The Effectiveness of Cutaneous Wart Resolution with Current Treatment Modalities

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Abstract

Non-venereal warts are a frequent dermatological presentation with potential spontaneous regression in immunocompetent adults and children within 2 years. Evidence shows that conventional wart treatments are not a guaranteed treatment modality and can carry concerns regarding safety. The aim of this literature review was to identify the most effective treatments for wart resolution to guide clinical practice while identifying areas for further research.

A systematic literature review was performed to determine the current treatment modalities for non-anogenital cutaneous warts in immunocompetent individuals and their effectiveness. Articles were categorized into one of eight groups depending on anatomical location, population age, or recalcitrant status with ranked levels of evidence.

This literature review highlights a variety of treatments for non-venereal warts shown to be effective. In this instance where optimal evidence-based treatments are not available, clinical experience determines the most appropriate clinical practice.

Further reproducible immunotherapy research on wart resolution is required to enable clear comparisons of these treatment modalities to conventional methods. Future clinical practice will require the human papillomavirus type to target the wart treatment accordingly; however, further research is required to determine these correlations.

Keywords: Recalcitrant, treatment, verruca, warts

Introduction

Verruca lesions are strategically named depending on their location: face, shins and dorsum of hands (verruca plana), soles of feet (verruca plantaris), common warts (verruca vulgaris), and surrounding nails (periungual verruca). Verruca lesions are caused by a localized infection of the keratinocytes by the human papillomavirus (HPV), which is a small deoxyribonucleic acid virus of the papovavirus family.[1] There are more than 150 different types of HPV identified with the majority of verruca vulgaris lesions caused by HPV types 1, 2, 4, 27, or 57 and verruca plana lesions by HPV types 3 or 10.[1] Viruses can be treated with antiviral agents; however, there is often a reliance on the body’s defense mechanisms to control the spread and subsequent effects of viruses. Interestingly, there is selective research determining the HPV type for a cutaneous wart before targeting treatment accordingly.[2]

Verruca lesions are identified as “recalcitrant” if they were resistant to an initial treatment method, clinically requiring an alternative therapy.[3] In immunocompetent individuals, spontaneous regression of warts is influenced by the rate of resolution, for example, host immunity, HPV type, and site of infection. However, treatment for instant eradication is favored over spontaneous resolution as natural resolution is found to be successful in only 40% of patients within 2 years.[4]

The literature has shown that conventional treatments used in everyday practice are uniformly unsuccessful and carry concerns regarding safety.[3] A Cochrane review by Kwok et al.[4] completed a meta-analysis of the topical treatments for cutaneous warts. They found that liquid...
nitrogen cryotherapy had the same effectiveness as placebo; salicylic acid may be more effective on the hands and feet compared to placebo and no significant difference was found between salicylic acid and cryotherapy on all areas of the body. These findings are concerning for medical practitioners and for patients receiving treatment.

Over the past decade, interest in more sophisticated and focused wart treatments targeting the immune response to HPV has attracted considerable interest compared to the destructive and irritant approaches currently used. Current verruca vulgaris research is focusing on immune-manipulation methods to determine their effectiveness. These include 5-fluorouracil, dinitrochlorobenzene, intralesional bleomycin, intralesional interferon, photodynamic therapy, and intralesional antigen. Many of these new immunotherapy interventions have an unknown mechanism of action; however, these new immunotherapy interventions show positive signs of wart clearance at the site of injection and systemically.

This literature review is first to collate relevant articles over 10 years categorized into anatomical locations with recalcitrant and non-recalcitrant warts segregated. This will provide clarity on the effectiveness of treatment modalities for non-venerreal wart resolution.

**Materials and Methods**

The following electronic search method was undertaken on March 22, 2017 following the PICO format to answer the question: What are the current treatment modalities for non-anogenital cutaneous warts in immunocompetent individuals and how effective are they?

- **Population:** Immunocompetent individuals with non-anogenital cutaneous warts.
- **Intervention:** Wart treatment modalities.
- **Control:** No intervention.
- **Outcome:** Resolution of warts.

The EBSCOHost platform was used to search the relevant articles published between 2007 and 2017 using medical subject headings (MeSH) for the following databases: MEDLINE, CINAHL, and Academic Search Premier.

A total of 759 articles were retrieved from the databases combined. Filters of English language, peer reviewed articles, published since 2007, and “human only” were applied leaving 500 articles.

