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Original Research Article

Comparative efficacy of trichloroacetic acid combined with silver nitrate and cryotherapy in treating plantar warts study in Military Medical Specialty Center

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ABSTRACT

Background: Warts are benign growths that affect the skin and mucous membranes. Comparative studies evaluating the efficacy of trichloroacetic acid (TCA), silver nitrate, and cryotherapy for treating plantar warts reveals distinct advantages for each treatment modality. Objectives were to determine the comparative efficacy of TCA with silver nitrate and cryotherapy in treating planter warts.
Methods: It was a descriptive, descriptive analytical and cross-sectional hospital-based study conducted at MMSC. Data were analyzed by statistical package for social sciences (SPSS) version 26.
Results: Among the100 participants (82% male, 18% female). The age distribution showed that most participants were between 20-29 years (34%) and 30-39 years (33%). The duration of the disease was less than 3 months for (50%) participants, while (44%) had the disease for 3-6 months. Most participants were employed (89%), aged 20-39 years (67%), and had experienced plantar warts for less than six months (94%). Both groups achieved high rates of complete resolution (82% for TCA vs. 74% for cryotherapy), though the difference was not statistically significant. Recurrence was significantly lower in the TCA group (12%) compared to the cryotherapy group (38%). Treatment duration and side effects varied significantly between groups, with TCA showing shorter treatment durations and fewer side effects. Cryotherapy was associated with higher rates of moderate and severe side effects.
Conclusions: The study demonstrates that TCA with silver nitrate is more effective and has a better safety profile than cryotherapy for the treatment of plantar warts. These findings support the recommendation of trichloroacetic acid with silver nitrate as a first-line treatment option, particularly for patients with a high risk of recurrence or those who may be sensitive to the side effects of cryotherapy. Further research with larger sample sizes and longer follow-up periods are recommended to confirm these results and assess long-term outcomes.

Keywords: Wart, Infection, Cryotherapy, Trichloroacetic acid, Silver nitrate

INTRODUCTION

Plantar warts, or verrucae plantaris, are common cutaneous lesions located on the plantar aspect of the foot, caused by the human papillomavirus (HPV) infection of keratinocytes. HPV is widespread, with many individuals serving as asymptomatic carriers. However, approximately 2% of the general population seeks medical care for warts annually.[1-3]

Warts are benign epithelial proliferations resulting from skin or mucosal HPV infections, with over 80 distinct HPV types characterized, and several others reported.[4-6] Although warts are most prevalent in childhood, they can

occur at any age. Observational studies suggest that 5-30% of children and young adults are affected by warts at.[4]

Patients with plantar warts typically present with pain or a sensation of having a stone or swelling under their foot.[7,8] Pain is most exacerbated by activities that exert pressure on the soles, such as walking or standing.[9] Beyond physical discomfort, patients often seek treatment due to concerns about spreading the infection to other parts of their body or to others.[9,10] Additionally, patients may report a gradually enlarging wart or an increasing number of lesions on the plantar surface of their foot.[9,10]

The treatment of warts is important because each lesion can act as a reservoir for HPV, potentially leading to the spread of the infection both within the same patient and to others. Nonpharmacological techniques for wart treatment include surgical excision, electrocauterization, or laser therapy.[11,12]

TCA is a topical destructive agent that induces cell death through the hydrolysis of cellular proteins. It is effective in treating common, cervical, genital, and anal warts at concentrations of 70-80%, with response rates comparable to cryotherapy.[15] Silver nitrate, a chemical cauterizer, has also shown efficacy in treating plantar warts. A recent randomized controlled trial (RCT) found that weekly applications of 95% silver nitrate resulted in complete resolution in 37.5% of participants after 10 weeks.[13-15] Cryotherapy, which involves the application of liquid nitrogen, causes direct cellular damage and triggers an inflammatory response. However, side effects such as pain, blistering, and post-inflammatory hypopigmentation or hyperpigmentation are common.[16]

The study aims to determine the comparative efficacy of TCA with silver nitrate and cryotherapy in treating plantar warts. Specifically, it seeks to evaluate the recurrence rates of plantar warts after treatment with these modalities, assess the safety and side effects associated with TCA with silver nitrate, and cryotherapy-including pain, blistering, and post-inflammatory skin changes-and identify patient demographic and clinical factors such as age, duration of wart formation, and prior treatment history that may influence treatment outcomes.

