Original Research Article

Duct Tape with Adhesive Cyanoacrylate Versus Cryotherapy in the Treatment of Warts

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: Comparative trial.
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 in significantly more participants treated duct tape with 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 warts.

Keywords: Duct tape, adhesive cyanoacrylate , duct tape occlusion therapy, cryotherapy, treatment of warts.

Introduction

Warts are common benign skin growths that appear when a virus infects the top layer of the skin. Around 7–12% of the population 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 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 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].

The current treatment of choice for warts preferable for many dermatologists is cryotherapy with liquid nitrogen. This method involves freezing the wart for 10 to 20 seconds every 2 to 3 weeks. Cryotherapy is inconvenient because it requires frequent clinic visits for success and when the freezing interval became 3 to 4 weeks, the cure rate was decreased from 75% to 40% [6]. Precisely how cryotherapy destroys warts is still not well understood,

but the established theory is that freezing causes heat transfer, cell injury and local inflammation, leading the host to mount an immune reaction against the infected virus [7].

In 1978, Jerome Z Litt was the first to suggest that adhesive duct tape could be used to treat warts on the fingers and toes. He claimed: "My manner is simple, safe, painless, easy, inexpensive, and highly effective. It leaves without scarring or nail deformity. The conundrum remains: How and why does this method work? I cannot prove any realistic or reasonable explanation. It cannot be all 'hypnotic' or 'suggestive.' Could it be that the precise obstruction and a chemical reaction set up by the adhesive in the duct tape might combine to release a chemical or toxin-producing the formation of antibodies? Whatever it may be, it works [8].

The cyanoacrylates were initially synthesized by a German chemist in 1949 [9]. Ten years later, cyanoacrylate was reported for wound closure [10]. 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 [11,12].

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 polymerisation. 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 [13]. Cyanoacrylates have been used in medicine for several years, for example, for low-tension surgical incisions and traumatic lacerations whose edges are easily approximated [14]. The tissue adhesives may also be used for skin tears [15].

Patients and methods

Study design:

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

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 adhesive tape or cryotherapy or adhesive cyanoacrylate.

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. On the same night, the warts were left untreated, and the next day the participants started adhesive cyanoacrylate with duct tape application again. 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 the group B, the cryotherapy group had liquid nitrogen applied to the target wart for 10 to 20 seconds every 2 to 3 weeks for 2 months or to wart resolution.

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.

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 wart 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.

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.

Result:

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 were located on the finger or dorsum of the hand compared to cryotherapy groups (37% vs 20%) are equal to the warts were located at the toe or dorsum of the foot (30% vs 27%). There were no statistically significant differences between the two

groups with respect to any of the categories at baseline. Also, there was no statistically significant difference in the number of 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 founded significantly more effective than cryotherapy. Twenty-four (80%) of 30 participants in duct tape with adhesive cyanoacrylate had complete resolution of their warts versus 18 (60%) of 30 participants in the cryotherapy (P=0.5).

There were no major complications noted in each group, side effects were more common in the cryotherapy group. The main side effects seen in the cryotherapy group were pain and burning at the site. Pain following Freezing was universal but ranged from mild to severe. The most frequent complaints in the duct tape with the adhesive cyanoacrylate group were difficulty in keeping the tape on the place and minor skin irritation. The most difficult site to keep the duct tape on was the palmar and plantar surface of the hand and the foot. If the duct tape fell off, parents were instructed to simply apply a new piece of duct tape.

Discussion:

Viral warts are common. 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 the verruca vulgaris. In this study, the simple application of duct tape with adhesive cyanoacrylate was more effective than cryotherapy in the treatment of the common wart.

Verruca vulgaris warts are a common diagnosis in the pediatric population, and many therapies exist for the treatment of these warts. Several probable benefits exist for using duct tape over cryotherapy. Duct tape is more practical for parents and participants to use, especially when compared to the multiple clinic visits required for wart freezing. In today's busy society, it can be troublesome for parents to keep follow-up appointments every 2-3 weeks for cryotherapy of their children's warts [16]. There was better compliance with the prescribed treatment regimen within the duct tape with the adhesive cyanoacrylate group, primarily due to the easy of administration. Another benefit is that it is much less costly than cryotherapy. The treatment can be undertaken in the home using economical duct tape with adhesive cyanoacrylate. Finally, the occlusion therapy appears to be less side effect or threatening to a young child than freezing.