Primary relevance assessment was conducted to exclude the following:

1. Molluscum contagiosum warts, anogenital warts, respiratory warts, oropharynx warts, and any other type of wart other than cutaneous warts.
2. Immunocompromised patients.
3. Absent effectiveness of the treatment modality measurements.
4. Meta-analysis, systematic reviews, literature reviews, or editorial articles.

The primary relevance assessment removed 414 irrelevant articles by title, 27 by abstract, and 14 by full-text review. The remaining 43 articles were used for analysis with an additional 17 articles from manually searching relevant systematic review and meta-analysis articles. In total, 60 articles were deemed relevant for analysis. Each article was ranked according to the National Health and Medical Research Council (NHMRC) Evidence Hierarchy and categorized into the following groups depending on the anatomical location, population age, and recalcitrant status.

1. Verruca vulgaris and verruca plantaris treatment.
2. Recalcitrant verruca vulgaris and verruca plantaris treatment.
3. Pediatric verruca vulgaris treatment.
4. Recalcitrant pediatric verruca vulgaris treatment.
5. Verruca plana treatment.
6. Recalcitrant verruca plana treatment.
7. Periungual verruca treatment.
8. Recalcitrant periungual verruca treatment.

**Findings**

**Verruca vulgaris and verruca plantaris treatment: 34 articles**

There were 19 Level II randomized control trials comparing varying treatment methods for verruca vulgaris lesions, as summarized in Table 1. Khozeimeh et al. compared intralesional Candida albicans antigen and liquid nitrogen cryotherapy. There was a statistical significance in wart resolution with immunotherapy more successful. Shaheen et al. found that purified protein derivative (PPD) and measles, mumps, and rubella (MMR) vaccine were statistically more effective than a saline injection for wart eradication; however, there was no statistical significance between PPD and MMR groups. Bruggink et al. found that cryotherapy was more effective for common warts than salicylic acid and the “wait-and-see” policy, but there was no difference in wart eradication between these treatments with plantar warts. Zamanian et al. compared intralesional MMR vaccine and normal saline finding a statistical difference in the second and third visits with fewer lesions in the interventional group. However, 30% of the MMR group had influenza type side effects. A similar study by Nofal et al. compared intralesional MMR and saline...
finding a statistical significance in therapeutic response with MMR being more effective. However, this was not the case with recalcitrant warts. Mohamad et al.[12] compared the MMR vaccine to saline in plantar warts with a statistical significance found for MMR having significant clearance. Cockayne et al.[13] compared cryotherapy and salicylic acid for plantar wart treatment finding no group more effective with relatively low clearance rates. Soni et al.[14] compared intralesional bleomycin and saline finding a statistical significance in resolution rate at 12 weeks in the intervention group. Dhar et al.[15] compared intralesional bleomycin and cryotherapy and found that bleomycin was significantly more effective than cryotherapy. Another previous study by Adalatkhah et al.[16] compared bleomycin and cryotherapy noting that bleomycin intralesional injection was more effective than cryotherapy. Aksakal et al.[17] compared pulsed dye laser (PDL) with cryotherapy and found no statistical significance between both interventions for complete remission. Huo et al.[18] studied local hyperthermia on plantar warts finding a statistical significant difference in cure rates for the local hyperthermia compared to a sham red dot without heat. Aksakal et al.[19] studied sublesional interferon-α injection in common warts finding a statistical significance between the intervention and the placebo as well as a statistical significance in response rate of a single wart more responsive than multiple lesions. Banihashemi et al.[20] compared cryotherapy and 80% phenol solution noting no statistical difference between the treatments. Yazdanfar et al.[21] compared 5-fluorouracil, lidocaine and epinephrine (5-FU+LE) against the placebo of normal saline finding a statistical significance in complete resolution for the intervention group. Ebrahimi et al.[22] compared 10% silver nitrate solution to black ink and found a statistical significant difference in cure rates in the intervention group as well as a statistical significant cure rate in females over males. Wenner et al.[23] compared duct tape occlusion therapy to placebo moleskin and found no statistical difference between the groups. Khattar et al.[24] compared topical zinc oxide and a combination of salicylic acid and lactic acid. They found no statistical difference between the groups for cure rates.