METHODS

Study design

This was a prospective, observational, descriptive analytical and cross-sectional hospital-based study.

Study area

The study was conducted at MMSC in Qatar armed force-medical services.

Study duration

This study was conducted during the period from January 2023 to August 2024.

Study population

Individuals with clinically diagnosed plantar warts were confirmed by a dermatologist based on established diagnostic criteria.

Inclusion criteria

Patients of both genders, aged 10 to 65 years, patients who provide written informed consent to participate in the study and adhere to the treatment and follow-up schedule were included.

Exclusion criteria

Individuals with other significant dermatological conditions on the plantar aspect of the foot that could confound the results. Known hypersensitivity or allergic reactions to any of the treatment agents (TCA, silver nitrate, or liquid nitrogen) were excluded.

Data collection tools and methods

Data was collected through an interview-administered questionnaire completed by the participants. Structured questionnaires were employed to gather both quantitative and qualitative data, covering demographic information, wart characteristics, treatment history, and treatment response. Closed ended questions were used to ensure consistent data collection. Follow-up visits were scheduled at regular intervals (e.g.4 and 8 weeks) to monitor treatment progress and document recurrence, side effects, and patient satisfaction. Follow-up records also included patient feedback and notes on any complications encountered during the study.

Data handling and processing

Statistical analysis was conducted using the SPSS version 20. Results were presented in tables and figures.

Ethical consideration

The proposal for the thesis was submitted to the ethics review committee of the Qatar armed forces medical services and the ethics committee at the research unit (EDC) for approval. The study concepts were carefully explained to participants, and written informed consent was obtained from parents. Participation was voluntary, with the right to withdraw at any time without affecting healthcare access. Confidentiality was ensured using serial codes, and data were used exclusively for research purposes. Safety measures included social distancing, masks, ventilation, and regular hand.

RESULTS

A total of 100 patients participated in the study. The majority were male 82 (82%), while females accounted for 18 (18%). In terms of marital status, 66 (66%) were married, and 34 (34%) were unmarried (Table 1).

The age distribution showed that most participants were between 20-29 years 34 (34%) and 30-39 years 33 (33%). Participants aged 40-49 years comprised 18 (18%), those 50-59 years were 8 (8%), and the smallest group was aged 10-19 years with 7 (7%). Regarding occupation, the majority were employees 89 (89%), followed by students 7 (7%) and unemployed individuals 4 (4%) (Table 1).

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Among the participants, 11 (11%) were diagnosed with systemic diseases, while 89 (89%) reported no such conditions. Currently, 10 (10%) participants were on medication, while the majority, 90 (90%), were not taking any medication.

The majority of participants reported that their plantar warts first appeared 3-6 months ago 50 (50%), followed by those who experienced the condition less than 3 months ago 46 (46%). Smaller proportion, 4 (4%), reported that the warts first appeared 6-12 months ago (Figure 1).

At baseline, most participants had 2-3 lesions 39 (39%), followed by 31 (31%) with 4-5 lesions. A smaller group had more than 5 lesions 21 (21%), while only 9 (9%) participants had a single lesion (Figure 2).

The duration of the disease was less than 3 months for 50 (50%) participants, while 44 (44%) had the disease for 3-6 months. A small proportion of participants reported having the disease for 6-12 months 2 (2%), and 4 (4%) had the condition for more than 12 months.

In terms of pain strength, the largest group of participants reported a pain level of 3 (32%), followed by a pain level of 2 (28%). A pain level of 4 was reported by (11%), while 6 (6%) reported a pain level of 1. A smaller group reported a pain level of 5 (3%), and 20 (20%) participants experienced no pain (Table 2).

Half of the participants, 50 (50%), had previously received treatment for warts, while the remaining 50 (50%) had not.

