

Efficacy of Long Pulse 1064 nm ND-Yag Laser in the Treatment of Common Wart in Comparison to LN Cryotherapy

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Abstract

Warts are one of the common dermatological diseases. Different treatment modalities of common warts are present with various efficacy and safety outcomes. To measure the efficacy of long pulse ND Yag laser in comparison to cryotherapy in the management of common warts a prospective comparative interventional study was conducted in Erbil Dermatology Center in Erbil city, Kurdistan Region-Iraq through six months period from 1st of March to 31st of August 2022. In this study about 56 patients with common warts were enrolled. The subjects have been divided into two groups. Group A 28 patients were treated by ND-Yag laser long pulse 1064 nm and group B composed of 28 patients was treated by LN cryotherapy. The treatment is composed of 1-4 sessions. Follow-up of the patient was performed after 2 weeks after the session. At the end of the sessions, a complete cure of common warts was observed in 75% of group A patients, while 67.9% of patients of group B patients had the complete cure. About 64.4% of patients who received Nd:YAG laser therapy were very satisfied with the treatment, while 71.4% of patients treated by LN cryotherapy were very satisfied with the treatment. The effectiveness and safety of Nd:YAG laser and cryotherapy in the management of common warts are close. Generally, Nd:YAG laser showed relatively better outcomes, especially in adult common warts patients who had the disease recently.

Keywords: Common warts, Cryotherapy, Nd:YAG laser.

Introduction

Warts are benign epithelial neoplasms that occur in the mucosa and skin. Human papillomavirus (HPV) infection is the cause of these lesions and more than 100 types of HPV were reported as responsible for warts etiology with different body locations (Al Aboud & Nigam, 2023). HPV can lead to benign or malignant lesions; however, the cutaneous warts are benign lesions with no malignancy risk in the future that are caused by risk-HPV (Santos-López., 2015). Cutaneous warts are caused at least by 15 different subtypes of HPV (Sterling et al., 2014). Primary manifestations of HPV infection included common warts, genital warts, flat warts, deep palmoplantar warts, focal epithelial hyperplasia, epidermodysplasia verruciformis and plantar cysts (Al Aboud & Nigam, 2023; Santos-López et al., 2015; Sterling et al., 2014). Common warts (*Verrucae vulgares*) are most dermatological cases presented to physicians. Most common warts are asymptomatic but in some cases might be painful under pressure and associated with aesthetic problems (Muršić et al., 2020).

Common warts affect approximately 10% of the general population (Barzallo et al., 2022). Common warts among adults are mostly not resolved spontaneously with high resistance to treatment, additionally, immunocompromised populations such as patients infected by human immunodeficiency virus or patients following transplant surgery are at high risk of common warts (Leavens et al., 2022). On histology examination, warts presented as epidermal acanthosis, papillomatosis, hyperkeratosis and parakeratosis with elongated ridges often curving toward the center of the wart (Leung, 2010). However, the common warts diagnosis might be difficult as these lesions simulate other skin lesions such as seborrheic keratosis, acne vulgaris, folliculitis, and others. Dermoscopy is helpful in the diagnosis of common warts and differentiates warts from other dermatological diseases (Secker et al., 2017).

Salicylic acid and cryotherapy are the first options in treating common warts with efficacy rates of 0-80% for salicylic acid and 14-90% for cryotherapy (Kwok et al., 2012). Cryotherapy and electrocautery are effective treatment options for common warts, but they are painful and might be complicated by scar formation with reported failure and relapse rates. Moreover, intralesional immunotherapy also showed an efficacy of 60% in the complete treatment of common warts (Horn et al., 2005). Treatment types of warts are various in regard to location, type, and size of lesion. Other treatment methods like surgery with curettage, acetic acid, tretinoin or 20%-50% trichloroacetic acid, cytostatic are also helpful in treating common warts lesions but with low

efficacy and high side effects (Wolff, 2009).

