

Original Article

Comparison of efficacy of 10% potassium hydroxide (KOH) versus liquid nitrogen cryotherapy in the treatment of palmoplantar warts

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Abstract

Background Viral Warts are benign proliferation of epidermis caused by Human Papilloma Virus (HPV). Different types of cutaneous warts include flat warts, palmoplantar warts, common warts, genital warts etc. Treatment options includes salicylic acid, formaldehyde, liquid nitrogen cryotherapy, trichloroacetic acid (TCA), tretinoin, potassium hydroxide (KOH) and cauterization.

Objective To compare the efficacy of 10% KOH solution versus liquid nitrogen (cryotherapy) in the treatment of palmoplantar warts.

Methods A total of 120 patients of palmoplantar warts fulfilling inclusion and exclusion criteria were inducted in the study. Patients were randomly divided into two groups; 60 patients in Group A received 10% KOH solution daily at night while 60 patients in Group B received treatment with liquid nitrogen cryotherapy weekly by cotton bud method. Efficacy was assessed at the end of 4 weeks for both groups. Treatment was labeled as efficacious if complete disappearance of warts occurred after 4 weeks of therapy.

Results Mean age of patients was 22.97 ± 10.69 years. Efficacy was seen in 73.3% patients in group A and 60% patients in group B. Treatment was found to be efficacious in both groups and there was no statistically significant difference in efficacy between these treatment modalities.

Conclusion 10% KOH was found to be equally as effective as liquid nitrogen cryotherapy in treating palmoplantar warts.

Key words

Cryotherapy; Human Papilloma Virus (HPV); Potassium hydroxide (KOH); Warts.

Introduction

Warts are localized growth of outer layer of skin (epidermis) caused by Human Papilloma viruses. Warts are a very common

dermatological problem. Prevalence of warts has been estimated to be as high as 22-33% in one study.¹ Warts are most commonly seen in young children and adolescents although it can affect any age group. Immunocompromised patients are at increased risk for acquiring warts.² HPV is a DNA virus that results in benign epidermal proliferation of skin. There are many types of HPV and their manifestation is related to the anatomical site of infection.³ Around 120 types of HPV have been recognized so far and they

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affect specific sites.⁴ Different types of cutaneous warts include flat warts, palmoplantar warts, common warts, genital, filiform, and peri-ungual warts.⁵ Pathophysiology of HPV is complex and involves incorporation of HPV in genome of epithelial keratinocytes.

Topical treatments have been used as standard treatment for cutaneous warts. Treatment options includes salicylic acid, often in combination with lactic acid, formaldehyde, glutaraldehyde, imiquimod, duct tape, liquid nitrogen, cidofovir, cantharidin, trichloroacetic acid (TCA), tretinoin, potassium hydroxide (KOH) and cauterization.^{5,6}

Cryotherapy is one of the standard treatment used for cutaneous warts in primary care.⁷ It is a common treatment option because of rapid response rate and its easy application. Liquid nitrogen causes cellular injury by ice crystal formation and induces selective tissue necrosis by vascular stasis.⁸ Although cryotherapy is usually used as first line therapy in many hospitals, but cost, tissue damage, healing time, pain, erythema, edema, vesiculation and depigmentation are main side effects of cryotherapy that limits its use. In one study, it was seen that cryotherapy cost was very high with no additional benefit like early healing compared with salicylic acid.⁹

Potassium hydroxide (KOH) is a strong alkali and usually used for diagnosis of fungal infection of skin, hair and nail. Mechanism of action of KOH involves dissolution of keratin leading to destruction of cells infected by virus. It also acts as an irritant that triggers inflammatory reaction causing resolution of warts. It is simple to use and is also suitable for self-administration.

In one study conducted in Pakistan, 10% KOH was effective in 84% patients of palmoplantar

warts.⁵ Another study conducted in Brazil compared the efficacy of KOH and cryotherapy, revealed that there was no difference in effectiveness of therapies in both groups.¹⁰ This study used 5% KOH and was specific for genital warts only. Another study conducted in Srilanka compared 5% KOH and 10% KOH with liquid nitrogen. Results of this study showed that 69.2% patients in 5% KOH group, 25% patients in 10% KOH group and 76% patients in cryotherapy group showed response at the end of treatment.¹¹ There were no significant differences between liquid nitrogen and either of KOH solutions but the difference between 5% KOH and 10% KOH was significant. Another study showed efficacy of 10% KOH is 25.92%.¹²

Rationale for this study was that cryotherapy is expensive and needs specialized administration. It also has a number of side effects especially pain and hypopigmentation which makes it undesirable for many patients. Treatment with 10% KOH is cheap, readily available and has the advantage of self administration. This was the first type of study in Pakistan to compare efficacy of 10% KOH and cryotherapy in treatment of palmoplantar warts. So this study was planned to determine the best treatment option for patients of palmoplantar warts with minimum side effects.

