

# CASE REPORT: Er:YAG Laser Resurfacing Treatment of Linear Verrucous Epidermal Nevus

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## ABSTRACT

The subject case of this report is a 22-year-old female patient with Verrucous Linear Epidermal Nevus (VLEN) who underwent Er:YAG laser resurfacing. The lesion unilaterally affected the external side of the upper left arm from the cubital space to shoulder, the left mammary region, the left neck region, and the left part of the back from the shoulder to the gluteal region. Several dermatological treatments were previously performed without significant results. Prior to laser treatment, skin biopsies were taken and histopathology examinations showed hyperkeratosis, papillomatosis and acanthosis with elongation of the rete ridges, with no pigmentary incontinence or dermal abnormalities. We performed resurfacing with a 2940 nm Er:YAG laser with percutaneous local anesthesia. After lasing in the cold ablation regime, the vaporized, atypical, disorganized epidermal cells were replaced with normal, well-organized keratinocytes from the follicular adnexa. The Er:YAG resurfacing technique provided complete removal of the lesion in two treatments, which was very important considering the large surface treated.

This case clearly shows the benefit of Er:YAG laser ablation as a highly precise, simple, and effective method for treating VLEN.

**Key words:** Verrucous Linear Epidermal Nevus, Er:YAG laser, cold ablation

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## I. INTRODUCTION

Verrucous epidermal nevi are cutaneous hamartomas mostly consisting of keratinocytes, characterized by papulokeratotic and verrucous papules and plaques covering large areas of the skin in a linear pattern. Epidermal nevi usually arise on the torso and extremities. They are often present at

birth as flat tan or brown marks, but they become more apparent in adulthood when they become thickened and often warty [1].

Treatment of linear epidermal nevus is a complex process since superficial procedures are often associated with recurrences, while more aggressive treatments often end up with scarring [2]. A large number of therapeutic options includes tretinoin and 5-fluorouracil [3 - 4], acitretin [5], calcipotriol [6 - 8], dithranol [9], podophyllin, dermabrasion, or cryotherapy [2]. In past years, many studies presented laser treatments such as CO<sub>2</sub> laser, argon laser and dye laser as promising treatment options [10-15], although long-term follow-ups showed a high recurrence rate as well as several side effects such as hypopigmentation and scarring. A high resistance rate to treatment was also observed after CO<sub>2</sub> laser treatment [16].

Er:YAG lasers, however, with a wavelength of 2940 nm, allow extremely precise skin ablation. It is very efficiently absorbed by water and can be used to produce minimal thermal injury, therefore, it can be considered as perfect tool for treating superficial skin lesions [17, 18, 19].

The goal of our study was to consider Er:YAG laser resurfacing as a treatment choice for treating patients with verrucous epidermal nevi since it allows for controlled, layer-by-layer skin ablation, avoiding the induction of thermal injury.

## II. MATERIALS AND METHODS

### a) Clinical data

We report on a case of linear epidermal nevus in a 22-year-old female patient. The lesion unilaterally affected the external side of the upper left arm from the cubital space to the shoulder, the left mammary region, the left neck region, and the left part of the back from the shoulder to the gluteal region (Fig. 1). Several dermatological treatments, i.e. topical corticoids and keratolytics, calcipotriol, cryotherapy, and radio wave surgery were previously performed without significant results.

In consideration of this fact, we performed resurfacing with a 2940 nm Er:YAG laser (Dualis SP II, Fotona, Slovenia) with percutaneous EMLA local anesthesia.



Figure 1: 22-year-old patients with verrucous linear epidermal nevus.

#### b) Treatment

The area to be treated was first cleaned with an antiseptic solution. Then the lesion was anesthetized with EMLA (eutectic mixture lidocaine and prilocaine), and the 2940 nm Er:YAG laser (Dualis SP II, Fotona, Slovenia) was used in the cold ablation regime.