Participants were evenly distributed between the two treatment groups: 50 (50%) received TCA with silver nitrate, and 50 (50%) were assigned to cryotherapy.

The number of sessions varied between the two treatment groups. In the TCA with silver nitrate group, most participants required more than 4 sessions 27 (54%) or 3 sessions 23 (46%). No participants in this group completed treatment in fewer than 3 sessions. In contrast, the cryotherapy group had the highest proportion completing treatment in 4 sessions 32 (64%), followed by 3 sessions 15 (30%). A small number of participants in this group completed treatment in 1 session 1 (2%) or 2 sessions 1 (2%). Only 1% of participants overall completed treatment in either 1 or 2 sessions. The difference in the number of sessions required between the two treatment groups was statistically significant (p=0.001) (Table 3).

The time since the start of treatment varied across both groups. In the TCA with silver nitrate group, 9 (18%) participants had initiated treatment less than 1 month ago, compared to 7 (14%) in the cryotherapy group. The majority of participants in both groups began treatment 1-2 months ago 24 (48%) in the TCA with silver nitrate group and 18 (36%) in the cryotherapy group. Considerable number of participants started treatment 2-3 months ago, including 16 (32%) in the TCA group and 21 (42%) in the cryotherapy group. Only 1 (2%) participant from the TCA group and 4 (8%) from the Cryotherapy group-initiated treatment more than 3 months ago. The overall difference in treatment timelines between the two groups were not statistically significant.

The treatment outcomes varied between the two groups. In the TCA with silver nitrate group, 41 (82%) participants experienced complete resolution of plantar warts, compared to 37 (74%) in the cryotherapy group. Partial resolution was reported by 9 (18%) participants in the TCA group and 11 (22%) in the cryotherapy group. No participants in the TCA group showed no change or worsening, while in the cryotherapy group, 1 (2%) participant reported no change, and another 1 (2%) reported worsened symptoms. The difference in treatment outcomes between the two groups was not statistically significant (p=0.493).

The recurrence of plantar warts was more common in the cryotherapy group compared to the TCA with silver nitrate group. In the cryotherapy group, 19 (38%) participants experienced recurrence, while only 6 (12%) participants in the TCA group reported recurrence. Most participants in both groups did not experience recurrence, with 44 (88%) in the TCA group and 31 (62%) in the cryotherapy group. The difference in recurrence between the two groups was statistically significant.

The timing of plantar wart recurrence differed between the two treatment groups. In the cryotherapy group, 1 (5.3%) participant experienced recurrence within 1 month after treatment, while No participants in the TCA with silver nitrate group reported recurrence during this period. Recurrence 1-2 months after treatment was observed in 2 (33.3%) participants in the TCA group and 5 (26.3%) in the cryotherapy group. The majority of recurrences occurred 2-3 months after treatment, reported

by 3 (50%) participants in the TCA group and 7 (36.8%) in the cryotherapy group. Recurrence beyond 3 months was noted in 1 (16.7%) participant from the TCA group and 6 (31.6%) from the cryotherapy group. The difference in the duration of recurrence between the two groups was not statistically significant.

The difference in the duration of treatment between the two groups was statistically significant.

The overall rate of side effects varied significantly between the two treatment groups. In the TCA with silver nitrate group, 39 (78%) participants reported no side effects, compared to only 17 (34%) in the cryotherapy group. Mild side effects were reported by 11 (22%) participants in the TCA group and 10 (20%) in the cryotherapy group. Moderate side effects were experienced by 22 (44%) participants in the cryotherapy group, whereas none were reported in the TCA group. Severe side effects were reported by only 1 (2%) participant in the cryotherapy group and none in the TCA group. This difference in side effect severity between the two groups was statistically significant (Table 4).