Three Level III-2 prospective cohort studies were noted. Kaçar et al.[25] compared topical CPS (1% cantharidin, 5% podophyllotoxin, 30% salicylic acid) and cryotherapy for plantar warts noting that topical CPS was significantly more effective than cryotherapy for resolution. Choi et al.[26] compared DCP (1% diphencyprone) to cryotherapy noting a statistical significance in clearance rate in the DCP group at 12 months. Bohlooli et al.[27] compared Fig Tree latex and cryotherapy finding cryotherapy to be more effective for wart reduction.

Twelve Level IV experimental design studies with a one-arm intervention or retrospective experimental studies were analyzed. These research studies were conducted without a control group. These treatments included PPD, MMR vaccine, Candida antigen, Nd:YAG, mycobacterium w (Mw) vaccine, intralesional injection of photodynamic therapy, adapalene, CO₂ laser, and homologous autoimplantation.

### Recalcitrant verruca vulgaris and verruca plantaris treatment: 14 articles

Four Level II randomized control trials were analyzed, as summarized in Table 2. Dhakar et al.[28] compared Mw vaccine and cryotherapy noting no statistical significance between the two groups. Amirnia et al. (2015)[29] compared intralesional PPD, liquid nitrogen cryotherapy, and saline placebo. They found a statistical

| Table 1: Effective treatment methods for verruca vulgaris and verruca plantaris lesions |
|-------------------------------------------------------------|
| **Treatment modalities (only Level II studies included)**     | **Effective?**                      |
| Immunotherapy                                               |                                        |
| Candida albicans antigen                                    | Yes: compared to cryotherapy          |
| PPD                                                         | Yes: to placebo. Same as MMR         |
| MMR                                                        | Yes: to placebo. Same as PPD         |
| Monochloroacetic acid (MCA)                                 | No: compared to cryotherapy and salicylic acid |
| Bleomycin                                                  | Yes: to placebo, cryotherapy         |
| Interferon-α injection                                      | Yes: to placebo                      |
| 5-FU+LE                                                    | Yes: to placebo                      |
| Conventional                                               | Yes: compared to salicylic acid and “wait-and-see” |
| Liquid nitrogen cryotherapy                                 | Unsure: same as salicylic acid, pulsed dye laser, and phenol |
| Salicylic acid                                              | No: compared to bleomycin            |
| 10% silver nitrate                                          | Unsure: same as cryotherapy          |
| Other                                                      | Yes: to placebo                      |
| Pulsed dye laser                                            | Unsure: same as cryotherapy          |
| Local hyperthermia                                          | Yes: placebo                         |
| Phenol                                                     | Unsure: same as cryotherapy          |
| Duct tape occlusion                                         | No: to placebo                       |
| Zinc oxide                                                 | No: compared to salicylic acid + lactic acid |

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significance in clearance between PPD and the control. Togsverd-Bo et al. compared intense pulsed light (IPL) and paring alone finding no statistical significant difference in clearance rate at 6 weeks. López-García et al. compared oral zinc sulfate and starch placebo finding no significant difference in clearance rates between the two groups.

A Level III-2 non-randomized control trial compared PDL and Nd:YAG for warts eradication finding no statistical significance between the two groups.

Nine Level IV experimental design studies with a one-arm intervention or retrospective experimental studies were analyzed. These studies did not include a control group. The treatments included cantharidin/podophyllotoxin/salicylic acid, MMR vaccine, Mw vaccine, C. albicans antigen, PDL, autowart injection, photodynamic therapy, and retinoid.

Pediatric verruca vulgaris treatment: 3 articles
Gladso et al. in a Level II randomized controlled trial, compared 5% 5-fluorouracil cream with duct tape occlusion applied once a day to the same treatment applied twice a day. They found no significant difference in resolution rate between the two groups [Table 3].

Bruggink et al. in a Level III-2 prospective cohort study, analyzed the “wait-and-see” policy finding 50% of warts were gone in 1 year.

Maronn et al. (2008) in a Level IV retrospective experimental study on 170 patients with no control group, found that 87% had complete resolution with C. antigen injection.

Recalcitrant pediatric verruca vulgaris treatment: 3 articles
Two Level IV retrospective experimental studies with no control groups were found. Sethuraman et al. with no control group found a 75% overall clearance rate using PDL. Fernández-Guarino et al. found a 76.4% resolution rate with 3% topical Cidofovir applied twice daily without occlusion.

