

*Research Article***Diode 577 nm laser versus 1064 nm Nd-YAG laser in the treatment of cutaneous wart**

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Abstract

Introduction: Verrucae are benign epithelial proliferations, caused by human papillomavirus (HPV) infection occurring on the skin and mucosa. Traditional therapeutic options for warts, such as topical therapy, cryotherapy, surgical excision, and electrocautery, have proven somewhat effective, but these approaches may offer incomplete and superficial results leading to high recurrence rates. Laser therapy offers an alternative solution to traditional treatment methods. **Methods:** The study was carried out on 50 patients presented with common wart (verruca vulgaris) 250 lesions (100 lesions treated with 1064 nm Nd-YAG laser, 100 lesions treated with 577 nm Diode laser, and 50 lesions as control). All patients attended to the laser unit of the Dermatology and Andrology department at Al-Azhar University Hospital (Assiut) between December 2019 and July 2020. **Results:** Considering lasers efficacy, most of wart lesions were completely disappeared after 1st session of laser treatment, with no significant difference between Nd-YAG and Diode lasers, moreover, most of control wart lesions 34 (68%) had no changes, while 16 (32%) were completely disappeared after treatment, with no significant complications detected in most of patients. **Conclusion:** 1064 nm Nd-YAG laser and 577 nm Diode laser, can be used as safe and effective monotherapy for the treatment of viral warts. Factors as younger age, skin photo type III of patients, short duration, small size and 1st appearance of lesions, can be used as predictive parameters for the treatment.

Keywords: Cutaneous wart, Diode laser, Nd-YAG laser.

Introduction

Warts are considered as one of the most reported cases at Dermatology outpatient clinics. It has a great concern not only in terms of cosmetic reasons but also their association with other medical conditions. They are benign growths that appear when a virus infects the skin surface and mucosa i.e both oral and genital. Viruses that cause warts are called human papillomavirus (HPV)^[1].

Viral warts can persist for several years and be functionally and cosmetically disabling. Although 60% are estimated to resolve spontaneously within 2 years as a result the development of cell-mediated immunity^[2].

Screening and treatment of such condition is of a major public health concern. Attention is beginning to focus on the viral factors that determine persistence and neoplastic

progression to cancer and the possible role of HPV in other nongenital cancers (e.g., skin, upper aerodigestive tract)^[3].

There is currently no cure for HPV infection, and therapy does not affect transmissibility^[4]. Therefore, current therapy aims at eliminating signs and symptoms. No single treatment is fully effective in all patients. Different types of warts may need different site-dependent treatments, and treatments may need to be combined. Spontaneous regression of warts must be considered in researching the effectiveness of treatment^[5].

The ultimate wart treatment^[2] would resolve all or a great percentage of warts, be painless, need only one or a part of a wart treated, call for one to three treatments, create no scarring, offer HPV immunity for a lifetime and be available to all patients^[6].

Different therapies are used for this purpose. However, there are concerns regarding these modalities in terms of their success, cost and side effect profile^[7].

Laser therapy offers an alternative solution to traditional treatment methods. Monochromatic light energy of a specific fluence and wavelength is absorbed by targeted tissue chromophores and converted to thermal energy, leading to selective tissue destruction leading to clearance of HPV infection^[8].

The aim of this work is to compare between Diode 577 nm laser versus 1064 nm Nd-YAG laser in the treatment of cutaneous wart and correlate each efficacy and safety with the patients' clinico-demographic features in an attempt to better management of such condition.

Patients and methods

The study was carried out on 50 patients presented with common wart (verruca vulgaris) 250 lesions (100 lesions treated with 1064 nm Nd-YAG laser, 100 lesions treated with 577 nm Diode laser, and 50 lesions as control). All patients attended to the laser unit of the Dermatology and Andrology department at Al-Azhar University Hospital (Assiut) between December 2019 and July 2020.

Complete history was taken from patients as: Personal history included; name, age, sex, and any special habits of medical importance; Present history included; onset, course, and duration of verruca vulgaris; Past history of photosensitivity, PIH, or other general or endocrinal diseases; Family history of verruca vulgaris, photosensitivity, PIH, or other general or endocrinal diseases.

All patients were subjected to: General examination, for general condition of the patients; and dermatological evaluation in order to define Fitzpatrick skin type, site of verruca vulgaris (flexor sites, extensor sites, or both), and laterality of verruca vulgaris (unilateral, or bilateral).

