical/chemical measures</td>
<td></td>
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<tr>
<td>Topical medications</td>
<td></td>
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<tr>
<td>Oral (systemic) antifungals</td>
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<td>Traditional agents (griseofulvin)</td>
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<td>Newer drugs (e.g., itraconazole,</td>
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<td>fluconazole, terbinafine)</td>
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underlying disease, it may improve their quality of life and enhance their sense of well-being.

TREATMENT CONSIDERATIONS

The primary concerns in treating a diabetic patient with onychomycosis are establishing a diagnosis, determining the duration of therapy, and anticipating possible drug interactions. As is the case with any patient with onychomycosis, treatment should not be initiated until a diagnosis has been made. Nonfungal onychodystrophies are also common in diabetic patients. However, because sharp instruments are used to obtain samples for KOH and culture, particular care should be taken when collecting a specimen from a diabetic patient to avoid injuring the skin of the nail bed and thereby increasing the risk of a bacterial infection.

The duration of therapy is another important consideration, particularly in elderly patients whose nails may grow more slowly than those of younger patients and who may have vascular abnormalities. These patients may require a longer course of therapy or may benefit from the use of additional intermittent or "pulse" therapy with one of the newer oral antifungal agents.

TREATMENT OPTIONS

The traditional methods of treating onychomycosis in diabetics are the same as in nondiabetics and include the mechanical or chemical removal of thickened, infected nails, and the use of topical antifungal medications or the older, systemic drugs, griseofulvin and ketoconazole (Table I). All these approaches have serious limitations, however, and it was not until the introduction of the newer, oral antifungal agents that the outlook for diabetic patients with onychomycosis significantly improved. This latter group of compounds includes the triazole agents, itraconazole and fluconazole, and the allylamine, oral terbinafine. Of these three, only itraconazole has been approved for this indication in the United States. At present, no studies have been published that specifically evaluate the role of these newer antifungal agents in the treatment of diabetic patients with fungal nail infections. However, the preliminary results of a large, clinical trial of itraconazole in which a small number of diabetic patients were enrolled indicated that the majority of study participants with diabetes experienced significant clearing of their infection after 3 months of continuous therapy with 200 mg/day.10

Drug interactions are an important concern in diabetic patients being treated for onychomycosis. The azole antifungals, fluconazole and itraconazole, have been shown to interact with oral hypoglycemic agents, resulting in elevated blood levels of the hypoglycemic agent.11-13 Thus patients receiving oral hypoglycemics should be carefully monitored for hypoglycemia when being treated for onychomycosis with one of these newer azole oral antifungal drugs.

REFERENCES