

Effective and Safe Solar Lentigo Treatment with Frequency-Doubled Nd:YAG (532 nm) Laser – Our Experiences

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ABSTRACT

In a retrograde study we analyzed 33 patients who were treated for solar lentigo with the StarWalker® frequency-doubled Nd:YAG (532 nm) laser. By telephone interview after an average of one and a half years following the last therapy, patient questionnaires were completed. Four men and 29 women with an average of 61 years (min. 32 years, max. 85 years) were included. 20 patients had laser treatment of facial lentigines, 3 of dorsal hands and 10 of both the hands and face together. 20 subjects received one and 13 subjects received two treatment sessions. The treating doctor evaluated the final results after the laser treatment by comparing the photo documentation of the involved patients before and at least 3 weeks after the laser therapy. Compared to previous studies, we used lower energy, lower frequency, a bigger spot, and fewer repetitions to achieve good results with the lentigo treatment. One pass was applied using a 4 mm or 5 mm spot size, 1.0–1.5 J/cm² fluence, and 1–2 Hz frequency. Sun protection was advised. For a majority of the 33 included patients, recovery time was not longer than two weeks, laser therapy and recovery time to complete healing was not painful, the laser therapy of solar lentigines was safe, and both the patients and the treating doctor were very satisfied with the result of the treatment. In conclusion, we found that the treatment of solar lentigines with the StarWalker® frequency-doubled Nd:YAG (532 nm) laser was safe, not painful and effective long-term.

Key words: frequency-doubled Nd:YAG (532 nm) laser, lentigo, laser treatment.

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I. INTRODUCTION

Solar lentigines are benign, hyperpigmented lesions that develop on sun-exposed sites, particularly the face or the back of hands. They are flat, well circumscribed and harmless macules of darkened skin, round, oval or irregular in shape. The color varies from skin-colored,

tan to dark brown or black, and the size varies from a few millimeters to several centimeters in diameter [1, 2]. It results from exposure to ultraviolet (UV) radiation, which causes local proliferation of melanocytes and accumulation of melanin within the skin cells named keratinocytes. Solar lentigo is often diagnosed on its clinical appearance. Examination using dermatoscopy can clarify the diagnosis. If there is still diagnostic doubt, a skin biopsy may be performed for histological examination [2]. Solar lentigines are very common and a sign of photoaging, especially in people over the age of 40. Sometimes they are also known as “old age spots” or “senile freckles”. Preventive measures include minimizing sun exposure and the use of sunscreens, but this should be started early in life [3].

Because of cosmetic concerns with many patients, different therapeutic modalities have been tried to remove these unwanted spots. The theory of selective photothermolysis suggests that laser therapy would be the treatment of choice because of its ability to selectively destroy pigment without injuring the surrounding tissue [4]. The development of short-pulsed, pigment-specific lasers has enabled physicians to selectively destroy the pigment within the solar lentigo lesions with significant clinical improvement, low risk of adverse effects, and high patient acceptance [2, 4, 5].

To obtain selective photothermolysis of melanin, pigmented lesions must be treated with laser light having a wavelength appropriate for the absorption spectrum of melanin. The absorption of melanin is highest in the UV range and decreases dramatically as the wavelength increases into the infrared region. Ideally, the pulse duration of the laser should be shorter than the thermal relaxation time of the targeted tissue to achieve selective photothermolysis. Thus, one would expect lasers with shorter wavelengths to be more effective in selectively removing melanin from skin [4].

In our retrograde study we analysed patients treated for solar lentigo with the StarWalker® frequency-doubled Nd:Yag laser. The 1064-nm laser light is focused into a doubling crystal to produce the 532-nm wavelength. It has 5 nanoseconds duration, high peak power, energy of many joules and photomechanical

impact to shatter tiny skin targets without injury to the surrounding skin. The main advantage of this kind of laser is the ability to treat superficial pigmented lesions like lentigo solaris and efelides [6].

II. PATIENTS AND METHODS

At the Remeda medical center in Domžale, Slovenia, patients with solar lentigo of the face and hands were treated with frequency-doubled Nd:YAG (532 nm) laser from January 2018 to February 2020. After applying local anesthetic cream to the treatment area, one pass was applied using a 4 mm or 5 mm spot size, 1.0–1.5 J/cm² fluence, and 1-2 Hz frequency. Moisturizing cream and sunscreen were applied after treatment. One or two treatment sessions were needed at a 4-week interval with the “spot” technique, where only the lentigo area was treated. Sun protection was advised.

Patients were interviewed by telephone after an average period of 17 months (min. 5 months, max. 29 months) from the last laser therapy. Questionnaires about skin improvement, safety, and patient satisfaction with the laser treatment were completed with the patient’s permission (Table 1). Answers for questions 1,2,4,6,7a and 8 were evaluated by Likert scale: 1 - yes; 2 - more yes than no; 3 - neither yes or no; 4 - more no than yes and 5 - no. The pain scale was used for questions 3 and 5: 1 – minimal pain up to 10 – maximal pain. The treating doctor, who evaluated the photo documentation of the patients before and at least three weeks after the laser therapy, answered question 7b by Likert scale (Table 2). For statistical analysis, SPSS was used.

Table 1: Questions about the patients’ skin spots, sun skin protection, safety of the laser procedure, pain and recovery time and patients’ and doctor’s satisfaction with the final results after frequency-doubled Nd:YAG (532 nm) laser treatment of lentigo.