Nowadays, different new treatment approaches are used like energy-based devices commonly lasers. Ablative lasers like CO₂ (Hemmatian Boroujeni & Handjani, 2018) and Er: YAG (Balevi et al. 2017) lasers are used in warts management with an efficacy rate of 70%. However, a Non-ablative laser is also selected for treating warts with an efficacy rate of 96% (Alshami & Mohana, 2016). The mechanism of action for Non-ablative laser is local hyperthermia (Huo et al., 2010). This mechanism includes the conversion of laser monochromatic light with specific fluence and wavelength that is absorbed by targeted tissue chromophores to thermal energy and destroys a specific tissue. This tissue destruction is the result of either coagulation or blasting and is dependable on pulse duration and energy density (Bingol et al., 2015).

The Nd: YAG laser is the best laser treatment choice for common warts due to its deep penetration wavelength (1064-nm), which helps in direct contact with common warts with low risk of pigmentation of dark skin (Hsu, Aldahan, Tsatalis, Perper, & Nouri, 2017), but unfortunately associated with pain, which needs topical or infiltrative anaesthesia (Bingol et al., 2015; Kimura et al., 2014; Shin et al., 2017). The Nd: YAG laser showed great efficacy in wart removal with high safety without anesthesia (Smith et al., 2015; Zorman & Koron, 2021).

In the Kurdistan region, the common warts are common dermatological cases presented to health institutes with a reported efficacy rate of cryotherapy was reaching to 66.7% (Muhamad & Sulaiman, 2018), while the reported efficacy rate for Nd:YAG laser among Iraqi patients with plane wart was reaching to 91.43% (Al-Sabak et al., 2019). The current study aimed to measure the efficacy of long pulse ND Yag laser in comparison to cryotherapy in the management of common warts.

Martial and methods

The present study was a prospective comparative interventional study conducted in Erbil Dermatology Teaching Center in Erbil city, Kurdistan Region-Iraq through six-month period from 1st of March to 31st of August 2022.

The inclusion criteria were approved diagnosis of common warts irrespective of age and gender. Exclusion criteria were; patients already on topical wart therapy, patients with peripheral vascular disorders, patients with peripheral neuropathy, and patients on systemic immunosuppressive agent, pregnancy and lactation. The ethical considerations were

implemented according Helsinki Declaration regarding ethical approval of Health authorities; an ethical approval was taken from Kurdistan higher council of medical specialties, agreement of dermatology center authority, informed written consent of patients and management of complications accordingly.

A sample of 56 patients with common warts was enrolled and randomly divided into two groups; group A composed of 28 patients were treated by ND-Yag laser long pulse 1064 nm, with fluence 101j/cm², frequency 2 Hz, spot size 2mm, 2 pass of laser was performed. This procedure performed by using Picolor® – Dual Pulsed Q-Switch Nd:YAG Laser (manufactured by Maria Medical Technology). Group B composed of 28 patients. They were treated by LN cryotherapy using cryogun, 2 cycles of freezing and thawing performed on each wart. Session of both groups repeated at interval of 2 weeks.

The data of enrolled patients were collected by researcher directly from patients in the center and recorded in a prepared data record sheet which was designed by the researchers. This data record sheet included the following information: General characteristics of patients (age, gender, social status, economic status, address and job), disease characteristics (disease duration, previous attack, previous treatment, treatment type, side effects of previous treatment, location of lesions, number of lesions and size of lesions), outcome of treatment sessions, cure rate, efficacy of treatment, side effects of treatment and satisfaction of patients regarding treatment.

Follow-up of the patient was performed after 2 weeks after each session. The evaluation of treatment of the wart was measured by size reduction as follows; complete response (reduction of size by more than 80%), good response (reduction of the size of wart by 51-80%), mild response (reduction of the size of wart by 25-50%) and no response (reduction of the size of wart by less than 25%). Recording of adverse effects was implemented by identifying erythema, purpura, bleeding, crusting, bullae formation, and infection.

Data obtained was analyzed by using the statistical package for social sciences (SPSS version 22). Numerical data is summarized by calculating the means and standard deviations, and categorical data is summarized as frequencies and percentages. The Chi-square test of association is used to compare proportions. A P value of < or equal to 0.05 will be considered as statistically significant.

