Usefulness of Wood’s Lamp for the Diagnosis and Treatment Follow-up of Onychomycosis

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ABSTRACT

Wood’s lamp was demonstrated to be useful in three cases of dermatophytoma treated during clinical dermatological practice. Clinical signs of onychomycosis are longitudinal yellow and white striae on the nail plate and are diagnosed by KOH direct microscopic examination. For its treatment, surgical debridement is recommended. Usefulness of the Wood’s lamp for diagnosis of tinea capitis caused by Microsporum canis is standard. In the first and second cases, we used Wood’s lamp (Woody™) to make a clear margin for debridement of onychomycosis. In the third case, onychomycosis was unsuccessfully treated using topical 5% luliconazole nail solution for 1 year and 10 months with yellow nail discoloration. Under Wood’s lamp, we were able to distinguish luliconazole crystal staining from onychomycosis. This method is simple and quick, and useful for nail observation in dermatology clinics.

Key words: fluorescence microscope, luliconazole, onychomycosis, Trichophyton rubrum, UVA lamp, Wood’s lamp, yellow nail discoloration

Introduction

Onychomycosis is a nail disease caused by the dermatophyte, nondermatophyte, and yeast infection of the nail plate. It is a highly treatable nail disorder for which the treatment options include oral and topical medications, in addition to devices¹. For the treatment of onychomycosis with biofilm formation, surgical debridement is recommended²–³. After treatment of onychomycosis, the recurrence or reinfection rate is 20% to 25%⁴. Early and correct diagnosis is highly important. We discuss the usefulness of Wood’s lamp for the diagnosis and treatment follow-up of onychomycosis.

Case 1

A 45-year-old man with right 3rd, 4th, and 5th toe discoloration presented with no other symptoms. Longitudinal yellow and white striae were observed on the nail plate (Fig. 1a). For the diagnosis and treatment, we opened the 3rd toenail plate using nippers (Fig. 1b). Before (Fig. 2a) and after (Fig. 2b) opening the toenail plate, we observed the toenails under Wood’s lamp (Woody™), and the diagnosis was made by KOH direct examination (Fig. 3a). We observed KOH-mounted slides under fluorescence microscopy (BZ-X710, Keyence) and took photos in the same angle (Fig. 3a-b). We noted fluorescence-positive dermatophytoma and fungal hyphae. We used Wood’s lamp to make a clear margin for debridement of dermatophytoma (Fig. 2c). Plate culture on Sabouraud dextrose agar yielded brownish white and velvety colonies with reddish brown reverse. Slide culture revealed septate hyphae with microconidia. The isolate was preserved as IFM 66170 at the Medical Mycology Research Center, Chiba University. Based on the morphological characteristics and sequence of internal transcribed spaces of the ribosomal RNA gene regions, it was identified as Trichophyton rubrum.

We were able to make a clear margin using Wood’s lamp (Fig. 2c), and fluorescence microscopy was useful for the observation of dermatophytoma (Fig. 3b). We used luliconazole 5% nail solution once a day combined with this debridement. The affected nail area relative to the entire nail...
area was about 10% after 36 weeks of treatment with topical 5% luliconazole nail solution (Fig. 3c).

Case 2

A 77-year-old man with right big toe discoloration presented with no other symptoms. Longitudinal yellow and white striae were observed on the nail plate. For the diagnosis and treatment, we opened the big toenail plate using nippers. After opening the toenail plate (Fig. 4a), we also observed the toenails under Wood’s lamp (Woody™) (Fig. 4b), and the diagnosis was made by KOH direct examination. We used Wood’s lamp to make a clear margin for debridement of dermatophytoma (Fig. 4c).

