

COMBINATION OF TRADITIONAL CO₂ LASER AND PULSE DOSES ITRACONAZOLE IN PRIMARY TOTAL DYSTROPHIC ONYCHOMYCOSIS (TDO) TREATMENT: A CASE REPORT

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ABSTRACT

Onychomycosis is one of the most common nail diseases. Treatment of onychomycosis, mainly moderate to severe, can be very challenging, expensive and time consuming. Compared with topical and oral therapies, laser treatment offers a more promising modality for the treatment of severe or resistant cases. To enhance the effect, the combination of oral itraconazole pulse doses with mechanical removal of the affected part of the nail plate by using ablative CO₂ laser are investigated. Here, we report a total dystrophic onychomycosis case successfully treated with traditional CO₂ laser and pulse doses itraconazole. This suggests the potential of conventional ablative CO₂ laser in the treatment of severe onychomycosis.

Keywords: Onychomycosis, CO₂ laser, ablative, oral itraconazole, pulse doses, intermittent dosing.

1. INTRODUCTION

Onychomycosis is a chronic fungal infection of the nail that may involve the nail bed, plate or matrix, mostly caused by dermatophytes (ninety percent of cases of toenail onychomycosis) [1]. It is one of the most prevalent and challenging nail disorders with a prevalence of more than 50% of all nail diseases [2]. In addition to the psychological and cosmetic effects, onychomycosis may also cause secondary infections, paronychia, severe pain and change in gait [3].

Based on the clinical classification, onychomycosis is divided into four types: superficial white onychomycosis (SWO), proximal subungual onychomycosis (PSO), distal-lateral subungual onychomycosis (DLSO) and the most severe affected nail, total dystrophic onychomycosis (TDO) where the nail plate is almost completely destroyed. Primary TDO is rare and recalcitrant [2].

Fungal laboratory tests (direct microscopy using potassium hydroxide and fungal culture) are mainly used for confirmative diagnosis of onychomycosis. However, in some cases, dermoscopy and biopsy may aid diagnosis [2].

There are lots of treatment methods for onychomycosis, including systemic medications and topical drugs. While consecutive oral antifungal agents are not favorable for patients who are elder and or with

existing hepatic, cardiovascular disorders due to its adverse reactions (ADR), the topical agents lead to the poor efficacy related to lack of compliance of the patients, the limited nail penetration and the ability of fungi to form a protective biofilm with drug efflux pumps [4]. Laser therapies such as Neodymium-doped yttrium aluminum garnet (Nd:YAG) laser 1064 nm, photodynamic therapy and ablative fractional CO₂ laser show a noticeable results but they are not feasible, in some cases, because of the availability of the technology, high cost and longtime treatment period [5]. Therefore, traditional CO₂ laser with its advantages, such as inexpensive, easily accessible and available, should be a better modality treatment. The US Food and Drug Administration (FDA) approved itraconazole for the oral treatment of dermatophyte onychomycosis. Following British Association of Dermatologists' (BAD) guidelines for the management of onychomycosis 2014, itraconazole is also recommended for dermatophyte onychomycosis (strength of recommendation A; level of evidence 1+) [6].

2. CASE REPORT

A 25-year-old woman was admitted to Vietnam National Hospital of Dermato-Venereology because

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of finger nail dystrophy for 4 months. She works in the barber shop so that she was unconfident about the unsightly appearance of the finger nail.

Previous therapy included consecutive oral itraconazole dosing regimen and topical ciclopirox which are given by dermatologist. She has a poor response because of the lack of compliance due to the need for long-term therapy and invisible clinical improvement.

The physical examination demonstrated that all the fourth fingernail in the right hand was affected. It showed total fingernail dystrophy with leukonychia, subungual hyperkeratosis and onycholysis in the distal anterior and lateral edges (Fig.2a). Direct microscopy with a potassium hydroxide (KOH) 20% preparation was conducted. The result was positive for fungal hyphae. Based on clinical and laboratory test, she was diagnosed with total dystrophic onychomycosis (TDO).

After informed consent, the patient was tested for normal liver and kidney functions and had a complete peripheral blood count (CBC). After that, she was

treated with traditional ablative CO₂ laser and itraconazole pulse dosing. First, the subungual hyperkeratosis and leukonychia in the distal-lateral nail was removed by using a conventional ablative CO₂ laser (Hestia L200-S, Korea). The selected parameters including the power is 5 J/cm², continuous waves, 2-3 passes until the patient perceives slight pain, which is assumed to be an indicator of the appropriate depth of penetration of the thickened nail plate. It is important to clean the carbonized tissue delicately by wet gauze without bleeding or any injury to the nail bed. Then, apply fusidic acid cream (Fucidin) and 50% urea cream to the treated nail plate followed by occlusive dressing with transparent film which will be maintained for 24 hours (Fig.1). The next day, apply topical fusidic acid twice a day for 10 days after removing the dressing. At the beginning of treatment, the patient was given oral itraconazole with pulse doses regimen: 400 mg per day in the first week of month, the rest three weeks of month stopped. The ablative CO₂ laser combined with pulse doses itraconazole therapy was repeated 2 times at a month-interval.