Results

A total of 56 patients, 28 cases in each group, were studied. Patients' ages ranged between 2-50 years of age. The majority of the patients were between 2-25 years of age in both groups. Mean age was 23.00 ± 12.16 years and 18.696 ± 11.984 years in groups A and B, respectively. There were 15 males (53.6%) in-group A and 10 males (35.7%) in group-B while 13 females (46.4%) in group-A and 18 females (64.3%) in group-B (Table 1).

Table 1. Distribution of general characteristics of the patients in the study groups.

Parameters		Group A Nd:YAG Laser (n=28)		Group B LN Cryotherapy (n=28)	
		No.	%	No.	%
Mean age of the patients (in years)		18.7		23.0	
Age (in years) (Groups)	2 – 25	22	78.6%	20	71.4%
	26 – 50	6	21.4%	8	28.6%
Gender	Male	10	35.7%	15	53.6%
	Female	18	64.3%	13	46.4%
Social Status	Single	16	57.1%	15	53.6%
	Married	12	42.9%	12	42.9%
	Divorced	0	0.0%	1	3.6%
Economic Status	Poor	5	17.9%	7	25.0%
	Moderate	14	50.0%	13	46.4%
	Good	8	28.6%	6	21.4%
	Very good	1	3.6%	2	7.1%
Address	Inside Erbil	28	100.0%	26	92.9%
	Outside Erbil	0	0.0%	2	7.1%
Occupations	Child	4	14.3%	1	3.6%
	Student	11	39.3%	11	39.3%
	Gov. Employee	0	0.0%	1	3.6%
	Private employee	4	14.3%	9	32.1%
	Jobless	9	32.1%	6	21.4%

The mean duration of disease in-group A was 23.96 ± 27.067 months, while group B was 20.96 ± 31.774 Months. About half of the patients in both groups had their common warts on the upper limbs as shown in Table 2.

Table 2. Anamnesis and physical characteristics of the disease

Parameters		Group A		Group B	
		Nd:YAG Laser (n=28)		LN Cryotherapy (n=28)	
		No.	%	No.	%
Duration in Month		21		24	
Duration Groups	≤ 1 Year	18	64.3%	17	60.7%
	>1 Years	10	35.7%	11	39.3%
Previous history of warts	No	27	96.4%	24	85.7%
	Yes	1	3.6%	4	14.3%
Previously used Treatment	No	19	67.9%	13	46.4%
	Yes	9	32.1%	15	53.6%
Mean number of Lesions/ one patient		4		4	
Size of the largest wart (in mm)		6		7	
Location	Head and Neck	1	3.6%	0	0.0%
	Trunk	0	0.0%	0	0.0%
	Upper Limbs	18	64.3%	16	57.2%
	Lower Limbs	11	39.2%	13	46.4%

At 2-week checkup after first sessions of the treatment, complete cure been observed in 5/28 patients in the group of Nd:YAG laser and 3/28 of patients in LN cryotherapy group (Table 3). At 4-week checkup after 4th sessions of the treatment complete cure reached up to 21/28 and 19/28 cases in Nd:YAG laser (Figure 1,2,3) and LN cryotherapy (Figure 4,5) groups respectively.



Figure 1. A 21 years old male patient with a solitary common wart on the dorsum of right hand. The left hand complete clearance after one session of Nd:YAG laser therapy



Figure 2. A 28 years old male patient with multiple common warts, mosaic in some locations. After four sessions of Nd:YAG laser therapy achieved complete clearance almost all lesions.



Figure 3. A 12 years old female with peri-ungual wart on right middle finger. After two sessions Nd:YAG laser therapy achieved completer clearance.



Figure 4. A 38 year old female with common wart on the dorsum of her right thumb. After 3

session of LN cryotherapy achieved complete clearance.