A nonrated case study (Kellis 2011) found hypnosis for 6 weeks resolved the warts within 1 week with no recurrence.

Verruca plana treatment: 2 articles
Vali and Ferdowsi in a Level II randomized control trial, found that 50% citric acid solution was statistically significant in clearance rate as compared with 0.05% tretinoin lotion; however, no significant difference was noted in the onset of action [Table 4].

A nonrated case study (Bhushan et al. 2014) concluded that 200-mg hydroxychloroquine that was applied twice daily had complete resolution in 40 days.

Recalcitrant verruca plana treatment: 1 article
Kartal Durmazlar et al. in a Level IV experimental design with a one-arm intervention, noted that all patients had clinical cure within 16 weeks using 0.7% cantharidin solution in acetone solution.

Periungual verruca treatment: 1 article
AlGhamdi and Khurram in a Level IV experimental design with a one-arm intervention, found that 86.6% had complete clearance with 1 mL bleomycin at 6 months after treatment.

Recalcitrant periungual verruca treatment: 2 articles
Espana et al. in a Level IV retrospective experimental study, concluded that 50% of patients had complete clearance with Cidofovir cream application.

A nonrated case study (El-Khayate et al. 2011) concluded complete resolution with systemic acitretin 25 mg applied once daily.

Table 2: Effective treatment methods for recalcitrant verruca vulgaris and verruca plantaris lesions

| Treatment modalities (only Level II studies included) | Effective? |
|-----------------------------------------------------|------------|
| Immunotherapy                                       | Mw vaccine |
| Conventional                                        | PPD        |
| Conventional                                        | Liquid nitrogen cryotherapy |
| Paring                                              |            |
| Other                                               | IPL        |
| Zinc sulfate                                        | No: to placebo |

Table 3: Effective treatment methods for pediatric verruca vulgaris lesions

| Treatment modalities (only Level II studies included) | Effective? |
|-----------------------------------------------------|------------|
| Immunotherapy                                       | 5-Fluorouracil cream |
| Conventional                                        | –          |
| Other                                               | Duct tape occlusion |

Table 4: Effective treatment methods for verruca plana lesions

| Treatment modalities (only Level II studies included) | Effective? |
|-----------------------------------------------------|------------|
| Immunotherapy                                       | –          |
| Conventional                                        | –          |
| Other                                               | 50% citric acid |
|                                                    | 0.05% tretinoin |

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**Summary of treatment modality effectiveness**

| Cutaneous warts                        | Effectiveness                                                                 |
|---------------------------------------|-------------------------------------------------------------------------------|
| Verruca vulgaris + verruca planaris   | Yes: *Candida albicans* antigen better than cryotherapy                        |
|                                       | Yes: PPD same as MMR, better than placebo                                     |
|                                       | Yes: Bleomycin better than placebo and cryotherapy                            |
|                                       | Yes: Interferon-α injection better than placebo                               |
|                                       | Yes: 5-FU+LE better than placebo                                              |
|                                       | Yes: 10% silver nitrate better than placebo                                   |
|                                       | Yes: local hyperthermia better than placebo                                   |
|                                       | ? Salicylic acid, pulsed dye laser and phenol all the same as cryotherapy    |
|                                       | ? Cryotherapy same as salicylic acid and wait and see                          |
| Recalcitrant verruca vulgaris + verruca planaris | Yes: PPD                         |
|                                       | ? Mw vaccine same as cryotherapy                                              |
|                                       | ? Paring same as IPL                                                           |
| Pediatric verruca                     | None                                                                          |
| Recalcitrant pediatric verruca        | None                                                                          |
| Verruca plana                         | Yes: 50% citric acid better than 0.05% tretinoin                              |
| Recalcitrant verruca plana            | None                                                                          |
| Periungual verruca                    | None                                                                          |
| Recalcitrant periungual verruca       | None                                                                          |

**DISCUSSION**

Numerous wart treatment modalities have been researched with the aim to identify the most effective treatment for wart resolution. Of the studies each has its own intervention concentration, method protocol, and comparison. Determining the exact effectiveness of these treatments is made difficult with these varying parameters and absent comparison between each intervention.