All patients constructed to receive one or more sessions (maximum of three) of laser treatment at an interval of 4 weeks on wart lesions (250 lesions, 100 lesions treated with 1064 nm Nd-

YAG laser, 100 lesions treated with 577 nm Diode laser, and 50 lesions as control).

Follow-up of the patients was done every month and at the end of 3rd month by clinical examination and photography. Follow up included: Comparing the photographs before and after therapy; Evolution of clinical response included extent of improvement and possible side effects.

Results

The age of patients ranged from 18-70 years with a mean of 27.56 ± 12.04 years. The majority of patients 40 (80%) were female. Regarding skin photo type, most of patients 48 (96%) presented with skin photo type III, family history of wart was positive in 12 (24%) of patients. The duration of common wart lesions ranged from 2 to 24 weeks with mean 8.84 ± 5.40 weeks. Size of lesions, ranged from 1 to 5 mm with mean 2.68 ± 1.33 mm. As regard appearance of lesions, 36 (72%), had 1st time appearance, while 14 (28%) of lesions were recurrent. As regard site of wart, the majority of lesions 26 (52%) presented in flexor site, then extensor site 20 (40%), and both sites 4 (8%). With reference to laterality of lesions, most of lesions 32 (64%) presented bilaterally, as shown in (Table 1).

Most of wart lesions were completely disappeared after 1st session of laser treatment, with no significant difference between Nd-YAG and Diode lasers. There was significant difference between Nd-YAG and Diode lasers according to recurrence, as lesions treated with diode laser had no recurrence at all, while 12 (12%) of lesions treated with Nd-YAG laser had history of recurrence, as shown in (Table 2).

There was significant relation between improvement and clinic-demographic data of studied patients in Nd-YAG laser treated lesions regarding age, and skin photo type, duration, size, and appearance of lesion, as shown in (Table 3).

There was significant relation between improvement and clinic-demographic data of studied patients in Diode laser treated lesions regarding age, and skin photo type, duration, and appearance of lesion, as shown in (Table 4). Most of patients had no complications, while

transient erythema and post inflammatory hypopigmentation were the most common complications presented in some patients, with

no significant difference between Nd-YAG and Diode lasers, as shown in (figure 1).

Table (1): Clinic-demographic data of studied patients.

Age (Years):	
(Range) Mean ± SD	(18-70) 27.56 ± 12.04
Sex: n (%)	
Male	10 (20)
Female	40 (80)
Skin photo type: n (%)	
III	48 (96)
IV	2 (4)
Family history: n (%)	
Positive	12 (24)
Negative	38 (76)
Duration (weeks):	
(Range) Mean ± SD	(2-24) 8.84 ± 5.40
Size (mm):	
(Range) Mean ± SD	(1-5) 2.68 ± 1.33
Appearance: n (%)	
1 st time	36 (72)
Recurrent	14 (28)
Site: n (%)	
Flexor	26 (52)
Extensor	20 (40)
Both	4 (8)
Laterality: n (%)	
Unilateral	18 (36)
Bilateral	32 (64)

Table (2): Difference between Nd-YAG and Diode lasers regarding improvement and recurrence.

	Nd-YAG (100)	Diode (100)	p-value
	n (%)		
Improvement			
After 1 st session	84 (84)	80 (80)	0.799
After 2 nd session	8 (8)	12 (12)	
After 3 rd session	8 (8)	8 (8)	
Recurrence			
Recurrence	12 (12)	0 (0)	0.012*
No recurrence	88 (88)	100 (100)	

Table (3): Relation between improvement and clinic-demographic data of studied patients in Nd-YAG laser treated lesions.

	After 1 st session	After 2 nd session	After 3 rd session	p-value
Age (Years):				
(Range) Mean ± SD	(18-44) 27.14±12.14	(28-69) 38.50±7.92	(22-70) 41.50±13.12	0.023*
Skin photo type: n (%)				
III (48)	42 (87.5)	4 (8.3)	2 (4.2)	0.001*
IV (2)	0 (0)	0 (0)	2 (100)	
Duration (weeks):				
(Range) Mean ± SD	(2-14) 6.43±5.34	(4-16) 8.23±3.30	(4-24) 16.13±4.94	0.012*
Size (mm):				
(Range) Mean ± SD	(1-5) 2.52 ± 1.31	(2-3) 2.50 ± 0.47	(4-5) 4.50 ± 0.45	0.014*
Appearance: n (%)				
1 st time (36)	34 (94.4)	2 (5.6)	0 (0)	0.002*
Recurrent (14)	8 (57.1)	2 (14.3)	4 (28.6)	

Table (4): Relation between improvement and clinic-demographic data of studied patients in Diode laser treated lesions.