The efficacy of treatment was significantly different between the two groups. In the TCA with silver nitrate group, no participants rated their efficacy as 2, while 1 (2%) participant in the cryotherapy group rated it as such, contributing to a total of 1 (1%) for this category. For a rating of 3, there was 1 (2%) participant in the TCA group and 11 (22%) in the cryotherapy group, resulting in a total of 12 (12%). A rating of 4 was given by 12 (24%) participants in the TCA group and 18 (36%) in the cryotherapy group, bringing the total for this rating to 30 (30%). The most notable finding was in the highest efficacy rating of 5, where 37 (74%) of participants in the TCA group reported this level of efficacy compared to 20 (40%) in the cryotherapy group. Overall, the results indicated a significant difference in efficacy between the treatments (Table 5).

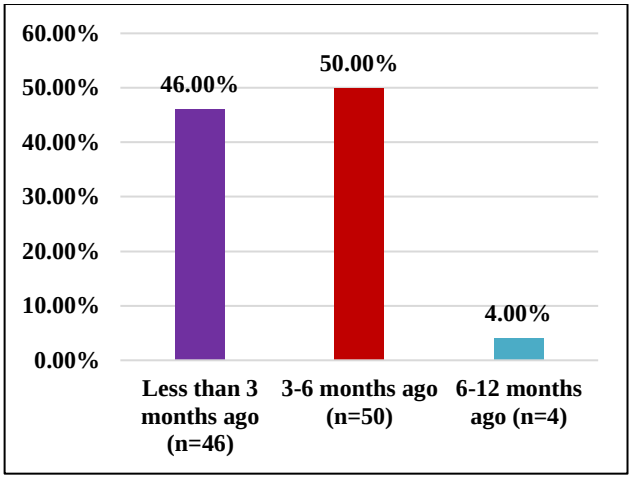

Figure 1: Date of first appearance of plantar warts among the patients in the study of comparative efficacy of TCA with silver nitrate and cryotherapy in treating planter warts, (n=100).

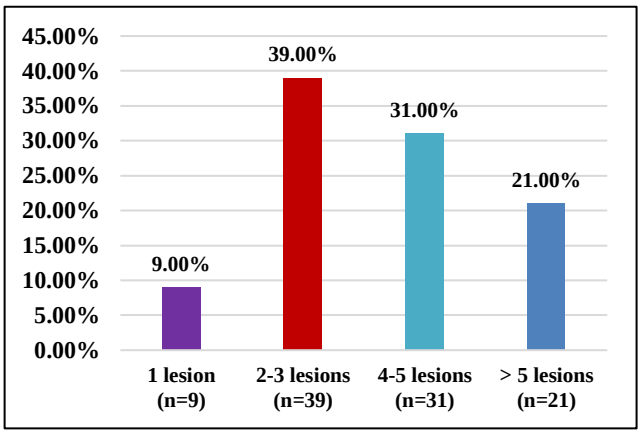

Figure 2: Number of plantar warts at baseline among the patients in the study of comparative efficacy of TCA with silver nitrate and cryotherapy in treating planter warts, (n=100).

Table 1: Distribution of the patients according to demographic data in the study of comparative efficacy of TCA with silver nitrate and cryotherapy in treating planter warts, (n=100).

Demographic data		N	Percent (%)
Gender	Male	82	82
	Female	18	18
Marital status	Married	66	66
	Unmarried	34	34
Age groups (in years)	10-19	7	7
	20-29	34	34
	30-39	33	33
	40-49	18	18
	50-59	8	8
Occupation	Student	7	7
	Employee	89	89
	Unemployed	4	4
Total		100	100

Table 2: Local diseases among the patients in the study of comparative efficacy of TCA with silver nitrate and cryotherapy in treating planter warts, (n=100).

The strength rate of pain	N	Percent (%)
1	6	6
2	28	28
3	32	32
4	11	11
5	3	3
No pain experience	20	20
Total	100	100

Table 3: Number of sessions among the study groups in the study of comparative efficacy of TCA with silver nitrate and cryotherapy in treating planter warts, (n=100).