Figure 5. An 18-year-old male patient with two common warts on the palm of the left hand. Complete clearance of the warts was achieved after two sessions of LN cryotherapy

Table 3. Response of the wart to the treatment modalities

Response to treatment		Group A		Group B	
		Nd:YAG	Laser	LN Cryotherapy	
		No.	%	No.	%
After 1 st Session (2 weeks)	Number of the patients	N=28		N=28	
	No response	1	3.6%	1	3.6%
	Mild response	15	53.6%	16	57.1%
	Good response	7	25.0%	8	28.6%
	Complete cure	5	17.9%	3	10.7%
After 2 nd Session (4 weeks)	Number of the patients	N=23		N=25	
	No response	3	13.1%	0	0.0%
	Mild response	5	21.7%	11	44.0%

	Good response	10	43.5%	9	36.0%
	Complete cure	5	21.7%	5	20.0%
After 3 rd Session (6 weeks)	Number of the patients	N=18		N=20	
	No response	3	16.7%	0	0.0%
	Mild response	2	11.1%	5	25.0%
	Good response	8	44.4%	10	50.0%
	Complete cure	5	27.8%	5	25.0%
After 4 th Session (8 weeks)	Number of the patients	N=13		N=15	
	No response	1	7.7%	0	0.0%
	Mild response	1	7.7%	3	20.0%
	Good response	5	38.5%	6	40.0%
	Complete cure	6	46.1%	6	40.0%

As shown in Figure 6; the efficacy rate of Ng:Yag Laser therapy in achieving complete cure was 75% in the treatment of common warts, while the efficacy rate of LN Cryotherapy therapy to achieve complete cure in the treatment of common warts was 67.9% with no significant difference between both study groups ($p=127$).

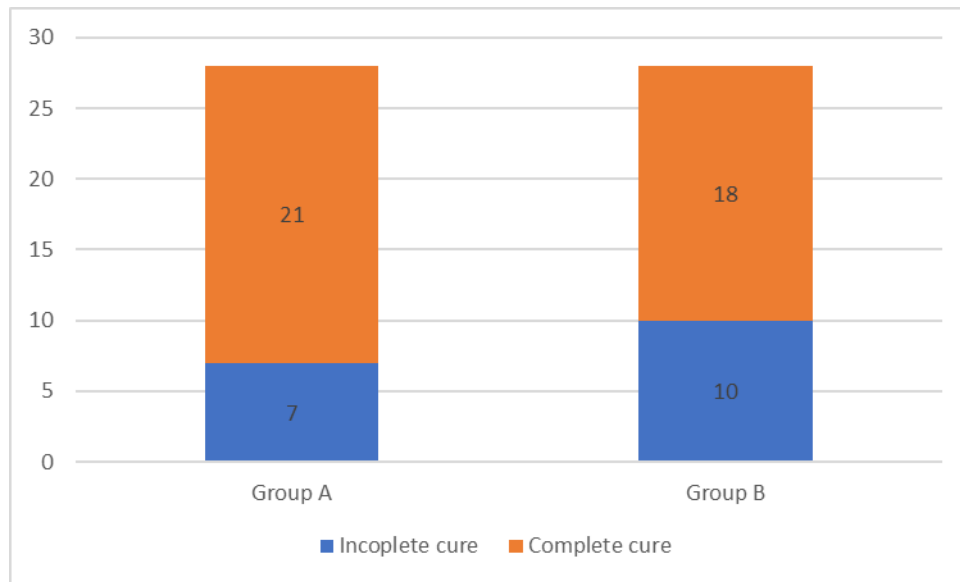


Figure 6. Efficacy of Group-A (Nd:YAG Laser) & Group-B (LN Cryotherapy), (Chi square = 2.333, P-Value = 0.127).

Figure 7 shows patients' satisfaction to the treatment modalities. About 64.4% of group A patients were very satisfied on treatment, 17.8% of them fairly satisfied and 17.8% of them were not satisfied on treatment. Regarding group B; 71.4% of them were very satisfied on treatment, 3.6% of them were fairly satisfied and 25% of them were not satisfied on treatment.