	After 1 st session	After 2 nd session	After 3 rd session	p-value
Age (Years):				
(Range) Mean ± SD	(18-42) 21.33±12.47	(26-65) 27.15±7.72	(24-70) 40.70±11.11	0.033*
Skin photo type: n (%)				
III (48)	40 (83.3)	6 (12.5)	2 (4.2)	0.001*
IV (2)	0 (0)	0 (0)	2 (100)	
Duration (weeks):				
(Range) Mean ± SD	(2-24) 7.85±5.41	(8-18) 10.67±2.06	(4-24) 16.37±4.84	0.008*
Appearance: n (%)				
1 st time (36)	30 (83.3)	6 (16.7)	0 (0)	0.002*
Recurrent (14)	10 (71.4)	0 (0)	4 (28.6)	

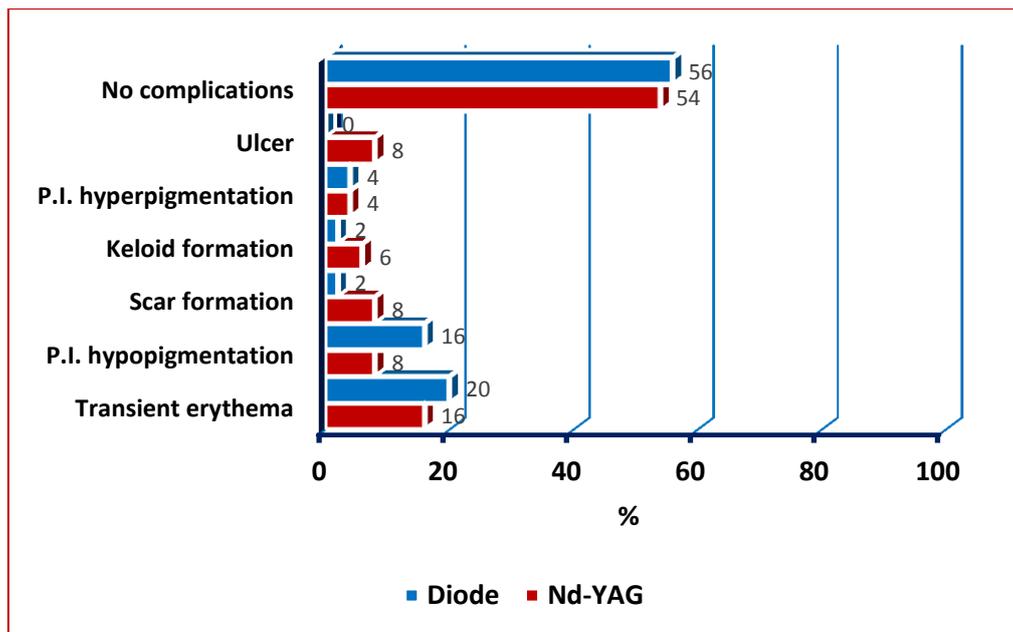


Figure (1): Difference between Nd-YAG and Diode lasers regarding complications.

Discussion

Laser therapy offers an alternative solution to traditional treatment methods^[8]. The neodymium-doped yttriumaluminum garnet (Nd:YAG) laser is specifically suited for verruca treatment due to its deeper penetrating 1064-nm wavelength and relatively low risk of pigmentation changes in dark skin types^[9]. Moreover, diode laser is a multipurpose tool for various disorders in dermatology. This laser type offers coagulation for vascular lesions with a low risk of scarring. It can vaporize warts. Diode laser can be used subcutaneously, intravascular, and transepidermal^[10]. So, the objective of this study was to evaluate the Diode 577 nm laser versus 1064 nm Nd- YAG laser in the treatment of cutaneous wart, in an attempt to achieve better management of such condition.