No. sessions	Assigned treatment group, N (%)		Total, N (%)
	TCA with sliver nitrate	Cryotherapy	
1	0 (0)	1 (2)	1 (1)
2	0 (0)	1 (2)	1 (1)
3	23 (46)	15 (30)	38 (38)
4	0 (0)	32 (64)	32 (32)
>4	27 (54)	1 (2)	28 (28)
Total	50 (100)	50 (100)	100 (100)

*P=0.001.

Table 4: Overall rate of side effects among the study group in the study of comparative efficacy of TCA with silver nitrate and cryotherapy in treating planter warts, (n=100).

Overall rate of side effects	Assigned treatment group, N (%)		Total, N (%)
	TCA with sliver nitrate	Cryotherapy	
No side effects	39 (78)	17 (34)	56 (56)
Mild	11 (22)	10 (20)	21 (21)
Moderate	0 (0)	22 (44)	22 (22)
Severe	0 (0)	1 (2)	1 (1)
Total	50 (100)	50 (100)	100 (100)

*P=0.000

Table 5: Efficacy evaluation among the study group in the study of comparative efficacy of TCA with silver nitrate and cryotherapy in treating planter warts, (n=100).

Efficacy evaluation	Assigned treatment group, N (%)		Total, N (%)
	TCA with sliver nitrate	Cryotherapy	
2	0	1 (2)	1 (1)
3	1 (2)	11 (22)	12 (12)
4	12 (24)	18 (36)	30 (30)
5	37 (74)	20 (40)	57 (57)
Total	50 (100)	50 (100)	100 (100)

*P=0.001.

DISCUSSION

In our study, participants were evenly distributed between the two treatment groups, with 50 (50%) receiving TCA combined with silver nitrate and 50 (50%) assigned to cryotherapy. This balanced distribution allows for a robust comparison of treatment efficacy. Previous studies have also explored the effectiveness of TCA in various concentrations and combinations; for instance, Yousaf et al compared a 30% TCA solution with 0.025% tretinoin for treating flat warts.[18] Karrabi et al evaluated the effects of 40% TCA against cryotherapy for plantar warts while Jayaprasad et al assessed the safety and efficacy of a topical 10% potassium hydroxide solution in conjunction with 30% TCA for plane warts.[19,20] Additionally, García-Oreja et al focused specifically on the efficacy of cryotherapy in treating plantar warts.[17] These prior comparisons underscore the relevance of our study in contributing to the existing body of evidence regarding treatment options for plantar warts. In this study, we examined the efficacy of TCA, silver nitrate, and

cryotherapy in treating plantar warts among a total of 100 patients. Our cohort predominantly consisted of males (82%) aged between 20 and 39 years, with a mean age of 26±7.53 years. This demographic distribution is consistent with findings from Yousaf et al and Karrabi et al which also reported a male predominance in their patient populations, with males constituting 61.7% and 68.33%, respectively.[18,19] These trends suggest that plantar warts may be more prevalent in younger males, potentially due to lifestyle factors or occupational exposures that increase the risk of HPV infection, which is known to cause plantar warts. The mean age of participants in our study falls within the range reported by Jayaprasad et al who noted patients from as young as 6 years to 78 years.[20]

The majority of our patients were in their twenties and thirties, aligning with the notion that this age group may be more likely to engage in activities that predispose them to the development of plantar warts. The high incidence of plantar warts in younger populations may be attributed to factors such as increased skin trauma and higher levels of foot exposure in communal settings. Among the participants, 11 (11%) were diagnosed with systemic diseases, while 89 (89%) reported no such conditions (Figure 1).

In our study, we found that the duration of plantar warts was predominantly short, with 50% of participants having the condition for less than 3 months and 44% for 3-6 months. Only a small fraction of participants (6%) reported having warts for longer durations (2% for 6-12 months and 4% for over 12 months). This acute presentation contrasts sharply with the findings of Jayaprasad et al who reported durations ranging from 2 months to 5 years and Karrabi et al who noted mean durations of 35.5±22.5 months in the TCA group and 37.8±19.5 months in the cryotherapy group.[19,20] The predominance of shorter disease duration in our cohort may suggest a higher rate of treatment-seeking behavior, emphasizing the need for timely intervention in managing plantar warts.

