

CASE REPORT

Treatment of warts with 1064 nm Nd:YAG

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ABSTRACT

Cutaneous warts are benign epidermal proliferations caused by human papillomavirus infection. Among the available medical and destructive therapeutic options for cutaneous warts, none is uniformly effective or virucidal. Laser light was previously shown to be effective in treatment of warts. Many studies have used 585-nm pulsed dye lasers with the wart blood vessels as the target tissue. Nd:YAG 1064 nm laser was also previously shown to be effective for wart clearance.

In our case report, four cases of wart removal with 1064 nm Nd:YAG are presented. In all cases a successful treatment of the warts was achieved. There were no reoccurrence of warts. Pain during a treatment was diagnosed as moderate and transient in nature. Apart from the transient pain there were no other unwanted side effects reported.

We can conclude that wart removal with 1064 nm Nd:YAG is a safe, effective and well-tolerated treatment with no adverse events reported.

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I. INTRODUCTION

Cutaneous warts are benign epidermal proliferations caused by human papillomavirus (HPV) infection (1). Infection of epidermal cells results in cell proliferation and a thickened, warty papule on the skin.

Warts are very common with an estimated incidence of 10% in children and young adults (2). There are more than 100 different types of HPV. The appearance of warts is determined by the type of virus and the location. Any area of skin can be infected, but the most common sites are the hands and feet.

Common warts are most often seen on the hands and present as skin-colored papules with a rough "verruccous" surface. Flat warts are most often seen on the backs of the hands and on the legs. They appear as slightly elevated, small plaques that are skin-colored or light brown. Plantar warts grow on the soles of the feet. They look like hard, thick patches of skin with dark specks. Genital warts are found on and around male and female genitals (3).

Among the available medical and destructive therapeutic options for cutaneous warts, none is uniformly effective or virucidal. Aims of the treatments are to cure the patient's physical and psychological discomfort, and to prevent the spread. The treatment is challenging and there is no single therapy established as completely curative (1). Invasive methods have downsides such as pain and long recovery periods. Topical management requires the application of drugs for a long time and treatment success is, therefore, highly dependent on patient compliance (4). However, patients often request treatment because of social stigma or discomfort. Ideally, treatment should be simple with a low risk of adverse effects (5).

Here four cases are presented where long pulse 1064 nm Nd:YAG was successfully used for the treatment of warts on the hands and feet, showing the efficacy and safety of the treatment.

CASE 1

A 38-year-old man came to the office with a wart on his finger. The wart was previously surgically removed. After one month there was a recurrence of the wart, which grew back along the surgical scar (See Figure 1a).

A wart was then treated with a Nd:YAG 1064 nm laser (Dualis SP, Fotona, Slovenia) at the Primamed Clinic, Slovenske Konjice, Slovenia. The parameters used were: 3 mm spot size, fluence 240 J/cm², pulsewidth 30 ms, frequency 1 Hz. After three weekly sessions the wart was successfully removed and there was no recurrence for the next two years. A scar which is still visible in Figure 1b is a result of the previous surgical treatment.

The patient tolerated the treatment well and there were no side effects after the laser treatment.



Fig. 1: a) Recurrent wart as it grew back along the surgical scar one month after surgical removal of the original wart; b) patient's finger, clear of wart with Nd:YAG laser, two years after completion of laser therapy. The only trace is a thin longitudinal scar which remains from the previous unsuccessful attempt of surgical wart removal. (Courtesy of Dr. Katja Semprimožnik)

CASE 2

A young man with a large common wart on a heel was treated with a Nd:YAG 1064 nm laser (Dualis SP, Fotona, Slovenia) at the Primamed Clinic, Slovenske Konjice, Slovenia. Such large warts are usually treated surgically but as removal of such a large wart would require a skin graft, the surgeon decided for a laser treatment. The patient was treated 12 times twice per month. The parameters were: 3 mm spot size, fluence 240 J/cm², pulsewidth 30 ms, frequency 1 Hz. Cold air was used to reduce the pain during the treatment. After 6 months there was a complete resolution of the wart (See Figs. 2b and 2c).



Fig. 2: a) Large wart on the heel treated with Nd:YAG laser; b) and c) patient's heel clear of the wart 6 months after Nd:YAG laser removal. There are no visible traces of the previously very large wart. (Courtesy of Dr. Katja Semprimožnik)

CASE 3

A man with a large resistant mosaic wart on the foot came to the office (Laser Aesthetics Clinic in Willmar, USA), claiming to have had this wart for several years and unsuccessfully tried many removal techniques (See Fig. 4a). The practitioner decided to use a single-session Nd:YAG laser treatment with relatively strong settings: 4 mm spot size, fluence 240 J/cm², pulsewidth 14 ms, frequency 1 Hz. Approximately 20 laser shots were delivered to fully cover the wart and about 2-3 mm of healthy skin around it (See Fig 3).



Fig. 3: An example of the treatment technique on several plantar warts: aside from irradiating the wart itself, the surrounding skin is irradiated with the laser beam as well. (Courtesy of Robin Sult, RN)

Air cooling during the treatment was used to reduce patient discomfort.

A necrosis of wart tissue two days after a treatment is apparent on Figure 4b. After 30 days the foot was totally cleared of the wart (See Fig. 4c). The patient's status was checked 27 months after the treatment. The foot was still clear and there was no sign of recurrence of the wart.