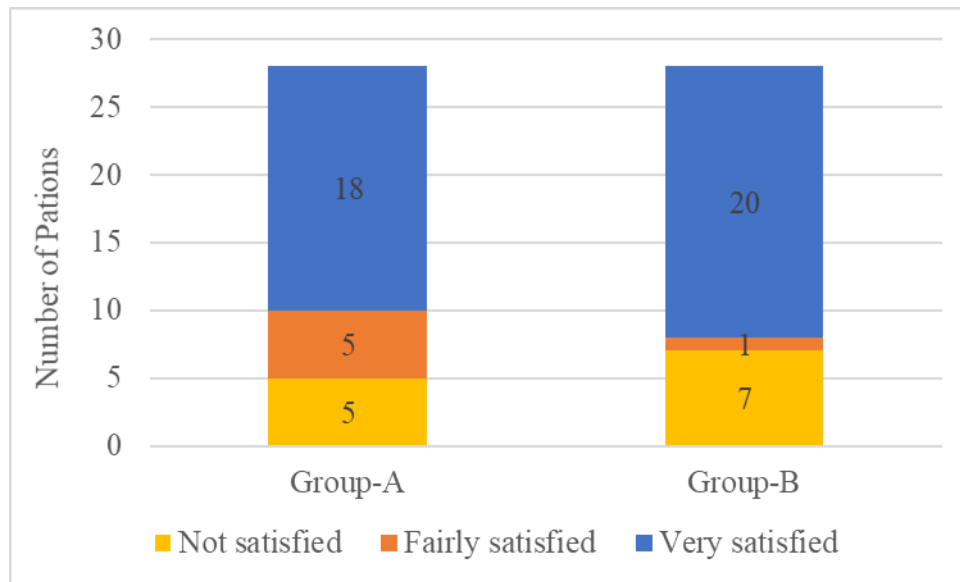


Figure 7. Satisfaction of patients according to study groups.

Regarding side effects at the site of the treatment were different among both groups. Pain sensation during sessions and ecchymosis were more in patients with Nd:YAG laser therapy, while swelling and bullae formation after procedures were more observed in cases undergoing LN cryotherapy (Table 4).

Table 4. Side effects observed during and after treatment in the studied groups

Sessions	Side effects	Group A Nd:YAG Laser (n=28)		Group B LN Cryotherapy (n=28)	
		No.	%	No.	%
1 st Session	Pain during session	4	14.3%	1	3.6%
	Bullae and swelling	0	0.0%	2	7.1%
	Ecchymosis	1	3.6%	0	0.0%

	Pain, Bullae and swelling	0	0.0%	13	46.4 %
	Pain and Ecchymosis	21	75.0%	1	3.6%
	Pain, Bullae and swelling + Ecchymosis	2	7.1%	11	39.3 %
2 nd Session	Pain during session	7	35.0%	2	8.7%
	Bullae and swelling	0	0.0%	1	4.3%
	Ecchymosis	2	10.0%	0	0.0%
	Pain + Bullae and swelling	0	0.0%	10	43.5 %
	Pain + Ecchymosis	11	55.0%	2	8.7%
	Pain + Bullae and swelling + Ecchymosis	0	0.0%	6	26.1 %
3 rd Session	Pain during session	5	35.7%	2	11.1 %
	Bullae and swelling	0	0.0%	3	16.7 %
	Ecchymosis	3	21.4%	0	0.0%
	Pain, Bullae and swelling	0	0.0%	9	50.0 %
	Pain and Ecchymosis	5	35.7%	0	0.0%
	Pain, Bullae, swelling and Ecchymosis	0	0.0%	3	16.7 %
4 th Session	Pain during session	3	37.5%	0	0.0%
	Bullae and swelling	0	0.0%	3	25.0 %
	Ecchymosis	2	25.0%	0	0.0%
	Pain, Bullae, and swelling	0	0.0%	7	58.3 %
	Pain and Ecchymosis	3	37.5%	0	0.0%

Discussion

Different treatment modalities for common warts have been explored to detect the best treatment option for common warts resolution. Finding out the exact effectiveness of each treatment way is not easy with various parameters and absent comparison between each of these treatment ways (Huo et al., 2022).