At baseline, the distribution of lesions among participants indicated that the majority had 2-3 lesions (39%), followed by 31% with 4-5 lesions. A notable portion of participants (21%) presented with more than 5 lesions, while only 9% had a single lesion. This finding contrasts with the results reported by Yousaf et al who noted a mean number of lesions of 7.23±2.89, with 85% of patients having up to 10 lesions.[18] Similarly, Jayaprasad et al documented a broader range of wart numbers, varying from 3 to 50, and sizes between 1 and 10 mm.[20] The lower lesion counts observed in our study suggest a potentially less severe presentation among participants, which may influence treatment efficacy and outcomes. In terms of pain strength, the largest group of participants reported a pain level of 3 32 (32%), followed by a pain level of 2 28 (28%). A pain level of 4 was reported by 11 (11%), while 6 (6%) reported a pain level of 1. A smaller group reported a pain level of 5 3 (3%), and 20 (20%) participants experienced no pain. The number of treatment sessions varied significantly between the two groups. In the TCA with silver nitrate group, the majority of participants required more than 4 sessions (54%), while 46% needed 3 sessions. Notably, no participants in this group completed treatment in fewer than 3 sessions. Conversely, in the cryotherapy group, most participants completed their treatment in 4 sessions (64%), followed by 30% in 3 sessions. A small fraction of this group finished in just 1 session (2%) or 2 sessions (2%). Overall, only 1% of participants completed treatment in either 1 or 2 sessions. The observed differences in the number of sessions required between the treatment groups were statistically significant (p=0.001), indicating that the TCA with silver nitrate regimen necessitated more treatment sessions compared to cryotherapy. This finding may have important implications for patient compliance and treatment planning, as longer treatment durations could affect overall satisfaction and outcomes. The time since the start of treatment exhibited some variation between the two groups. In the TCA with silver nitrate group, 18% of participants had initiated treatment less than 1 month prior, while 14% of those in the cryotherapy group began within the same timeframe. The majority of participants in both groups commenced treatment 1-2 months ago, with 48% in the TCA group and 36% in the cryotherapy group. Importantly, the overall difference in treatment timelines between the two groups were not statistically significant (p=0.310). This finding suggests that both treatment modalities were initiated around the same time frame, which may help control for time related factors when assessing treatment outcomes. The treatment outcomes demonstrated some differences between the two groups. In the TCA with silver nitrate group, 82% of participants experienced complete resolution of plantar warts, while 74% achieved complete resolution in the cryotherapy group. Partial resolution was reported by 18% in the TCA group and 22% in the cryotherapy group. Notably, no participants in the TCA group experienced no change or worsening of their condition; however, in the cryotherapy group, 2% reported no change, and another 2% experienced worsened symptoms. The difference in treatment outcomes between the two groups were not statistically significant (p=0.493), suggesting comparable efficacy between the two methods. Previous studies provide additional context to these findings. García-Oreja et al found that intralesional cryotherapy might be more effective than spray-on methods, although no significant difference was observed between two different freeze-thaw cycles in cryotherapy.[17] Yousaf et al reported a higher efficacy rate for 30% TCA compared to 0.025% tretinoin, with 90% efficacy in one group versus 53.3% in another.[18] Karrabi et al observed that while there was no statistically significant difference in clinical improvement between TCA and cryotherapy (p=0.317), the TCA group showed a higher overall improvement rate (87% vs. 77%).[19] Additionally, Jayaprasad et al reported no significant difference in objective therapeutic responses