Methods

It was a randomized controlled study conducted at Department of Dermatology, Lahore General Hospital, Lahore for duration of 6 months. After taking approval from the hospital ethical committee, a total 120 patients of palmoplantar warts, of age ranging from 15 to 60 years, either gender, with warts of more than 1 month duration, size of 5mm or more and with any number of warts were enrolled in the study. Patients receiving treatment for warts within last

1 month, those having hypersensitivity to KOH, immunosuppressed patients and pregnant females were excluded from the study.

An informed written consent was taken from all the participants to be included in this study. Particulars of patients like age, gender, duration and number of warts were taken. Detailed history (e.g. symptoms, number of warts) and examination was performed. All data was entered in predesigned proforma. Random number table was used to assign patients into two groups (Group A and Group B).

Patients in Group A received 10% KOH topical application which was applied daily at night by the patients or their attendants for 4 weeks.

Patients in Group B received liquid nitrogen through cotton bud method. Application of liquid nitrogen was done by keeping the cotton bud perpendicular to the wart until a frozen halo of 2mm appeared around the base of the wart. This procedure was repeated every week for 4 weeks. In order to prevent cross infection, one cotton bud was used for single lesion.

Efficacy was assessed at the end of 4 weeks for both groups. Treatment modality was labeled to be effective if complete disappearance of wart occurred after 4 weeks of therapy.

Data Analysis was performed using SPSS version 21. Mean and standard deviation were used to present quantitative variables, age of patients and duration of warts. Frequency and percentages were calculated for gender of patients and efficacy of treatments. Using the chi square test, the efficacy of the two groups (liquid nitrogen cryotherapy and 10% KOH) was compared. A p value of 0.05 or less was deemed significant. Age, gender, the number of warts, and their duration were used to stratify the data. A chi square test after stratification was used taking p value of ≤ 0.05 as significant.

Results

A total of 120 patients participated in our study. Mean age of patients was 22.97 ± 10.69 years. In this study, 108 (90%) patients were upto 35 years old whereas remaining 12 (10%) were between 36-60 years. Regarding gender, 74 (61.7%) were females and remaining 46 (38.3%) were males.

With regards to duration of warts, 60 (50%) patients had warts for upto 3 months and 60 (50%) had warts for more than 3 months. In this study, 80 (66.7%) patients had upto 2 warts whereas 40 (33.3%) patients had more than 2 warts (**Table 1**).

Results of our study showed that 44 patients out of 60 (73.3%) in Group A (10% KOH group) achieved efficacy. On the other hand, only 36 out of 60 patients (60%) in Group B (cryotherapy group) showed efficacy of treatment (**Table 2**). There was no significant difference between treatment with 10% KOH and cryotherapy i.e. P value:0.121.

Table 1 Clinico-demographic data.

	Number of patients		
	Group A	Group B	Total
Age			
≤ 35 years	54	54	108
36 to 60 years	6	6	12
Gender			
Male	26	20	46
Female	34	40	74
Duration of warts			
≤ 3 months	32	28	60
> 3 months	34	26	60
Number of warts			
≤ 2 warts	42	38	80
< 2 warts	18	22	40

Table 2 Efficacy of treatment.

Groups	Efficacy n(%)		Total
	Yes	No	
Group-A (10% KOH)	44 (73.3)	16 (26.7)	60
Group-B (Cryotherapy)	36 (60)	24 (40)	60

P value= 0.121

Table 3 Stratification by age.

Age (years)	Groups	Yes	No	Total
≤ 35	Group-A	40	14	54
	Group-B	32	22	54
36-60	Group-A	4	2	6
	Group-B	4	2	6

P value=0.102

Table 4 Stratification by gender.

Gender	Efficacy		Total	P value
	Yes	No		
Male				
Group-A	20	6	26	0.01
Group-B	8	12	20	
Female				
Group-A	24	10	34	0.95
Group-B	28	12	40	

Table 5 Stratification by duration of warts.

Gender	Efficacy		Total	P value
	Yes	No		
≤ 3 months				
Group-A	26	6	32	0.138
Group-B	18	10	28	
> 3 months				
Group-A	16	18	34	0.019
Group-B	20	6	26	

Table 6 Stratification by number of warts.

Gender	Efficacy		Total	P value
	Yes	No		
≤ 2 warts				
Group-A	32	10	42	0.79
Group-B	28	10	38	
> 2 warts				
Group-A	12	6	18	0.056
Group-B	8	14	22	

The data was stratified for age of patients, gender, duration of warts, number of warts and the results are shown below (**Table 3-6**).