Appreciating the meta-analysis findings on cutaneous wart treatments, Kwok et al.[4] highlighted the neutral comparison between cryotherapy and salicylic acid to placebo providing a basis for our analysis. This literature review discovers immunotherapy injections for treatment of verruca vulgaris and verruca plantaris lesions as more superior to the conventional methods. The immunotherapy treatments studied in randomized controlled trials considered to be effective include *C. albicans* antigen, PPD, MMR vaccine, and bleomycin. Interferon-α and 5-FU+LE are considered effective treatments against placebo; however, it is unknown how effective they are as compared to other treatment methods. Treatments found not to be effective include PDL, phenol, duct tape occlusion, and zinc oxide. Furthermore, when treating recalcitrant verruca vulgaris and verruca plantaris lesions there is no well-demonstrated effective treatment.

Pediatric populations still appear to greatly benefit from the “wait-and-see” policy with all other treatment modalities in an experimental phase. Recalcitrant and non-recalcitrant verruca plana and periungual lesions are still in experimental stages with potentially effective citric acid and tretinoin applications.

Interestingly, clinical practice has been known to encompass the use of surgical removal or electrosurgery for treatment of verruca lesions. However, this literature review was unable to appreciate the effectiveness of this modality with the absence of this method published during our search strategy. This is similar to potassium hydroxide, used in the pediatric verruca population, which was also not mentioned in the results.

The findings align with the study purpose of collating systematically searched literature on treatment modalities for wart resolution over the past 10 years. The findings also support the previous systematic review noting liquid nitrogen cryotherapy and salicylic acid treatments no more superior than placebo.[4]

This literature review has highlighted a variety of treatments for non-venereal warts shown to be effective. In this instance where optimal evidence-based treatments are not available, clinical experience determines the clinical practice. This can include conventional treatments if the deemed necessary even though the current evidence does not clearly support their practice. From this study, we gain a greater insight of the effective treatment modalities for anatomical location, population group, and recalcitrant status. Even though the majority of the research into immunotherapy drugs is still in an experimental stage with varied methods, there is still continued evidence demonstrating their effectiveness. The prediction is that the shift to these experimental treatments will take place in the near future, once formal guidelines and further research is available.

The limitations of this study manifest from the limited optimal evidence (Level II NHMRC hierarchy) currently available on wart treatments. There is a vast availability of experimental studies; however, they do not have a control group to provide any comparison of their effectiveness.

**FUTURE DIRECTIONS**

Larger, prospective controlled trials of non-venereal wart treatments including immunotherapy injections are required to determine the most effective practice and shape evidence based guidelines. The prediction is that future clinical practice will require the HPV type for each wart to target treatment accordingly;
however, further research is required to determine these correlations.

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Conflicts of interest
There are no conflicts of interest.