1. Solar lentigines are very disturbing skin lesions:
2. Laser therapy of solar lentigines was very painful:
3. The pain experienced between laser treatments was from 0 to 10:
4. The time from the laser treatment until complete healing was 2 weeks:
5. The pain after the laser treatment until complete healing was from 0 to 10:
6. The laser therapy was very safe:
7a. I (patient) am very satisfied with the result of the treatment:
7b. I (doctor) am very satisfied with the result of the treatment of my patient:
8. I am using sun skin protection regularly to prevent solar lentigines:

III. RESULTS

We treated 72 patients with solar lentigo of the face and/or hands from January 2018 to February 2020. In 33 treated subjects a telephone interview about skin improvement, safety, and patient satisfaction was completed. Among them, 4 men and 29 women with an average of 61 years (min. 32 years, max. 85 years) were included. 20 subjects received one and 13 subjects received two treatment sessions with frequency-doubled Nd:YAG (532 nm) laser. Twenty patients had laser treatment of facial lentigines, three of dorsal hands and ten of both the hands and face together. The data in Table 2 presents the patients’ relation to skin spots, sun skin protection, the safety of the laser procedure, pain and recovery time, and the patients’ and doctor’s satisfaction with the final results after the laser treatment.

Table 2: The mean ± SE of all 33 patients’ answers about skin spots, sun skin protection, safety of the laser procedure, pain and recovery time, and the patients’ and doctor’s satisfaction with the final results after frequency-doubled Nd:YAG (532 nm) laser treatment of lentigo.

Questions	mean ± SE of 33 patients’ answers (1,2,3,4,5,6,7a,8) / doctor’s evaluation (7b)
1. Solar lentigines are very disturbing skin lesions:	1.94 ± 0.20
2. Laser therapy of solar lentigines was very painful:	4.39 ± 0.19
3. Pain between the laser treatments (from 0 to 10):	2.52 ± 0.38
4. Time from the laser treatment to complete healing was 2 weeks:	1.12 ± 0.05
5. Pain after the laser treatment until complete healing (from 0 to 10):	0.80 ± 0.26
6. The laser therapy was very safe:	1.00 ± 0.00
7a. Patients’ satisfaction with the results of the treatment:	1.18 ± 0.06
7b. Doctor’s satisfaction with the results of the treatment:	1.45 ± 0.55
8. I am using sun skin protection regularly to prevent solar lentigines:	1.03 ± 0.03

The Likert scale was used for questions 1, 2, 4, 6, 7a, 7b and 8: 1 - yes; 2 - more yes than no; 3 - neither yes or no; 4 - more no than yes and 5 - no. The pain scale was used for questions 3 and 5: 1 – minimal pain up to 10 – maximal pain.

Additionally, we present some clinical results before and after the frequency-doubled Nd:YAG laser treatment of lentiginos of the face and hands in a group of women between 57 to 85 years old, who gave us the written permission for publication in the article (Figures 1 to 6).



Fig.1: Lentiginos on dorsal hands before and after 5 weeks after one frequency-doubled Nd:YAG (532 nm) laser treatment session on a 62-year-old woman.



Fig.2: Lentiginos on the face before and 13 weeks after two frequency-doubled Nd:YAG (532 nm) laser treatment sessions on a 68-year-old woman.



Fig.3: Lentiginos on dorsal hands before and 8 weeks after one frequency-doubled Nd:YAG (532 nm) laser treatment session on a 68-year-old woman.



Fig.4: Lentiginos on the face before and 8 weeks after two frequency-doubled Nd:YAG (532 nm) laser treatment sessions on a 57-year-old woman.



Fig.5: Lentiginos on the face before and 3 weeks after one frequency-doubled Nd:YAG (532 nm) laser treatment session on a 83-year-old woman.



Fig.6: Lentigines on the face before and 5 weeks after one frequency-doubled Nd:YAG (532 nm) laser treatment session on a 85-year-old woman.

IV. DISCUSSION

For a majority of the interviewed patients, solar lentigines were quite disturbing skin lesions. Many modalities are available for the treatment of pigmented lesions, but only the short-pulsed lasers offer the ability to selectively destroy pigment-containing cells. Many studies have contributed significantly to the understanding of the effect of wavelength and pulse duration on injury to the cutaneous pigmentary system. The frequency doubled Nd:YAG (532 nm) laser treatment is a safe and effective tool for the treatment of a number of benign pigmented lesions [6, 7, 8].

Compared to previous studies, we used lower energy, lower frequency, bigger spots, and fewer repetitions to achieve good results with the lentigo treatment [4, 7]. The explanation lies in previous studies, as they found larger spot sizes to penetrate deeper and fewer treatment sessions were required, so increased spot size increased the efficacy of treatment [8, 9]. Just the opposite was found regarding the relationship between the energy applied and the change in pigmentation, as no significant relationship was proved. Energy was determined according to the skin type of the patient. The spot size was adjusted afterward because the penetration of energy increases with increased spot size. The energy difference did not influence the reduction in pigmentation, so the energy applied did not affect the cosmetic outcome [9].

The assessment of laser therapy was done after an average of one and a half years after the last therapy, thus the long-term effectiveness of frequency-doubled Nd:YAG (532 nm) laser lentigo removal is assessed in this study. Only one third of the patients needed two treatment sessions for complete regression of the lentigo. For a majority of the 33 included patients, recovery time was not longer than two weeks, the laser therapy and recovery time to complete healing was not

painful, the laser therapy of solar lentigines was safe, and both the patients and the treating doctor were very satisfied with the final result of the treatment. This group of patients was also very well educated about sun skin protection for the prevention of solar lentigines. In conclusion, we find that the treatment of solar lentigines of our patients with the StarWalker® frequency-doubled Nd:YAG (532 nm) laser to be safe, not painful and effective long-term.

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