

Title: Treatment Efficacy and Safety of ND YAG 1064 nm Laser for Onychomycosis

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Abstract

Objective: This study set out to evaluate the safety and effectiveness of ND YAG 1064 nm laser therapy for onychomycosis.

Method: The study comprised 25 patients who had been diagnosed with onychomycosis. Patients who had used topical antifungal treatment within a week or oral antifungal medication within a year were excluded from consideration. The chosen patients received four weekly sessions of ND YAG 1064 nm laser treatment. Before every treatment, pictures were collected, and every week, fungal culture tests were carried out. Patients who showed improvement after the first round received additional treatment. If the test came back positive, there was a one-month follow-up and then another round. Patients who did not respond well to the second treatment received follow-up appointments three and six months later. Patients who refused laser treatment were not accepted and received normal care instead.

Result: A second treatment cycle was initiated following the first round, as 14 out of 25 individuals tested positive for the pathogen. Three individuals demonstrated resistance and were excluded after the second cycle, leaving six patients who still tested positive at the three- and six-month follow-ups. With the use of laser therapy, the remaining patients were successfully treated, with only minor side effects including erythema and edema.

Conclusion: As a safe and successful treatment for onychomycosis, ND YAG 1064 nm laser therapy has encouraging outcomes in terms of both efficacy and adverse effects. More research with a larger patient population and longer follow-up times is required to confirm its status as a trustworthy therapy approach.

Keywords: onychomycosis, efficacy, nd yag ,outcome,adverse effect.

Introduction:

About half of the nail diseases observed in clinical practice is caused by onychomycosis, which is estimated to have a 5.5% global prevalence¹. The infection can cause serious physical and psychological side effects, such as pain, discomfort, loss of function, self-consciousness, embarrassment, and depression, all of which can have a substantial influence on day-to-day activities and social interactions. Nail plate discoloration, thickening, brittleness, and deformity are characteristics of the infection². Because of their enhanced penetration and duration of residence in the nail matrix, as well as their frequently recommended intermittent regimens, a number of new-generation oral antifungal medications (terbinafine, itraconazole, and fluconazole) are regarded as reasonably potent, safe, and economical. Depending on the treatment agent, regimen, and infection site, only 40–60% of patients achieve a clinical cure, although their mycological cure rates typically surpass 70%³⁻⁴. With the ultimate

goal of improving cure and recurrence rates, physical treatment modalities, such as laser, photodynamic, ultrasound, and iontophoretic therapies, are being investigated to improve transungual penetration of topically applied drugs, avoid systemic side effects, broaden patient eligibility, and/or overcome adherence-related barriers of drug therapies. It has been suggested that the fungicidal impact of laser systems is caused by the fungal mycelium's chromophores being selectively photothermolyzed⁵⁻⁶. Mechanical breaking up of fungal biofilms resistant to treatment. At wavelengths between 750 to 1300 nm, maximum penetration of the nail plate and activation of the target fungal chromophores are attained, making Nd-YAG, near-infrared, dual-wavelength diode, and fractional CO2 lasers suitable systems. They have so far shown to be successful in enhancing the damaged nails' aesthetic look⁷⁻⁹. A meta-analysis of 35 reports on laser treatments for onychomycosis in over 1700 individuals revealed that the treatments were well tolerated, with the most frequent side effect being a mild to severe burning sensation¹⁰.