References
1. Sterling JC, Gibbs S, Haque Hussain SS, Mohd Mustapa MF, Handfield-Jones SE. British association of dermatologists’ guidelines for the management of cutaneous warts 2014. Br J Dermatol 2014;171:696-712.
2. Bruggink SC, Gussekloo J, De Koning MN, Feltkamp MC, Bavinck JN, Quint WG, et al. HPV type in plantar warts influences natural course and treatment response: secondary analysis of a randomised controlled trial. J Clin Virol 2013;57:227-32.
3. Abd-Elazeim FM, Mohammed GF, Fathy A, Mohamed RW. Efficacy of intralesional bleomycin compared to cryotherapy in the treatment of common warts. J Dermatolog Treat 2014;25:264-7.
4. Kwok CS, Gibbs S, Bennett C, Holland R, Abbott R. Topical treatments for cutaneous warts. Cochrane Database Syst Rev 2012, Art. No.: CD001781. DOI: 10.1002/14651858.CD001781.pub3.
5. Gibbs S. The trials of treating warts. Indian J Dermatol Venereol Leprol 2014;80:495-6.
6. Khozeimeh F, Jabbari Azad F, Mahboubi Oskouei Y, Jafari M, Zamanian A, Mobasher P, Jazi GA. Efficacy of intralesional bleomycin in palmo-plantar and periungual warts. J Cutan Aesthet Surg 2011;4:188-91.
7. Zamanian A, Mobasher P, Jazi GA. Efficacy of intralesional bleomycin in comparison with cryotherapy in the treatment of common warts. J Cutan Dermatol Venereol 2010;75:20-5.
8. Bruggink SC, Gussekloo J, Egberts PF, Bavinck JNB, de Waal MWM, Assendelft WJJ, et al. Monochloroacetic acid application is an effective alternative to cryotherapy for common and plantar warts in primary care: a randomized controlled trial. J Invest Dermatol 2015;135:1261-7.
9. Shaeen MA, Salem SA, Fouad DA, El-Fatah AA. Intralesional tuberculin (PPD) versus measles, mumps, rubella (MMR) vaccine in treatment of multiple warts: a comparative clinical and immunological study. Dermatol Ther 2015;28:194-200.
10. Bruggink SC, Gussekloo J, Egberts PF, Bavinck JNB, de Waal MWM, Assendelft WJJ, et al. Comparison of monochloroacetic acid application with cryotherapy in the treatment of multiple warts. J Eur Acad Dermatol Venereol 2014;28:495-6.
11. Togsvard-Karlsson-Gardell K, Grimm P, Dahiya R, Aitken M, Cheplounogue A, et al. A randomized, placebo-controlled, double-blind study of a novel silver nitrate solution for the treatment of common warts. J Invest Dermatol 2015;135:1261-7.
12. Zamanian A, Mobasher P, Jazi GA. Efficacy of intralesional injection of mumps-measles-rubella vaccine in patients with wart. Adv Biomed Res 2014;3:107.
13. Mohamad NS, Badran F, Yakoob E. Evaluation of the efficacy of a combination—measles, mumps and rubella vaccine in the treatment of plantar warts. Our Dermatology Online 2013;4:463-7.
14. Cockayne S, Hewitt C, Hicks K, Jayakody S, Kang’ombe AR, Starmulli E, et al. EVer T Team. Cryotherapy versus salicylic acid for the treatment of verruca plantaris with a single sublesional injection of interferon-α2a. Clin Exp Dermatol 2011;4:164-9.
15. Soni P, Khandelwal K, Aara N, Ghiya BC, Mehta RD, Bumb RA. Efficacy of intralesional bleomycin in palmo-plantar and periangual warts. J Cutan Aesthet Surg 2011;4:188-91.
16. Adalatkhah H, Khahiliollahi H, Amini N, Sadeghi-Bazargani H. Compared therapeutic efficacy between intralesional bleomycin and cryotherapy for common warts: a randomized clinical trial. Dermatol Online J 2007;13:1-3.
17. Akhyan M, Ehsani AH, Noormohammadpour P, Shamsodini R, Azizahari S, Sayanjali S. Comparing pulsed-dye laser with cryotherapy in the treatment of common warts. J Laser Med Sci 2010;1:14-9.
18. Huo W, Gao XH, Sun XP, Qi RQ, Hong Y, Mchezape UO, et al. Local hyperthermia at 44 degrees C for the treatment of plantar warts: a randomized, patient-blinded, placebo-controlled trial. J Infect Dis 2010;201:1169-72.
19. Aksakal AA, Ozden MG, Atahan C, Onder M. Successful treatment of verruca plantaris with a single sublesional injection of interferon-α2a. Clin Exp Dermatol 2008;34:16-9.
20. Banishashemi M, Pezeshkpoor F, Yazdanpanah MJ, Family S. Efficacy of 80% phenol solution in comparison with cryotherapy in the treatment of common warts of hands. Singapore Med J 2008;49:1035-7.
21. Yadzafar A, Farshchian M, Fereydoonnejad M, Farshchian M. Treatment of common warts with an intralesional mixture of 5-fluorouracil, lidocaine, and epinephrine: a prospective placebo-controlled, double-blind randomized trial. Dermatol Surg 2008;34:656-9.
