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Nd:YAG Treatment of Nail Plate Infection with *Pseudomonas Aeruginosa*

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Parameters:

Laser source:	Nd:YAG
Wavelength:	1064 nm
Fluence:	40 J/cm ²
Scanner spot size:	4 mm
Pulse duration:	35 ms
Frequency:	1,4 Hz

Treatment procedure:

A 37-year-old female patient was referred to our clinic due to changes of the big toe nail on the right foot, which were observed for more than two years. Clinically, a clouding nail plate with wide greenish area was observed on the distal third of the big toe nail, which concentrically continued on the proximal part of the nail. On this part of the nail, dermoscopy revealed a discrete splinter hemorrhage with a yellowish area and a few longitudinal leukonychic striae with a fringed proximal margin (Fig 1a and Fig 2a). These changes are hard to identify on clinical examination only, however, the nail's dermatoscopic changes are suggestive for onychomycosis (DLSO - distal and lateral subungual type) in combination with a *Pseudomonas aeruginosa* infection. The microbiological tests confirmed an infection with *Pseudomonas aeruginosa*, sensitive for several antibiotics (imipenem, gentamycin, ciprofloxacin...), while the first set of tests for onychomycosis (KOH wet mount preparation and fungal culture) were negative. The patient had in the meantime visited her local dermatologist who had proposed a systemic therapy with 500 mg ciprofloxacin for 4 weeks. However, the patient was reluctant for antibiotic therapy, so she returned to our clinic and asked for other therapeutic options. She agreed to try laser therapy, so we performed a single test treatment with Nd:YAG (fluence 40 J/cm², spot 4 mm, pulse duration 35 ms). A month after the test treatment with Nd:YAG, significant improvement was observed without any adverse effects, so we further suggested the Nd:YAG treatment consisting of four therapies at one week intervals.

3 months after laser treatment, a nearly complete regression of greenish nail changes was observed and microbiological tests were negative for *Pseudomonas aeruginosa* (Fig. 2c). However, the nail plate dermoscopy still showed some longitudinal striae with a fringed proximal margin, together with a so-called "aurora borealis" type discoloration which was suggestive for DLSO. Re-testing for onychomycosis (KOH wet mount preparation and fungal culture) revealed the presence of *Trichophyton rubrum*. Additional Nd:YAG treatment was suggested to eliminate the fungal nail infection.

In the literature, we did not find any clinical report or trial on this topic, however, there were a few articles confirming favorable in vitro photoresponses on *Pseudomonas aeruginosa* after different types of laser irradiation. Nd:YAG laser could represent a potential alternative approach for the treatment of nail plate infection with *Pseudomonas aeruginosa*, however, appropriate studies and clinical trials are needed.



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Before Nd:YAG treatment



A month after the treatment



3 months after treatment