Case 3

A 75-year-old male onychomycosis patient was treated using topical 5% luliconazole solution for 1 year and 10 months. We noted yellow nail discoloration (Fig. 5a). To assess the usefulness of Wood’s lamp, we observed his left big toenail (Fig. 5b). The color of the superficial yellow lesion did not change, but the nail bed lesion was clearly fluorescent (Fig. 5c). We observed KOH-mounted slides under Wood’s lamp (Fig. 5d). Only the nail bed lesion was clearly fluorescent. The nail bed was positive on KOH direct examination (Fig. 6a), but the superficial yellow nail lesion was negative. The superficial yellow nail discoloration was
Fig. 3.
(a) KOH direct examination of dermatophytoma with fungal hyphae taken from the right 3rd toenail. Trichophyton rubrum was isolated from the dermatophytoma.
(b) Fluorescence microscopy image of the dermatophytoma taken from the right 3rd toenail at the same angle.
(c) Case 1 clinical image of onychomycosis after 36 weeks of treatment.

Fig. 4.
(a) Case 2 clinical image of onychomycosis. The right big toenail was opened using plastic nippers.
(b) Clinical image of onychomycosis under Wood’s lamp. A brightly fluorescent nail bed and underside of the nail were observed.
(c) Clinical image of onychomycosis under Wood’s lamp during nail debridement. A brightly fluorescent nail bed and underside of the nail were observed.
due to luliconazole crystals (Fig. 6b).

**Discussion**

Dermatophytoma is a dermatophyte nail infection with biofilm formation and nail characteristics associated with a poor response to onychomycosis treatment\(^1\). Clinical signs of the condition are longitudinal yellow and white striae on the nail plate. Dermatophytoma is diagnosed by KOH direct microscopic examination. For its treatment, surgical debridement is recommended\(^2,3\).

The usefulness of fluorescence microscopy as a diagnostic tool for dermatophytosis was reported by Estela Cubells JR et al. in 2016\(^4\). Several pathogenic fungi, such as *Microsporum canis*, fluoresce under ultraviolet light. This phenomenon forms the basis of the Wood’s lamp test, in which ultraviolet A (UVA) light is applied to detect fungal skin infection\(^5,6\).

Wood’s lamp is a diagnostic tool in dermatology. Robert Williams Wood, a physicist from the early 20\(^{th}\) century, developed what is now known as Wood’s light or Wood’s lamp. The wavelengths of UV radiation produced by the lamp range between 320 nm and 400 nm, with a peak at 365 nm.

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**Fig. 5.**
(a) Case 3 clinical image of onychomycosis. Toenails were yellow.
(b) The left big toe had a yellow surface, and the nail was thick.
(c) Clinical picture of onychomycosis of the left big toe under Wood’s lamp. The nail bed lesion was clearly fluorescent.
(d) KOH-mounted slide under Wood’s lamp. In the clipped nail of the left big toe, only the nail bed lesion was brightly fluorescent.

**Fig. 6.**
(a) KOH direct examination of the left big toenail bed. Fungal hyphae were observed.
(b) KOH direct examination of the left 1st superficial toenail. Luliconazole crystals were observed.
Normal skin and nail have a blue fluorescent appearance under Wood’s lamp examination, whereas diseased skin creates specific fluorescence patterns. The use of Wood’s lamp for observation of M. canis infection of the hair is standard. We evaluated the usefulness of Wood’s lamp and fluorescence microscopy for dermatophyte infection of the nail. This method is simple and quick for nail observation compared to histopathological staining of the lesion.

In Japan, two topical medicines for onychomycosis are available. Both can induce yellow nail stains if the patients do not sufficiently wash their nails. The patient in Case 3 was treated using 5% luliconazole nail solution. For the observation, we used Wood’s lamp. After observation under Wood’s lamp, we performed KOH direct microscopic examination. We noted fungal hyphae on the nail bed and luliconazole crystals causing the yellow surface discoloration on KOH direct microscopic examination.

In summary, our three cases demonstrated that Wood’s lamp (Woody™) can detect dermatophyte infection in the nail bed. This method is simple and quick, and useful for nail observation in dermatology clinics.

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Conflict of Interest

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