We used a 3 mm spot size, pulse energy of 300 – 1000 mJ, fluence 5 – 14 J/cm<sup>2</sup>, and a pulse repetition rate of 8 Hz. A lower fluence of 5 J/cm<sup>2</sup> was used in the delicate neck area or for superficial lesions. Higher energy densities of 14 J/cm<sup>2</sup> were used in thicker areas such as the lower back and shoulder.

For each region of the nevi, two to five passes were carried out during the same session. Between the two passes, the resulting desiccated tissue debris was wiped away with saline soaked dry gauze. Additional passes were carried out over the

remaining lesions to smoothen them, but with increasing risk of complications.

The postoperative site was cleaned with no necrotic tissue remaining. Postoperatively, a sterile OpSite dressing (TJ Smith and Nephew Ltd. Hull, England) was applied. On the second day, redressing was performed. A topical antibiotic ointment was applied twice a day during the ensuing 2 weeks when the healing process was completed. On the second day, and in weeks 1, 4, 8, 12, 24, and 48, evaluation of the healing process was performed by means of clinical exams as well as photography.

A year after the first treatment, the procedure was repeated to remove the remaining epidermal nevi.

### III. RESULTS AND DISCUSSION

The entire nevus was removed after two sessions, using up to five passes across the whole VLEN area (Figs. 2 - 4). Healing was achieved with a satisfactory cosmetic result (Fig. 2). The treated areas re-epithelialized within 2 weeks, leaving small erythematous patches. Three months after treatment, no recurrence was seen with any pigmentary changes. Consequently, there was no scarring. Only minor erythematous papules were visible after the first treatment (Fig. 3, after) and were successfully removed with an additional session performed 1 year after the first treatment (Fig. 4).



Figure 2: Appearance 2 weeks after Er:YAG laser resurfacing.



Figure 3: Appearance before (upper pictures) and 10 months after the first treatment.



Figure 4: Appearance 6 months after second Er:YAG laser treatment.

Due to the low level of tissue destruction and minimally traumatic procedure, there are many advantages of using Er:YAG laser resurfacing in the treatment of a wide range of superficial skin lesions, such as minimal postoperative pain, swelling, and lack of local infections, necrosis or unacceptable scarring. In our opinion, this minimally traumatic technique is significantly advantageous in relation to the other comparable techniques (electrocautery, fulguration, CO<sub>2</sub> laser etc.). Er:YAG lasers, with a wavelength of 2940 nm, allow for extremely precise skin ablation. Their energy is very efficiently absorbed by water and can be used to produce a minimal thermal injury to approximately 5 to 10 micrometers; thus they can be considered as the perfect tool for treating superficial skin lesions [19].

It seems that the more profound dermal inflammatory lesions of Verrucous Linear Epidermal Nevus (IVLEN) required more laser passes and a more aggressive treatment. The underlying dermis must be removed or destroyed, thus increasing the risk of unwanted scarring.

To avoid scars we preferred to perform one to five passes at lower energy, since we hypothesize that the relative decrease in adnexal structures on the neck along with a relatively thinner epidermis such as in mammary region and a decrease in vascularity in the neck region is responsible for the increase of side effects [20].

Our young female patient with verrucous epidermal nevi had a good recovery without relapse. The resulting wounds healed without complication. Superficial lesions responded optimally with complete regression, leaving hyperpigmented patches in some area and no scars or atrophy.

The Er:YAG resurfacing technique provided complete removal of the lesion in only two treatments, which was very important considering the large surface treated.

The patient's discomfort was minimal and her satisfaction with this method of treatment was high.

#### IV. CONCLUSIONS

Er:YAG resurfacing is a highly precise, simple, and effective method of treating linear epidermal nevus, which can be repeated if lesions should reoccur. Appropriate laser power allowing sufficient ablation, avoiding deep dermal changes, are needed for successful laser treatment. Suboptimal procedures lead to recurrences. The healing of the wound after removing the linear epidermal nevus was astoundingly swift. In comparison with other ablative laser therapies, multimode Er:YAG laser treatment offers more favorable results.

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