



Comparison of Duct Tape with Adhesive Cyanoacrylate versus Cryotherapy in the Treatment of Palmoplantar Warts

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Background: Warts are common benign skin growths that appear when a virus infects the top layer of the skin. Common therapies for warts include destruction (electrodesiccation, cryotherapy, salicylic acid, laser, etc.), topical immunotherapy and occlusion.

Objective: To evaluate the efficacy of duct tape occlusion therapy with adhesive cyanoacrylate versus cryotherapy for the treatment of warts.

Design: Randomized trial versus comparative cohort.

Methods: Sixty immunocompetent participants with 1-3 warts measuring 3 to 15 mm were enrolled between September 15, 2014, and February 15, 2016. Thirty participants were treated with duct tape, plus adhesive cyanoacrylate (group A), and 30 participants were treated with cryotherapy (group B).

Results: After two months, warts resolved completely, more in participants treated with duct tape, plus adhesive cyanoacrylate (80%) than in participants treated with cryotherapy (60%).

Conclusion: There was statistically significant difference between duct tape with adhesive cyanoacrylate and cryotherapy for the treatment of palmoplantar warts.

Keywords: Duct tape; adhesive cyanoacrylate; cryotherapy; treatment of warts.

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1. INTRODUCTION

Warts (*verruca vulgaris*) are a common benign skin disease that appears when a virus infects the top layer of the skin. Around 7–12% of the populations are affected at any one time, more common in children. Human papillomavirus (HPV) is the causative organism, of which there are over 150 genotypically different types [1]. HPV infection is acquired from direct contact, which may be from person-to-person or from the environment e.g. swimming pools and showers; skin penetration increases if the skin is broken or wet [2].

There are different types of cutaneous warts such as common, plain (flat), filiform/digitate, anogenital and plantar. This comparative study was targeting only the common wart affecting the hand and/or foot (palmoplantar) area. Obviously, not all types of cutaneous warts were amenable to this suggested line of treatment.

There is no single therapy that is 100% effective, so different types of treatment may be combined. Warts in adults, with a long duration of infection, are less likely to resolve spontaneously and are more difficult during treatment. Different type of treatments may be needed due to different types of warts at different sites [3].

The majority of warts can be treated in general practice and the ideal aims of treatment of warts are: (i) to bring out the wart with no recurrence; (ii) to produce no scars, and (iii) to induce lifelong immunity [4].

The most common wart therapies are destruction (electrodesiccation, cryotherapy, salicylic acid, laser, curettage, etc.), topical immunotherapy, chemotherapy, duct tape occlusion therapy, and even hypnosis [5].

Many dermatologists prefer cryotherapy with liquid nitrogen as a choice treatment for warts. Cryotherapy freezing used for 10 to 20 seconds every 2 to 3 weeks, when the freezing interval became 3 to 4 weeks, the cure rate was decreased from 75% to 40% [6]. The mechanism of action of cryotherapy is probably through heat transfer, cell injury and local inflammation, leading to the emergence of an immune reaction against the infected virus [7].

Litt [8] was the first one to suggest that adhesive duct tape could be used to treat subungual and periungual warts. He claimed that his manner is more handy and simple. It also showed no scarring or nails deformity. He speculated that the obstruction and chemical reaction set up by the adhesive duct tape might combine to release a chemical or toxin-producing the formation of antibodies.

The mechanism of action of duct tape on warts is still unknown; one of the theories is that the skin underneath the tape starts to break down a little bit, stirring up a local immune response that attacks the human papillomavirus. Another possibility is that the tape “debrides and debunks” the wart, removing some of the top (and, unfortunately, the skin around the wart) whenever it’s pulled off [9].

The cyanoacrylates were initially synthesized by a German chemist in 1949 [10]. Ten years later, cyanoacrylate was reported for wound closure [11]. Cyanoacrylates are a family of strong, fast-acting adhesives with industrial, medical, and household uses. The short-chain cyanoacrylates (methyl, ethyl) proved to be extremely toxic to tissue [12,13].

Cyanoacrylates or, in common parlance, superglue, or more accurately alkyl esters of cyanoacrylates, are compounds that have an extra cyano group attached to the acrylate portion of a molecule. This addition of the cyano (–CN) chemical group to the acrylate moiety in the film-forming monomer renders these compounds to be very sensitive to moisture on the skin, resulting in the quick formation of a flexible yet tough film, within minutes, on the skin. A film is a polymeric form of the monomeric cyanoacrylate that is liquid until it comes into contact with the skin when it begins rapid polymerization. The liquid is provided ‘neat’, without solvents, which eliminates problems generally associated with organic solvents such as inhalation hazards and fire risks. In addition, they bond chemically to the skin surface as opposed to being deposited as a polymer film [14]. Cyanoacrylates have been used in medicine for several years, for example, for low-tension surgical incisions and traumatic lacerations whose edges are easily approximated [15]. The tissue adhesives may also be used for skin tears [16]. In the treatment of warts, applying cyanoacrylate directly to warts, the cyanoacrylate polymerizes and forms a polymer coating

which inhibits the development of warts, the cyanoacrylate is securely stuck, and the entire or at least parts of warts can be removed easily and painlessly. By repeating the treatment, warts can disappear completely [17].