between 10% KOH and 30% TCA (p=0.07), though subjective responses favored 10% KOH with statistical significance (p=0.03). These comparisons illustrate the variability in treatment efficacy and highlight the importance of individual treatment response, emphasizing that while TCA with silver nitrate may demonstrate a slight edge in complete resolution rates, the overall clinical significance remains unclear. The recurrence of plantar warts was significantly more prevalent in the cryotherapy group compared to the TCA with silver nitrate group. In the cryotherapy group, 38% of participants experienced recurrence, while only 12% in the TCA group reported similar issues. Notably, the majority of participants in both groups did not experience recurrence, with 88% in the TCA group and 62% in the cryotherapy group remaining free of warts. The difference in recurrence rates between the two groups were statistically significant (p=0.003), indicating that TCA with silver nitrate may offer a more durable resolution of plantar warts. Previous studies offer valuable insights into these findings. For instance, Jayaprasad et al reported no recurrence of warts among complete responders during a 3-month follow-up in both treatment arms when using 10% KOH, which was found to be equally effective as 30% TCA, with the added benefit of faster action and fewer side effects.[20] These comparisons underscore the potential advantages of TCA with silver nitrate, particularly in terms of recurrence rates, suggesting it may be a preferable treatment option for plantar warts. The overall rate of side effects exhibited a significant difference between the two treatments groups. In the TCA with silver nitrate group, a notable 78% of participants reported no side effects, while only 34% in the cryotherapy group enjoyed similar outcomes. Mild side effects were reported by 22% of participants in the TCA group, compared to 20% in the cryotherapy group. However, moderate side effects were experienced by 44% of participants in the cryotherapy group, and severe side effects were reported by 2% of participants in this group, with no severe effects observed in the TCA group. The stark difference in the severity of side effects between the two groups was statistically significant (p=0.000), highlighting a potential advantage of TCA with silver nitrate in terms of tolerability. Moreover, the findings align with Jayaprasad et al who noted that while 10% KOH was equally effective in treating plane warts compared to 30% TCA, it also provided the advantages of a faster onset of action and a tendency to clear warts with fewer side effects.[20]

This suggests that TCA with silver nitrate may not only be effective but also offers a more favorable safety profile when compared to cryotherapy.

The efficacy of treatment demonstrated a significant difference between the two groups, with 74% of participants in the TCA group reporting the highest efficacy rating of 5, compared to only 40% in the cryotherapy group. Additionally, 24% of participants in the TCA group rated their treatment efficacy as 4, contributing to a total of 30% for this rating across both groups. The overall difference in treatment efficacy was statistically significant (p=0.001), indicating a stronger response to TCA with silver nitrate. Supporting these findings, Karrabi et al suggested that while 40% TCA was nearly as effective as cryotherapy for plantar warts, the lower adverse effects associated with TCA makes it a preferable alternative. Similarly, Yousaf et al reported a higher efficacy of 30% TCA compared to 0.025% tretinoin, with 90% efficacy noted in the TCA group versus 53.3% in the tretinoin group. Furthermore, Jayaprasad et al found that 10% KOH was equally effective as 30% TCA for plane warts but offered the advantages of a faster onset of action and a greater likelihood of complete wart clearance.[18-20]

Limitations

One of the primary limitations of this study is the relatively small sample size, which may impact the generalizability of the findings. A larger and more diverse sample would provide a more comprehensive understanding of the comparative efficacy of TCA with silver nitrate and cryotherapy in treating plantar warts. Additionally, the study was conducted within a specific demographic, primarily young adults and employees, which may not fully represent the broader population affected by plantar warts. Variability in treatment adherence, individual pain tolerance, and differences in wart severity could also influence the outcomes. Future studies with a larger sample size, extended follow-up periods, and diverse patient populations would help validate these findings and provide more definitive conclusions.

CONCLUSION

This study highlights key findings regarding the demographics, efficacy, recurrence rates, side effects, and treatment sessions associated with plantar wart management. The majority of participants were young adults, with a notable prevalence among employees, emphasizing the need for targeted awareness and early intervention strategies in this group. In terms of treatment efficacy, the combination of TCA with silver nitrate demonstrated superior outcomes compared to cryotherapy, with a higher rate of complete resolution and a greater proportion of participants rating the treatment as excellent. Additionally, recurrence rates were significantly lower in the TCA with SN group, suggesting its potential for more lasting results. The safety profile further supported its advantage, as participants experienced fewer moderate to severe side effects compared to those undergoing cryotherapy. However, the TCA with SN group required more treatment sessions, highlighting the need for a balanced approach that considers both efficacy and patient tolerance. These findings underscore the importance of individualized treatment plans to optimize patient outcomes in plantar wart management.