In male patients, in Group A, efficacy was achieved in 20 (76.9%) cases. In Group B, efficacy was achieved in 8 (40%) cases. The difference was significant ($p < 0.05$) (**Table 4**).

In patients having warts for more than 3 months, in Group A, efficacy was achieved in 16 (47%) cases. In Group B, efficacy was achieved in 20 (77%) cases. The difference was significant ($p < 0.05$) (**Table 5**).

Discussion

Viral Warts are benign proliferations of epidermis caused by infection with Human Papilloma Virus (HPV) affecting mostly children and adolescents. Warts occur anywhere on skin and mucosa although the hands and feet are the most commonest sites. Different types of cutaneous warts include flat warts, palmoplantar warts, common warts, genital, filiform, and periungual warts. Treatment options are liquid nitrogen, cauterization, trichloroacetic acid (TCA), tretinoin, imiquimod, potassium hydroxide (KOH), salicylic acid, often in combination with lactic acid, formaldehyde, 5-fluorouracil and intralesional vitamin D3 etc. Purpose of the present study was to compare efficacy of 10% KOH and cryotherapy in the treatment of palmoplantar warts.

In this study, the mean age of patients was 22.97 ± 10.69 years while the mean age was 8.32 ± 1.54 years in a study conducted by Shafqat *et al.*⁵ This difference in mean age group with the current study was because of the fact that starting age of patients in this study was 15 years.

In this study 61.7% were female patients and 38.3% were male patients. These results of our study were similar with the study conducted by Wickremasinghe *et al.* In this study mean duration of warts was 3.46 ± 2.19 months while mean duration of warts was 4.34 ± 0.87 months in the study by Wickremasinghe *et al.*¹¹

In our study, 73.33% patients in 10% KOH group showed efficacy to treatment. On the other hand, 60% patients in cryotherapy group showed efficacy to treatment. There was no significant difference in the two treatment groups i.e. P value 0.121. Results of this study were comparable to other studies. One study conducted by Wickremasinghe *et al.* in Srilanka compared 5% KOH and 10% KOH with liquid

nitrogen. Results of this study showed that 69.2% patients in 5% KOH group, 84.6% patients in 10% KOH group and 76% patients in cryotherapy group showed response at the end of treatment.¹¹ One study conducted in Pakistan by Shafqat *et al.* showed effectiveness of 10% KOH in 84% patients of palmoplantar wart. There was no significant difference in palmer vs. plantar warts i.e. $p=0.85$.⁵ Another study conducted by Al-Hamdi *et al.* showed that 10% KOH was completely effective in 82.1%.¹³ Another study done in Pakistan by Kanwal *et al.* revealed that 10% KOH had cure rate of 82% in patients with palmoplantar warts.¹⁴ The results of these studies were comparable to ours. Another study by Jayaprasad *et al.* showed complete response of 10% KOH in 25.92% patients. This difference might be because of the fact that in their study 10% KOH was applied once weekly until completion of 12 weeks or till all the lesions cleared.¹²

In the current study, 60% patients who were treated with cryotherapy had response to treatment. One study done in England by Cockyane *et al.* showed that cryotherapy was effective in 34% patients with plantar warts.¹⁵ Cryotherapy was given 2 to 3 weeks apart for 4 sessions. Another study done at Netherland by Bruggink *et al.* revealed that cryotherapy was effective in 49% patients with common warts and 30% for plantar warts.¹⁶ Another study done at UK by Bourke *et al.* showed that cure rate with cryotherapy was 43% in patient who were treated by cryotherapy at weekly basis compared to 37% who were treated every 2 weeks.¹⁷ Difference in efficacy of cryotherapy between studies may be due to different study population as compared to the current study.

When we stratified our data according to age of patients, it was seen that response to treatment in 10% KOH group was not significantly different than cryotherapy group in different age groups

of patient. In one study done by Brugginks *et al.* showed that there was no significant difference in treatment of plantar warts in different age groups treated with 10% KOH.¹⁶

This study showed that treatment response between different number of warts of patients was not significantly different. Similarly, a study done by Kanwal *et al.* revealed that efficacy of KOH was not significantly associated with number of warts.¹⁴

In the current study palmoplantar warts showed response to both treatment options. Cryotherapy is expensive and needs specialized administration in hospital settings. It has a number of side effects like pain and hypopigmentation, making it undesirable for many patients. Treatment with 10% KOH is cheap, readily available and has less side effects as compared to cryotherapy. It can be easily applied by the patient or their attendant at home.

Conclusion

In our study 10 % KOH and liquid nitrogen both were found to be efficacious for the treatment of palmoplantar warts and no statistically significant difference in efficacy was found in these two groups. 10% KOH is a safe, effective and low-cost treatment modality for palmoplantar warts and has advantage of self-administration as compared to liquid nitrogen cryotherapy.

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