
Photodynamic therapy of onychomycosis caused by *Trichophyton rubrum*

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A combination of topical and oral antifungals is widely used to treat onychomycosis, but treatment failure is common and oral drugs may cause toxicity and potential drug interactions. For this reason, new approaches and strategies should be considered. The following case shows that photodynamic therapy (PDT) may represent an alternative noninvasive approach to treatment of onychomycosis. (J Am Acad Dermatol 2008;59:S75-6.)

CASE REPORT

A 78-year-old woman presented with total onychomycosis of the right big toenail and proximal subungual onychomycosis of the left big toenail caused by *Trichophyton rubrum* (Fig 1). The patient had failed to respond to treatment with topical antifungals (potassium hydroxide [KOH] and cultures were positive after 18 months of use of amorolfine 5% nail lacquer) and had conditions that contraindicated administration of systemic antifungals (she was affected by hypertension and chronic hepatitis C virus infection and under treatment with warfarin and antihypertensive drugs).

The nail plate was first softened with 40% urea ointment under occlusion for 7 days, then clipped off. Nail bed hyperkeratosis was removed as well, then 5-aminolevulinic acid (Metvix cream 160 mg/g, PhotoCure, Oslo, Norway) was applied under an occlusive dressing for a period of 3 hours. The irradiation of the nail plate with Wood lamp showed a strong red fluorescence, confirming absorption of the photosensitizer. Fluorescence was more marked on the exposed nail beds than on the nail plate present on the first left toenail. We then irradiated, at a distance of 5 to 8 cm, the nail with a lamp (Aklilite CL 128, PhotoCure, Oslo, Norway) equipped with light-emitting diodes, which emits broadband red light at a wavelength of 630 nm at 37 J/cm² for 7 minutes and 24 seconds. The entire nail was included in the



Fig 1. Onychomycosis of toenails caused by *Trichophyton rubrum* after 1 year of treatment with systemic antifungals.

irradiation field. The patient did not report pain during irradiation nor did she develop any local side effects afterward.

The treatment was repeated two more times at intervals of 15 days, for a total of 3 PDT sessions during a period of 45 days, and the patient was then followed up every 3 months for 24 months. Treatment was well tolerated with no side effects. KOH and cultures were positive after the third PDT session and became negative 3 months after the last treatment. At the month-12 visit, KOH and cultures were still negative and the toenails were considered clinically cured with residual mild traumatic onycholysis (Fig 2). Mycologic and clinical cure persisted until the last follow-up at month 24.

DISCUSSION

The use of PDT has been recently extended from the oncologic field to that of antimicrobial chemotherapy.^{1,2}

In vitro studies have demonstrated that fungi can be effectively photosensitized after topical delivery of 5-aminolevulinic acid and killed at dose rates much lower than those that kill keratinocytes.³ Available information indicate that *T rubrum*, which

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Fig 2. Same nails completely cured 1 year after 3 sessions of photodynamic therapy with 5-aminolevulinic acid.

is responsible for 90% of onychomycosis, is a possible target of PDT, as almost 50% of the fungal growth could be inhibited *in vitro*.⁴

Watanabe et al⁵ reported complete cure in two patients with dermatophyte onychomycosis of the big toenails, which were irradiated 7 and 6 times, respectively, after the application of a 20% solution of aminolevulinic acid methyl ester in aqueous cream. The treatment site was irradiated with pulsed laser light at a wavelength of 630 nm at 100 J/cm², using an excimer-dye laser.

In our patient, we used an irradiation dose of 37-J/cm² broadband red light and we confirmed the disappearance of dermatophytes by KOH and culture after a total of 3 irradiation sessions. Removal of the nail plate and of nail bed hyperkeratosis is necessary for optimal effect of PDT.

The optimal light source, and the number of times for PDT necessary to cure all onychomycosis, however, remains to be established.

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