22. Ebrahimi S, Babiri N, Jamshidnejad E, Sarkari B. Efficacy of 10% silver nitrate solution in the treatment of common warts: a placebo-controlled, randomized, clinical trial. Int J Dermatol 2007;46:215-7.
23. Wenner R, Askari SK, Cham PK, Kedrowski DA, Liu A, Warshaw EM. Duct tape for the treatment of common warts in adults: a double-blind randomized controlled trial. Arch Dermatol 2007;143:309-13.
24. Khattar JA, Musharrafieh UM, Tamim H, Hamadeh GN. Topical zinc oxide vs. Salicylic acid-laetic acid combination in the treatment of warts. Int J Dermatol 2007;46:427-30.
25. Kaçar N, Taşlı L, Korkmaz S, Ergin S, Erdoğan BŞ, Cantharidin-podophytoxin-salicic acid versus cryotherapy in the treatment of plantar warts: a randomized prospective study. J Eur Acad Dermatol Venereol 2012;26:889-93.
26. Choi MH, Seo SH, Kim IH, Son SW. Comparative study on the sustained efficacy of diphenycyproone immunotherapy versus cryotherapy in viral warts. Pediatr Dermatol 2008;25:398-9.
27. Bohlolooi S, Moeheboopoo A, Mohammad S, Kouhnnavard M, Pesahpoor S. Comparative study of fig tree efficacy in the treatment of common warts (verruca vulgaris) vs. Cryotherapy. Int J Dermatol 2007;46:524-6.
28. Dhakar AK, Dogra S, Vinay K, Sarangal R, Kanwar AJ, Singh MP. Intralesional mycobacterium w vaccine versus cryotherapy in treatment of refractory exogranital warts: a randomized, open-label, comparative study. J Cutan Med Surg 2016;20:123-9.
29. Arminia M, Khodaeiinia E, Fouliadi DF, Masoudnia S. Intralesional immunotherapy with tuberculin purified protein derivative (PPD) in recalcitrant wart: A randomized, placebo-controlled, double-blind clinical trial including an extra group of candidates for cryotherapy. J Dermatolog Treat 2016;27:173-8.
30. Togsvard-Bo K, Glaud C, Winkel P, Larsen HK, Lomholt HB, Cramers M, et al. Paring and intense pulsed light versus paring alone for recalcitrant hand and foot warts: a randomized clinical trial with blinded outcome evaluation. Lasers Surg Med 2010;42:179-84.
31. López-García DR, Gómez-Flores M, Arce-Mendoza AY, de la Fuente-García A, Ocampo-Candiani J. Oral zinc sulfate for unresponsive cutaneous warts: too good to be true? A double-blind, randomized, placebo-controlled trial. J Cutan Dermatol 2010;49:34:894-5.
32. Fernández-Guarrino M, Harto A, Jaén P. Treatment of recalcitrant viral warts with pulsed dye laser MAL-PDT. J Dermatolog Treat 2011;22:226-8.
33. Gladsjo JA, Alió Sáenz AB, Bergman J, Kricorian G, Cunningham BB. 5% 5-fluorouracil cream for treatment of verruca vulgaris in children. Pediatr Dermatol 2009;26:279-85.
34. Bruggink SC, Eekhof JA, Egberts PF, van Blijswijk SC, Assendelft WJJ, Gussekloo J. Natural course of cutaneous warts among primary schoolchildren: a prospective cohort study. Ann Fam Med 2013;11:437-41.
35. Maronn M, Salm C, Lyon V, Galbraith S. One-year experience with Candida antigen immunotherapy for Warts and Molluscum. Pediatr Dermatol 2008;25:189-92.
36. Sethuraman G, Richards KA, Hiremagalore RN, Wagner A. Effectiveness of pulsed dye laser in the treatment of recalcitrant warts in children. Dermatol Surg 2010;36:58-65.
37. Kellis E. The treatment of warts with a little help from “The Simpsons”: A case example of the treatment of an 11-year-old boy. Australian Journal of Clinical and Experimental Hypnosis 2011;39:181-8.
38. Vali A, Ferdowsi F. Evaluation of the efficacy of 50% citric acid solution in plane wart treatment. Indian J Dermatol 2007;52:96-8.
39. Bhushan P, Aggarwal A, Baliyan V. Complete clearance of cutaneous warts with Hydroxychloroquine: Antiviral Action?. Indian J Dermatol 2014;59:211.
40. Kartal Durmazlar SP, Atacan D, Eskioğlu F. Cantharidin treatment for recalcitrant facial flat warts: a preliminary study. J Dermatolog Treat 2009;20:114-9.
41. AlGhamdi KM, Khurram H. Successful treatment of periungual warts with diluted bleomycin using translesional multipuncture technique: a pilot prospective study. Dermatol Surg 2011;37:486-92.
42. España LP, de Boz J, Morano TF, Arenas-villafranca J, de Troya M. Successful treatment of periungual warts with topical cidofovir. Dermatol Therapy 2014;27:337-42.
43. El-Khayat R, Hague J. Use of acitretin in the treatment of resistant viral warts. J Dermatolog Treat 2011;22:194-6.