Although both cryotherapy and duct tape are well-tolerated therapy, the side effect profile for duct tape occlusion therapy appears to be less. A variety of side effects with cryotherapy of warts have been reported, including pain during the procedure, erythema, hemorrhagic blister formation, recurrence of the wart, secondary infection, and nail dystrophy when treating periungual warts [16].

This study indicates that duct tape with adhesive cyanoacrylate is an effective treatment for warts and can be used as an alternative treatment to cryotherapy. Relatively small number of participants in each treatment group prevented us from determining whether wart locations made a difference in response to the occlusion therapy.

In conclusion, although many treatments exist for the eradication of warts, the use of duct tape with adhesive cyanoacrylate appears safe and non-threatening treatment modality for warts. In our study, duct tape with adhesive cyanoacrylate occlusion therapy was shown to be more effective in the treatment of warts than cryotherapy, and it caused few side effects.

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

References

1. Lynch MD, Cliffe J and Morris-Jones R. Management of cutaneous viral warts. BMJ 2014; 348:g3339.
2. Sterling JC. Virus infections. In: Burns. Breathnach S, Cox N & Griffiths C. (Eds.) Rook's textbook of dermatology. 8th ed. Chichester: Wiley-Blackwell; 2010; 33.1–33.81.
3. Larsen P and Laurberg G. Cryotherapy of viral warts. J Derm Treatment 1996; 7: 29-31.
4. Sterling JC, Handfield-Jones S, Hudson PM; British Association of Dermatologists. Guidelines for the management of cutaneous warts. Br J Dermatol. 2001; Jan. 144(1):4-11.
5. Gibbs S, Harvey I, Sterling JC, Stark R. Local treatments for cutaneous warts. Cochrane Database Syst Rev 2003;(3): CD001781.
6. Bunney MH, Nolan MW, Williams DA. An assessment of methods of treating viral warts by comparative treatment trials based on a standard design. Br J Dermatol. 1976;94:667-679.
7. Plasencia JM. Cutaneous warts, diagnosis, and treatment. Prim Care. 2000;27: 423-434.
8. Litt JZ. Don't excise--exorcise. Treatment for subungual and periungual warts. Cutis. 1978 Dec; 22(6):673-6.
9. Singer AJ, Quinn JV, Hollander JE. The cyanoacrylate topical skin adhesives. *Am J Emerg Med*. 2008;26(4):490-496.
10. Coover HW, Joyner FB, Shearer NH, Wicker TH. Chemistry and performance of cyanoacrylate adhesives. J Soc Plast Eng 1959;15:413-7.
11. Kline DG, Hayes GJ. An experimental evaluation of the effect of a plastic adhesive, methy-2-cyanoacrylate, on neural tissue. J Neurosurg 1963;20:647– 54.
12. Woodward SC, Hermann JB, Leonard F. Histotoxicity of cyanoacrylate tissue adhesive. Fed Proc 1964; 23:485.
13. Singer AJ, Hollander JE, Quinn JV. Evaluation and management of traumatic lacerations. N Engl J Med 1997;337:1142-8.
14. Milne CT, Corbett LQ. A new option in the treatment of skin tears for the institutionalized resident: formulated 2-octylcyanoacrylate topical bandage. Geriatr Nurs 2005;26:321-5.
15. Woo KY. Health economic benefits of cyanoacrylate skin protectants in the management of superficial skin lesions. Int Wound J. 2014 Aug;11(4):431-7.
16. Focht DR 3rd, Spicer C, Fairchok MP. The efficacy of duct tape vs cryotherapy in the treatment of verruca vulgaris (the common wart). Arch Pediatr Adolesc Med. 2002 Oct;156(10):971-4.