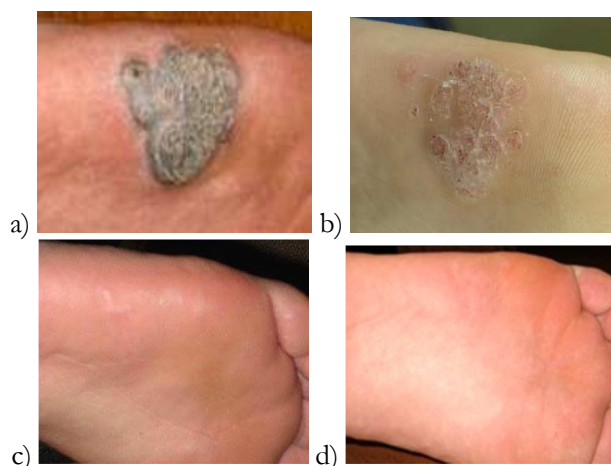


Fig. 4: a) Large resistant mosaic wart on the foot before the laser treatment; b) Necrosis of wart tissue at follow-up two days after a single session with a Nd:YAG laser; c) Patient's foot is clear of the wart at one month follow-up; d) Clear foot at follow-up 27 months after the laser treatment. (Courtesy of Robin Sult, RN)

CASE 4

A young female patient with a large mosaic wart on the foot was treated with Nd:YAG laser (DualisSP, Fotona, Slovenia) at the Primamed Clinic, Slovenske Konjice, Slovenia in period between August and December 2011 (See Fig. 5).



Fig. 5: Large resistant mosaic wart before laser treatment. (Courtesy of Dr. Katja Semprimožnik)

Twelve weekly sessions were needed to clear this wart. The laser parameters used were: 3 mm spot size, fluence 240 J/cm², pulsewidth 30 ms, frequency 1 Hz. Only cold air was used for pain reduction during the laser sessions.

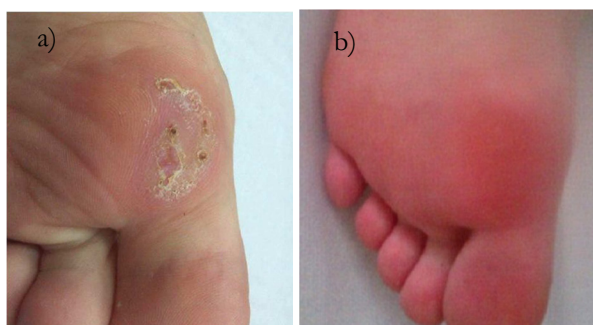


Fig. 6: a) Wart status after two weeks and two Nd:YAG laser sessions; b) Foot cleared of resistant mosaic wart at follow-up four months after completion of Nd:YAG laser therapy.

(Courtesy of Dr. Katja Semprimožnik)

The patient tolerated the treatment well and there were no scars or other adverse effects after this laser therapy. The wart was totally cleared as can be seen in Fig. 6b.

DISCUSSION

Laser light has previously been shown to be effective in the treatment of warts. Many studies have used 585-nm pulsed dye lasers with the wart blood vessels as the target tissue. Studies examining the

effectiveness of pulsed dye have reported overall cure rates of 48% to 93.6% (2,4,6,7). As the hemoglobin heats up, thermal energy is dissipated to surrounding tissues, leading to cauterization of blood vessels. This is because hemoglobin in blood has strong absorption peaks at wavelengths ranging from 585 to 595 nm (8). Hemoglobin has also a significant absorption at 1064 nm. There are many studies about the efficacy of Nd:YAG 1064 nm for the treatment of vascular lesions such as telangiectasias and venous lakes (9-11). Therefore 1064 nm Nd:YAG is also effective in treatment of warts with the wart blood vessels as the target.

Nd:YAG was also previously used for wart clearance. In a study by Han [8] the clearance rate was 96% (336 of the 348 treated warts were eradicated). The mechanism of action of a long-pulsed Nd:YAG laser in the treatment of warts is not fully understood. Dilated vessels in the papillary dermis are a characteristic feature of warts (8). Light microscopic evaluation of the treated wart and surrounding area showed separation of the dermo-epidermal junction, epidermal necrosis and destroyed blood vessels in the dermis surrounded by a dense inflammatory which may obliterate the nutrient supply to the wart or destroy the rapidly dividing epidermal cells that contain HPV.

Minimal destruction of the surrounding tissue is anticipated with long-pulsed Nd:YAG lasers.

In this report we presented four cases of successfully removed resistant warts using a 1064 nm Nd:YAG laser. Treatments were executed in two medical centers both using seemingly similar parameter settings, but having different numbers of sessions administered (a single session in one center and more than 10 sessions in the other). Such difference in the number of sessions could be partly attributed to differences in two parameter settings: spots sizes (4 mm vs. 3 mm) and pulse durations (14 ms vs. 30 ms). It is well known that bigger spot sizes penetrate deeper and deliver higher temperatures to the same tissue depths. So 240 J/cm² delivered with 4 mm spot will have stronger effect in the skin than the same fluence delivered with 3 mm spot. Also, the same energy delivered in shorter or longer pulse results in different peak powers, shorter pulses having higher peak powers. Thus 240 J/cm² delivered in a 14 ms pulse has approximately twice the peak power of a 30 msec pulse with the same fluence. Sharper pulses delivered with larger spot sizes are more painful, thus practitioners usually design their treatments according to patients' tolerability. Pain management is usually done just with cooled air and without other anesthesia.

Other reasons for the difference in the number of treatments are in the practitioner's technique when covering the wart with laser energy and also in the individual warts specifics.

However, in all presented cases warts were successfully removed and there were no recurrences (two cases have been followed for more than two years). Apart from the transient pain during the treatment, there were no other unwanted side effects reported.

CONCLUSION

We can conclude that wart removal with 1064 nm Nd:YAG is a safe, effective and well-tolerated treatment with no adverse events reported.

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