This study was conducted on 50 patients presented with common wart, 250 lesions (100 lesions treated with 1064 nm Nd-YAG laser, using fluenece (160 J/cm²); Pulse duration, (20 ms); number of pulse (2 p/sec); and spot size (5 mm), 100 lesions treated with 577 nm Diode laser, using fluence (200-400 J/cm²); Pulse duration, (1 ms); Wave length (577nm); and spot size (1 mm), and 50 lesions as control).

Considering lasers efficacy in our study, most of wart lesions were completely disappeared after the 1st session of laser treatment, and all lesions were completely disappeared after the 3rd session, with no significant difference between Nd-YAG and Diode lasers.

With reference to Nd-YAG laser results, this finding goes in agreement with Alshami and Mohana^[11], made a study on 240 Yemeni patients (142 males, 98 females; age 5–67 years) with a total of 2929 lesions were treated by long pulsed Nd:YAG with the following parameters: wavelength 1064 nm, pulse duration 20 msec, spot size 4–6 mm, and fluence 200–250 J/cm². The sessions were conducted at 4-week intervals. and they reported that, overall, 97% of 240 patients achieved complete clearance of all warts, with 90% of patients cured after one session, 4% after two sessions, and 3% after three sessions^[11].

Similarly, El-Mohamady and his colleagues^[12], who made a comparative study on 46 patients suffering from recalcitrant multiple plantar warts not responding to conventional therapy, one half of the lesions were treated by PDL, using spot size of 7 mm, energy of 8 joules (J),

and pulse duration of 0.5 millisecond (ms), while the remaining half were treated by Nd:YAG using spot size of 7 mm, energy of 100 J, and pulse duration of 20 ms. The patients received one or more sessions (maximum of six) of laser treatment at an interval of 2 weeks, and they demonstrated that, Nd:YAG laser is more effective than PDL and needs less number of sessions for clearance of the lesions^[12].

As well, Bingol and his colleagues^[9], made a study on 51 patients and 146 hand warts resistant to conventional treatment methods, and the patients treated by Nd:YAG using, spot size, 3 mm; pulse duration: 23 ms; fluence, 180–200J/cm². The patients received one or more sessions of laser treatment at an interval of 2 weeks, and they demonstrated that, long-pulsed Nd:YAG laser treatment was observed to be a rapid, and effective method (prior to considering surgical treatment) for treating recalcitrant warts^[9].

With reference to Diode laser results, we didn't find any studies that concerned with 577 nm Diode laser in treatment of warts, however, Findakly^[13], made a study on The study was done on 15 patients were divided into 3 groups to be treated with 810 nm Diode laser by different power; Group 1 with 9 W, power density 286 W/cm², Group 2 with 12 W, power density 381 W/cm², and Group 3 with 15 W, power density 477 W/cm², and he reported that, 810 nm Diode laser therapy of extensive viral warts should be considered as a viable alternative to other more traditional techniques. This treatment can offers a good results in eliminating the venrucae^[13]. Also, Wollina^[10], made a study on 300 patients with cutaneous wart, using ultrapulsed 980 nm diode laser is effective, of low-cost and simple treatment of wart^[10].

In this study, age of patients ranged from 18-70 years with a mean of 27.56 years, the majority of patients 40(80%) were female, most of patients 48(96%) presented with skin photo type III, family history of wart was positive in 12(24%) of patients, we found that, there was significant relation between improvement with patients' age, and skin photo type, as younger age and skin photo type III had better treatment response, while, there was no significant relation between improvement with sex, and family

history of wart in both Nd-YAG and Diode laser treated lesions.

This goes in accordance with, Gheisari and his colleagues^[14], who made a comparative study on 60 enrolled patients, 134 lesions were treated using cryotherapy and 114 other lesions treated with Nd-YAG laser beam. Thirty-four males (average age 26.85 ± 7.528 years) and 26 females (average age 26.73 ± 5.640 years) participated, and they demonstrated that, the response to the therapeutic methods was dependent on age of patients but not dependent on the sex^[14].

As well, Hsu and his colleagues^[15], demonstrated that, the laser's efficacy seems to be dependent on variables such as age of patients^[15].

On the other hand recently, Zorman and Koron^[16], made a retrospective study on 85 patients treated for wart removal using Nd-YAG laser, and they reported that, they have not been able to show any statistically significant association between age of the patient, and success of the treatment^[16], as was reported in some other studies as Alshami and Mohana^[11], and El-Mohamady and his colleagues^[12], who found no significant correlation between cure rate and any of clinical data (e.g., age, sex)^[11,12].