Methodology:

To assess the effectiveness and safety of ND YAG 1064 nm laser therapy in the treatment of onychomycosis, a thorough methodology was used in the study. For the study, a total of 25 patients with onychomycosis diagnoses were chosen. Participants were not allowed to use oral antifungal medication within a year or topical antifungal medication within a week in order to guarantee the laser therapy's specificity. The chosen patients received four weekly sessions of ND YAG 1064 nm laser treatment. Every week, fungal culture tests were carried out to determine the presence of infections, and before every session, pictures were taken to track any changes. A follow-up visit of one month was held following the conclusion of the first treatment cycle. If the fungal culture test came back positive during the follow-up, demonstrating the pathogen's persistence, a second treatment cycle consisting of four scheduled sessions was started. The treatment cycle lasted one month. Patients had follow-up appointments three and six months after finishing the second treatment cycle if the test came back negative. Patients who demonstrated resistance during the follow-up were not included in the laser treatment group and were treated using conventional techniques instead. The outcomes showed how successful the laser treatment was, and the only adverse effects that were noted were slight erythema and edoema. With thorough monitoring and follow-up procedures, this methodology offers a structured approach to evaluating the effects of ND YAG 1064 nm laser therapy on patients with onychomycosis.

Results:

Table 1: Test Results and Treatment Outcome after the First and Second Cycles

Patient ID	Test Result after 1st Cycle	Test Result after 2nd Cycle	Resistance	3-Month Follow-up	6-Month Follow-up	Treatment Outcome
1	Positive	Negative	No	Cured	Cured	Successful
2	Negative	-	No	-	-	Successful
3	Positive	Positive	No	Positive	Positive	Resistant

Table 2: Summary of Side Effects

Patient ID	Side Effects
1	Mild erythema, edema
2	-
3	Moderate erythema, itching

Pic 1



pic 2



Pic 3



pic 4



Discussion: The test results and treatment outcomes for patients receiving ND YAG 1064 nm laser therapy for onychomycosis are presented in detail in the results. Okan et al. observed that mycotic nails exposed to spiral long-pulsed Nd:YAG laser irradiation had 60% mycological cure and 47% clinical improvement rates¹¹. A second treatment cycle was started after 14 of the 25 patients in the previous cycle tested positive for the pathogen. Following the second round, six patients continued to show improvement. Three and six-month follow-ups, however, showed that three patients had become resistant to the medication. The remaining patients were successfully treated with laser therapy in spite of these resistances. According to Zhong et al., weekly treatment for 22 patients with onychomycosis using a long-pulsed Nd:YAG 1064 nm laser resulted in a 29% mycological cure rate after two months, which increased to 69% if treatment was continued once a month for four months¹². The findings emphasize the difficulty of treating onychomycosis and the necessity of ongoing observation and modification of treatment plans based on the reactions of individual patients. Studies that rate reactions to 1064 nm Nd using the Onychomycosis Severity Index (OSI) system: After YAG laser irradiation, the treatment's effects were less severe¹³. Furthermore, the treatment's documented side effects were minimal, according to reports. Patients reported symptoms like erythema and edema, which are typical side effects of laser therapy. Significantly, no severe or long-lasting side effects were reported, highlighting the ND YAG 1064 nm laser's safety profile for treating onychomycosis. Hyperthermia resulting from the deeply penetrating Nd:YAG 1064 nm laser has been associated with a microbicidal effect due to its denaturing effect on important cellular proteins and structures¹⁴⁻¹⁵. The fact that the adverse effects are mild and fleeting indicates that the patients are tolerant of the laser therapy. Overall, these tables' results provide important new information about the safety, effectiveness, and possible drawbacks of using ND YAG 1064 nm laser therapy to treat onychomycosis.

Conclusion: Based on the data, it was found that the laser treatment was highly effective, as most patients saw positive results. The safety profile of ND YAG 1064 nm laser therapy for onychomycosis is further supported by the low incidence of side effects, which are restricted to moderate erythema and edema. Interestingly, the study found cases of resistance in a tiny percentage of patients, which required excluding them from laser treatment and using conventional techniques instead. This emphasizes how crucial it is to conduct more research and longer-term follow-up studies in order to confirm the results and handle any potential obstacles or restrictions. Overall, the results point to the potential of ND YAG 1064 nm laser therapy as a secure and successful treatment option for onychomycosis, underscoring the necessity of more research and validation using bigger sample sizes.

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