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REFERENCES

1. Krishna SK, Jethwa AS. Human papillomavirus infections in adults and children. Am J Epidemiol Infect Dis. 2013;1(2):11-9.
2. Bruggink SC, Gussekloo J, Berger MY, Zaaijer K, Assendelft WJ, de Waal MW, et al. Cryotherapy with liquid nitrogen versus topical salicylic acid application for cutaneous warts in primary care: randomized controlled trial. CMAJ. 2010;182(15):1624-30.
3. 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(3):227-32.
4. Sterling JC, Gibbs S, Haque Hussain SS, Mohd Mustapa MF, Handfield-Jones SE, Hughes JR, et al. British Association of Dermatologists' guidelines for the management of cutaneous warts 2014. Bri J Dermatol. 2014;171(4):696-712.
5. Bacelieri R, Johnson SM. Cutaneous warts: an evidence-based approach to therapy. Am Family Phys. 2005;72(4):647-52.
6. Gibbs S, Harvey I. Topical treatments for cutaneous warts. Cochrane Database of Systematic Reviews. 2006(3):CD001781.
7. Bruggink SC, Eekhof JA, Egberts PF, van Blijswijk SC, Assendelft WJ, Gussekloo J. Warts transmitted in families and schools: a prospective cohort. Pediatrics. 2013;131(5):928-34.
8. Sladden MJ, Johnston GA. Common skin infections in children. BMJ. 2004;329(7457):95-9.
9. Watkins P. Identifying and treating plantar warts. Nursing standard. 2006;20(42):50-4.
10. Lipke MM. An armamentarium of wart treatments. Clin Med Res. 2006;4(4):273-93.
11. Stulberg DL, Hutchinson AG. Molluscum contagiosum and warts. Am Fam Phys. 2003;67(6):1233-40.
12. Vali A, Ferdowsi F. Evaluation of the efficacy of 50% citric acid solution in plane wart treatment. Indian J Dermatol. 2007;52(2):96-8.
13. Abdel Meguid AM, Abdel Motaleb AA, Abdel Sadek AM. Cryotherapy vs trichloroacetic acid 90% in treatment of common warts. J Cosm Dermatol. 2019;18(2):608-13.
14. Ebrahimi S, Dabiri 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(2):215-7.
15. Concannon M, Keogh L, Stephenson J, Parfitt G, Forrest J. A randomized comparative evaluation of clinical and home application to investigate the effectiveness of silver nitrate ($AgNO_3$)(95%) for the treatment of verruca pedis. Int J Pharm Pract. 2001;25(6):421-8.
16. Kwok CS, Bennett C, Holland R, Abbott R. Topical treatments for cutaneous warts. Cochrane database of systematic reviews. 2012(9):CD001781.
17. García-Oreja S, Álvaro-Afonso FJ, Tardáguila-García A, López-Moral M, GarcíaMadrid M, Lázaro-Martínez JL. Efficacy of cryotherapy for plantar warts: A systematic review and meta-analysis. Dermatol Ther. 2022;35(6):e15480.
18. Yousaf A, Gul S, Zahra A, Aslam A, Khan AN, Hafeez L, et al. Comparison of efficacy of 30% solution of trichloroacetic acid (TCA) with 0.025% tretinoin in the treatment of flat warts at a tertiary care hospital. J Pak Assoc Dermatol. 2021;31(4):600-4.
19. Karrabi M, Kheirkhah M, Shahrestanaki E, Thomas S, Sahebkar M. Comparison of 40% trichloroacetic acid and cryotherapy for the treatment of plantar warts: A single blind, randomized clinical trial. Dermatol Ther. 2020;33(4):e13559.
20. Jayaprasad S, Subramaniyan R, Devgan S. Comparative Evaluation of Topical 10% Potassium Hydroxide and 30% Trichloroacetic Acid in the Treatment of Plane Warts. Indian J Dermatol. 2016;61(6):634-9.

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