We didn't find any research concerned with that relationship with 577 nm Diode laser. However, in contrast to our findings, Findakly^[13], made a study on Fifteen patients (their age ranged between 7- 40 years, with mean age 25.5 years) treated with 810 nm Diode laser, he reported that, disappearance of warts not dependent on age or sex of studied patients^[13].

In our study, the duration of wart lesions ranged from 2 to 24 weeks with mean 8.84 weeks. Size of lesions, ranged from 1 to 5 mm with mean 2.68 mm, 36(72%) of lesions, had 1st time appearance, the majority of lesions 26(52%) presented in flexor site, most of lesions 32(64%) presented bilaterally, we found that, there was significant relation between improvement with duration, size, and appearance of lesion, as short duration, small size and 1st appearance of lesions had better response, while, there was no significant relation between improvement and site, of lesion treated with Nd-YAG laser. Also,

we found that, there was significant relation between improvement with duration, and appearance of lesion, as short duration, small size and 1st appearance of lesions had better response, while, there was no significant relation between improvement with size, and site, of lesion treated with Diode laser.

This goes in accordance with, Alshami and Mohana^[11], who reported that, clearance of viral warts depending on the diameter, site, duration and number of warts the larger the number of warts, the greater their size, and the longer their duration, the lower our observed cure rates in patients treated with Nd-YAG laser. These effects can be explained by low immunity against HPV, which is necessary for HPV clearance^[11].

This result was not seen in the study conducted by Jain and Storwick^[17], who found no difference in cure rates according to wart localization in patients treated with Nd-YAG laser^[17]. Also, El-Mohamady and his colleagues^[12], found that, there was no significant correlation between cure rate and sites of lesions. Although there was no significant correlation with the duration of the lesions, it was noticed that lesion of shorter duration showed better cure rate than long standing lesion in patients treated with Nd-YAG laser^[12]. As well, Gheisari and his colleagues^[14], found no significant correlation between improvement with size, sites, and duration of lesions in patients treated with Nd-YAG laser^[14].

We didn't find any research concerned with that relationship with 577 nm Diode laser. However, in contrast to our findings, Findakly^[13], made a study on Fifteen patients (duration of wart lesions ranged between 2-72 months, size of lesions ranged between 2-5 mm, most of patients had 1st time appearance of wart, and most of lesions located on extensor site) treated with 810 nm Diode laser, he reported that, disappearance of warts not dependent on duration, appearance size, and site, of lesions^[13].

Considering lasers safety in this analysis, most of patients had no complications, while transient erythema and post inflammatory hypopigmentation were the most common complications presented in some of patients, with no significant difference between Nd-YAG and Diode lasers.

With reference to Nd:YAG laser complications, El-Mohamady and his colleagues^[12], reported that, the occurrence of adverse side effects reported by Nd: YAG laser was significantly higher than those reported by the PDL group. Transient erythema, followed by post inflammatory hypopigmentation, was the primary complaint from those treated by Nd:YAG. This study reported that an advantage of PDL over Nd:YAG is the absence of any wounds, thus eliminating postoperative pain, disability, or scarring^[12]. As well, Bingol and his colleagues^[9], reported minimal adverse effects presented by patients, 18.5% exhibited erythema, and 5.5% experienced hyperpigmentation^[9]. Also, Han and his colleagues^[8], reported minimal adverse effects on patients such as transient erythema and numbness (15%), hemorrhagic bullae (7%), hyperpigmentation (5%), hypopigmentation (4%), and nail dystrophy (2%)^[8].

With reference to Diode laser complications, Findakly^[13], found that, post-inflammatory hypopigmentation had been seen in some of patient in follow up of patients, he also reported that, erythema, oozing, scales, and oedema occurred and healed within about 1 week post laser treatment^[13].

The limitations of this study include the small number of patients, and the limited duration of follow-up. Therefore, more clinical data and longer follow-up periods are required to validate the efficacy and safety of this treatment modality.

Conclusion

According to the present results, we conclude that: 1064 nm Nd-YAG laser and 577 nm Diode laser, can be used as safe and effective monotherapy for the treatment of viral warts, also, factors as younger age, skin photo type III of patients, short duration, small size and 1st appearance of lesions, can be used as predictive parameters for the treatment of viral warts in patients treated with 1064 nm Nd-YAG laser and 577 nm Diode laser.

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