2. PATIENTS AND METHODS

2.1 Study Design

This study was a randomized trial versus comparative cohort. The participants were selected from the Outpatient Dermatology Clinic, College of Medicine, Qassim University, Saudi Arabia between September 15, 2014, and February 15, 2016.

2.2 Patients

Sixty participants (42 male and 18 female) were enrolled in this study. They were divided into two groups match to the same clinical warts and age. Group A, 30 participants were treated by duct tape, plus adhesive cyanoacrylate and group B, 30 participants were treated with cryotherapy. The inclusion criteria included patients aged older than 6 years, at least, 1 common wart with a diameter of 3 to 15 mm, patients had a hand or foot warts. Exclusion criteria included pregnancy or lactating women, patients had a wart away from hand and foot, no wart treatment within the past 4 weeks by any modality, immunodeficient patients and history of hypersensitivity or allergy to duct tape or adhesive cyanoacrylate or cryotherapy.

2.3 Methods

Participants were randomized to receive duct tape with adhesive cyanoacrylate (group A) treated their warts at home after they received instruction, including pictures, on how to apply adhesive cyanoacrylate and duct tape. Squeeze a thin coat of adhesive cyanoacrylate onto the wart to cover the entire wart, then the adhesive duct tape (Cloth Duct Tape) was cut to cover the wart and left in place for 6 days. If the piece fell off, a new adhesive cyanoacrylate drops with a new piece of duct tape was applied. At the end of 6 days, the participants had to remove the tape, soak the wart for 3-5 minutes in warm water, and rub the wart gently with a pumice stone or nail file. On the same night, the warts were left untreated, and the next day the participants started a new cycle. This treatment was repeated for as long as 2 months or until warts resolved, whichever occurred first. Written instruction was

given to the participants and asked to document all process.

In cryotherapy (group B), liquid nitrogen applied to the target wart for 10 to 20 seconds every 2 to 3 weeks for 2 months or to the wart resolution.

2.4 Patient's Evaluation

Group A participants were seen 3 times during the study: at baseline, 1 month, and 2 months. At the baseline visit, the target wart was chosen as the largest wart. At each visit, the location and diameter of target warts were documented and measured. The target wart was exfoliated with a No. 15 scalpel blade, and the first implementation was demonstrated by the physician. If the participant believed that there was a total resolution of the target wart before the next scheduled visit, the participant was seen as soon as possible in an additional visit, during which final end points were collected and study treatment was stopped. Group B participants were seen at baseline and every 2 to 3 weeks for 2 months. During the study period, participants were instructed not to use any other counter or prescription wart preparations or therapies. Six months after complete resolution the participants contact with the doctor by telephone to obtain any information regarding recurrence of the target wart.

2.5 Statistical Analysis

Data was analysis using Statistical Package for the Social Sciences (SPSS) software version 19. Frequencies, means, and standard deviation were deduced, and categorical data were compared using a Fisher Exact test. Participants were categorized as responders if they had complete resolution of the wart within 2 months of treatment. Differences between two groups in warts disappearance were analyzed using X^2 test. Demographic variables also analyzed, including age, sex, and location and baseline size of warts, using X^2 tests for categorical variables and the 2-tailed t test for continuous variables to detect any significant differences between two groups. P value of <0.05 was considered statistically significant.

2.6 Ethical Consideration

For publication of the manuscript, a written informed consent was taken from participants. The aim and the value of the work were described to them in a simplified manner. All

scientific measures were taken to avoid any harm being inflicted on them. On the contrary, all would have the benefits of follow-up and the results of the study.

This comparative study was approved by ethical board committee, College of Medicine, Qassim University, Saudi Arabia. Also, the author declares that there is no conflict of interest regarding the publication of this paper.

3. RESULTS

Between September 15, 2014, and February 15, 2016, sixty participants completed the study. Baseline demographic data are summarized in Table 1. In the duct tape with adhesive cyanoacrylate groups, warts on the finger or dorsum of the hand were 37% compared to cryotherapy groups 20%, while warts on the toe or dorsum of the foot were 30% vs. 27% respectively. There were no statistically significant differences between the two groups with regard to age, gender, marital status,

number and duration of warts. Also, there was no statistically significant difference in the site of treated warts between participants in both groups.