(a): Remove hyperkeratosis nail plate



(b): occlusive dressing with fusidic acid cream and 50% urea cream

Fig.1. Treatment with traditional ablative CO₂ laser

After 2 sessions of combined ablative CO₂ laser with intermittent doses itraconazole regimen, the patient's symptoms were dramatically relieved (Fig.2b). The fourth fingernail in her right hand is almost completely cured. She has no ADR related to laser therapy or oral pulse doses itraconazole regimen. During a follow-up of 4 months, no recurrence is reported.



(a): pre-treatment



(b): post-treatment
(1 month after 2 sessions, interval 1 month)

Figure 2. Different presentation of fingernail at different times

3. DISCUSSION

Onychomycosis refers to chronic fungal infection of the fingernails or toenails with causative fungi including dermatophytes, yeasts and nondermatophyte molds. Dermatophyte infections (also known as tinea unguium) are most common, mostly caused by *Trichophyton rubrum* [1].

Several studies revealed that the efficacy of CO₂ perforated laser treatment was superior to that of CO₂ fractional laser treatment in curing onychomycosis. Among the analyzed studies, the cure rate produced by CO₂ fractional laser treatment was 45%, while the cure rate of traditional CO₂ laser treatment was 95% [7],[8],[9]. Because of its photothermal effects, conventional CO₂ laser treatment can gasify and entirely remove the dermatophytomas within the nail plate or nail bed, which is likely to achieve a better long-term effect related to improved sterilization [10].

Like terbinafine, itraconazole also penetrates the nail quickly and is detected in the nail as early as 7 days after starting therapy and persists in the nail for up to 6-9 months after therapy discontinuation. The rapid detection, concentration and persistence of itraconazole in the nail plate make the intermittent dosing regimen as effective as daily dosing. In addition to efficacy, its ADRs are lower if itraconazole is given as intermittent doses [6].

Our result suggests that traditional ablative CO₂ laser is showing promising results in the treatment of onychomycosis. A greater role for combination therapy, ablative CO₂ laser and the intermittent dosing regimen of oral itraconazole, should improve efficacy and drug-related adverse effects.

4. DECLARATION OF COMPETING INTEREST

The authors declare that they have no competing interests.

5. ACKNOWLEDGEMENTS

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REFERENCES

- [1] Gasser J., Pagani E., Vittadello F., al e. Frequency, type and treatment of fungal pathogens in toenail onychomycosis in the central alpine region of South Tyrol, northern Italy: a 10-year retrospective study from 2004 to 2013. *Mycoses*. 2016;59(12):760-764.
- [2] Lipner S.R., R.K. S. Onychomycosis: clinical overview and diagnosis. *J Am Acad Dermatol*. 2019;80(4):835-851.
- [3] Drake L.A., Pattrick D.L., Fleckman P., al e. The impact of onychomycosis on quality of life: Development of an international onychomycosis-specific questionnaire to measure patients quality of life. *J Am Acad Dermatol*. 2000;41(2):189-196.
- [4] Gupta A.K., Daigle D., J.L. C. The role of biofilms in onychomycosis. *J Am Acad Dermatol*. 2016;74(6):1241-1246.
- [5] Ma W, Si C, Zhou B, al e. Laser treatment for onychomycosis. *Medicine*. 2019;98(48).
- [6] Ameen M., Lear J.T., Madan V., al e. British Association of Dermatologists' guidelines for the management of onychomycosis 2014. *British Journal of Dermatology*. 2014;171:937-958.
- [7] J.F. L. The observation of efficacy of 26 cases of CO₂ laser treatment for onychomycosis. *Chin J Mycol*. 2008;3:289-291.
- [8] Yang Y, Liu H, Yang RY, al e. The observation of efficacy of Ultrapulse CO₂ fractional laser treatment for onychomycosis. *Chin J Dermatol*. 2015:526-530.
- [9] Cheng YR, Wang CY, Cao LF, al e. Clinical observation of CO₂ laser treatment for onychomycosis. *Chin J Dermatovenereol*. 1997:53-54.
- [10] Xu J, Zhuo FL, Zhang RN, al e. The progress in laser treatment for onychomycosis. *Chin J Laser Med Surg*. 2013:41-44.