In the current study, in the group A patients who underwent Nd: YAG laser treatment, about 75% (21/28) of patients had complete cure of common warts, 17.9% (5/28) of them had good resolution, 3.55% (1/28) of them had mild resolution and 3.55% (1/28) of them had no response of the lesions. These findings are close to the results of Nguyen et al (Nguyen et al., 2016) systematic review study in the United States of America which reported that the response rate of non-genital warts to Nd: YAG laser therapy ranged between 46-100%. In Iraq, Al-Sabak et al (2019) performed a clinical trial on plane warts using a 532 nm long-pulsed Nd: YAG laser with a fluence of 30 J/cm on 22 patients. Their results showed that 78.94% achieved complete response after 3 sessions. The results were nearly the same as in our study, however, the fluence of the laser in our study was higher (101j/cm) and the subjects had plane warts in their study. This indicates that the common wart because of larger mass and more hyperkeratosis needs higher energy of Nd: YAG laser to achieve complete response.

Regarding group B patients, who received LN cryotherapy sessions, the results showed that 67.9% (19/28) of patients with common warts had the complete cure, 21.4% (6/28) of them had a good response, 10.7% (3/28) of them had a mild response. These findings are better than the results of Huo et al. (2022) multi-center non-randomized controlled trial study in China which reported that the complete clearance rate of plantar warts by cryotherapy was (54.3%). This difference might be attributed to differences in the type of warts, in which planter warts had more resistance to treatment.

The present study showed an efficacy rate of Laser therapy with Nd: YAG with complete remission as high as 75% in the treatment of common warts, while the efficacy rate of Cryotherapy therapy in the treatment of common warts as complete clearance was 67.9%, these results show that Nd: YAG laser has a higher percentage of complete clearance of common wart than LN cryotherapy, however, this difference was statistically not significant ($p=127$). These findings are similar to the results of Liu et al (Liu et al., 2022) randomized controlled trial in China which revealed that the therapeutic efficacy of Nd: YAG laser was similar to cryotherapy, but the laser was relatively more effective in recalcitrant warts and characterized by shorter time in removing warts. In Iran, a study conducted by Gheisari et al (Gheisari et al., 2019) found that both cryotherapy and long-pulsed Nd: YAG laser is effective in the reduction of both the width and length of common warts, but their efficacy was not significantly different.

In present study, the common side effects of Nd:YAG laser therapy after four sessions of treatment of common warts were commonly pain, bullae, and swelling. These findings are in agreement with the results of Shrestha and Karn's (2018) study in Nepal which found that pain and bullae are the main side effects of Nd: YAG laser therapy in the treatment of common warts. A study conducted in Slovenia by Zorman and Koron (2021) revealed that a long-pulse 1064-nm Nd: YAG laser without any topical anesthesia is safe and effective for the treatment of warts. Our study showed that pain and ecchymosis are the main side effects of laser treatment of common warts. These findings are close to the results of Tahir and Sulaiman's comparative study (Muhamad & Sulaiman, 2018) in Erbil city-Kurdistan region/Iraq which reported that pain and blistering are the common side effects of four sessions of cryotherapy treatment among patients with plantar warts.

The present study showed that 64.4% of patients were very satisfied with Laser treatment, 17.8% of them fairly satisfied and 17.8% of them were not satisfied with Laser treatment. These findings are close to the results of Bennardo et al (Bennardo et al., 2022) retrospective study in Italy which reported higher patients' satisfaction for long-pulsed Nd: YAG laser in the treatment of common warts. Regarding group B; 71.4% of patients with common warts were very satisfied on treatment, 3.6% of them were fairly satisfied and 25% of them were not satisfied on treatment. These findings are close to the results of Bruggink et al (Bruggink et al., 2010) randomized controlled trial study in the Netherlands which reported that 69% of patients with common warts were satisfied after cryotherapy treatment.

Conclusion

In this study, results concluded that 1064 nm long-pulsed Nd: YAG laser is satisfactory effective in achieving complete clearance of common warts in 75% as compared to LN cryotherapy (67.9%) was higher but this difference was statistically insignificant ($p=127$). The most common issues associated with Nd: YAG laser were pain during the procedure and ecchymosis, while in the LN cryotherapy pain during the procedure was lower but swelling and bullae were more observed.

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