There were statistically significant differences found between the two groups during treatment as shown in Table 2. In this study, the duct tape with adhesive cyanoacrylate was found significantly more effective than cryotherapy. Of 30 participants in duct tape with adhesive cyanoacrylate, 24 (80%) versus 18 (60%) of 30 participants in the cryotherapy had complete resolution of their warts ($P<0.05$). There were no major complications noted in each group, cryotherapy group had more side effects compare to another group. Pain (from mild to severe), burning and hemorrhagic blister formation were the main side effects. While in duct tape with the adhesive cyanoacrylate group the main frequent complaints were difficulty in keeping the tape on the place (palmar and plantar surface) and minor skin irritation.

Table 1. Baseline characteristics

Characteristic	Group		P value
	Duct tape with Adhesive cyanoacrylate (n=30)	Cryotherapy (n=30)	
Age, mean ± SD (range), y	19.47±8.76 (6-37)	20.67±8.67 (7-40)	0.72
Sex, No. (%)			0.4
Male	23 (76.7)	19 (63.3)	
Female	7 (23.3)	11 (36.7)	
Marital status, (%)			0.63
Single	17 (56.7)	22 (73.3)	
Married	13 (43.3)	8 (26.7)	
No of wart. (%)			0.61
Single	16 (53.3)	21 (70.0)	
Multiple	14 (46.7)	9 (30.0)	
Duration of warts, mean ± SD, m	4.07±2.07	4.33±2.1	0.62
Site of treated wart, No. (%)			0.68
Finger/dorsum of hand	11 (36.7)	6 (20)	
Palmer area	3 (10)	4 (13.3)	
Toe/dorsum of foot	9 (30)	8 (26.7)	
Plantar area	3 (10)	4 (13.3)	
Back of heel	2 (6.7)	4 (13.3)	
Other	2 (6.7)	4 (13.3)	
Previous treatment. No. (%)			0.74
None	7 (33.3)	9 (30)	
Physical treatment	11 (36.7)	11 (36.7)	
Cryotherapy	8 (26.7)	4 (13.3)	
Salicylic acid	2 (6.7)	3 (10)	
Other	2 (6.7)	3 (10)	
Size of the treated wart mean ± SD, mm on 1st visit	6.67±2.35	7.97±2.81	0.57

Table 2. Size of the treated wart during treatment

Size of the treated wart mean \pm SD, mm during treatment	Duct tape with Adhesive cyanoacrylate	Cryotherapy	P Value
2 weeks	4.9 \pm 2.48	6.14 \pm 2.37	0.055
4 weeks	2.9 \pm 2.12	3.77 \pm 2.254	0.090
6 weeks	1.3 \pm 2.12	2.23 \pm 2.53	0.046
8 weeks	0.83 \pm 1.78	1.75 \pm 2.43	0.031
Resolution. No. (%)			0.000
Yes	24 (80)	18 (60)	
No	6 (20)	12 (40)	

4. DISCUSSION

Viral warts are common and the prevalence increases during childhood, peaks in adolescence, and declines thereafter. The clinical appearance of warts depends on their site. The hands and feet are most commonly affected [5].

However, to our knowledge, this is the first study that compares the efficacy of duct tape with adhesive cyanoacrylate as occlusion therapy versus cryotherapy for the treatment of palmoplantar warts. This study showed that the application of duct tape with adhesive cyanoacrylate resulted in a better effect than cryotherapy in the treatment of palmoplantar warts particularly in children with a common diagnosis of the disease. It is rational that the use of the duct tape is more practical and comfortable for children cases and their parents, especially when compared to the multiple clinic visits required for wart freezing [18]. Duct tape with the adhesive cyanoacrylate group had better compliance as a treatment regimen due to the ease and simple of administration. Also, it is much less costly than cryotherapy and can be undertaken in the home. Finally, the side effect of duct tape occlusion appears to be less compared to cryotherapy. Cryotherapy side effects including pain, hemorrhagic blister, recurrence of warts, secondary bacterial infection, and nail dystrophy [18].

Some studies show the efficacy of duct tape as occlusion therapy for the treatment of warts. Focht et al. [18] reported successful treatment in 51 patients (26 in the duct tape group and 25 in the cryotherapy group). 85% receiving duct tape therapy shows complete resolution of their warts versus 60% receiving standard cryotherapy. While de Haen et al. [19] reported that the duct tape had a modest but non-significant effect on wart resolution in 103 children aged 4 to 12 years, in which, warts had disappeared in 16% of the children in the duct tape group compared

with 6% in the placebo group. Also Wenner et al. [20] evaluate the efficacy of duct tape occlusion therapy for the treatment of common warts in adults in 90 immunocompetent adults. They found no statistically significant difference between duct tape and moleskin for the treatment of warts.

Relatively small number of participants in each treatment group prevented us from determining whether the wart locations made a difference in response to the occlusion therapy.

5. CONCLUSION

In conclusion, although many modalities exist for the treatment of warts, the use of duct tape with adhesive cyanoacrylate as occlusion therapy appears to be safe, cheap and more effective in the treatment of palmoplantar warts than cryotherapy with fewer side effects compare with cryotherapy and it can be used as an alternative treatment to cryotherapy.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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