

## Topical formic acid puncture technique for the treatment of common warts

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### Abstract

**Background** Warts are a common chronic skin disorder that can be cosmetically disfiguring and, depending on the location, cause inhibition of function. The presence of dozens of topical and systemic treatments for warts is a testament to the lack of a rapid, simple, uniformly effective, inexpensive, nonscarring, and painless treatment.

**Aim** The purpose of this study was to determine the efficacy and safety of 85% formic acid application, an inexpensive therapy, for the treatment of warts.

**Methods** A placebo-controlled, nonrandomized, open trial was performed in 100 patients with common warts attending Father Muller's Medical College Hospital, Mangalore. Fifty patients received 85% formic acid application and 50 patients received placebo (water) using a topical application/needle puncture technique every other day.

**Results** Ninety-two per cent of patients who received formic acid application showed complete disappearance of warts after a 3–4-week treatment period, compared to 6% in the placebo group.

**Conclusions** The results show that 85% formic acid application is a safe, economical, and effective alternative in the treatment of common warts with few side-effects and good compliance. A multicenter trial is needed to examine the efficacy and safety of this treatment.

### Introduction

Warts are among the most common skin disorders seen by dermatologists. In India, various recent studies have shown that the incidence of warts represents 2.5–9% of patients attending a dermatology department.<sup>1,2</sup> The removal of warts is one of the routine procedures performed by a dermatologist. The approach to the therapy of warts depends on the age of the patient, the extent and duration of the lesions, the patient's immunologic status, and the patient's desire for therapy.<sup>3,4</sup>

The current standard treatment of warts involves primarily physical destruction of the infected cells. This destruction is performed by a number of different modalities, including chemical destruction, cryosurgery, electrosurgery, lasers, and immunotherapy.<sup>3,4</sup> Oral immunotherapeutic agents, such as cimetidine, have also been used.<sup>5</sup>

In the present study, we used formic acid for the treatment of common warts. Formic acid is a carboxylic acid. It is so named because it was first obtained by the

distillation of red ants (Latin: formica = ant). It is used in various industries.<sup>6,7</sup> Formic acid, 8%, has been used to remove nits in pediculosis capitis.<sup>8</sup>

### Methods

An open, nonrandomized, placebo-controlled study was conducted on patients with common warts who reported to the dermatology outpatient department of Father Muller's Medical College Hospital, Mangalore, India. One hundred wart patients (55 males and 45 females; aged 8–61 years) were included in the study. Informed consent was obtained and the need for regular follow-up was stressed. Patients were divided into two groups. Group I consisted of 50 patients treated with 85% formic acid application. Group II consisted of an equal number treated with placebo (water) application. Patients with warts on the eyelids, lips, and anterior nares were excluded from the study. Patients with other systemic diseases were also not included in the study. Also excluded from the study were patients who failed to adhere to the treatment schedule (three in group I and 11 in group II). They were replaced by new patients.

### Technique

The warts were cleaned with a spirit-moistened cotton swab. Formic acid was applied using a 24 gauge disposable needle. Keeping the skin taut, warts were punctured approximately 5–6 times. Care was taken to ensure that the puncture was not deep enough to produce bleeding and that there was no contact with normal skin. This form of treatment is called the "formipuncture technique." Placebo application was performed in a similar manner. Warts on the face and warts in children were treated by application of formic acid or water with a cotton stick swab.

All the patients were treated on alternate days until the lesions disappeared. The number of applications was restricted to 12, after which the treatment was considered to have failed. All patients were followed up once a month for a period of 3 months. The response to therapy, the appearance of new lesions, and the presence of secondary infection and other side-effects were noted.

### Results

A total of 50 patients (32 males and 18 females) received formic acid application (group I) and 50 patients (23 males

and 27 females) received placebo application (group II) for warts. The average duration of the disease was 15.28 months in group I [standard deviation (SD), 11.34 months] and 12.53 months in group II (SD, 10.79 months). The average number of lesions in group I was 5.12 (SD, 4.58) and in group II was 6.37 (SD, 4.98). In both groups, most patients had between one and five lesions, i.e. 72% in group I and 56% in group II.

The sites of warts included the scalp, face, legs, feet, periungual region, and hands. The hands were the predominant site in both groups. Many patients had involvement of more than one site.

The average number of applications required for the warts to disappear in group I was 4.60 (SD, 2.47) and in group II was 11.6 (SD, 1.63) (see Tables 1 and 2). The efficiency of therapy was assessed at the end of 3 months of treatment: 92% in group I and 6% in group II showed the disappearance of warts (see Table 3 and Figs 1–6).

Thus, in this study, 46 patients belonging to group I showed complete clearance of common warts after a maximum of 12 applications. In group II, only three out of 50 patients showed the complete disappearance of warts.

**Table 1** Number of alternate day treatments

Number of applications	Number of patients				Total
	Group I	%	Group II	%	
1–4	30	60	1	2	31%
5–8	15	30	2	4	17%
9–12	5	10	47	94	52%

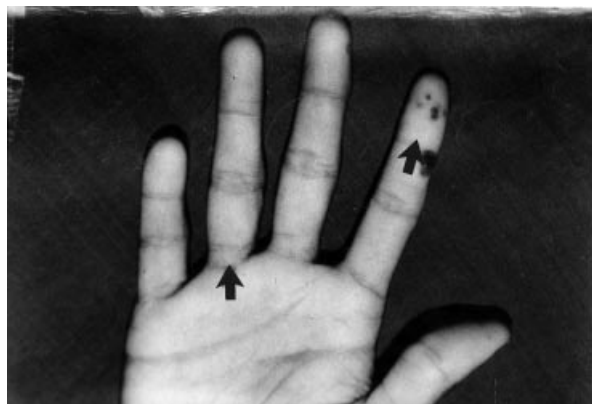
**Table 3** Complete clinical resolution of warts at 3 months

	Number of patients			
	Group I	%	Group II	%
Complete clinical resolution	46/50	92	3/50	6

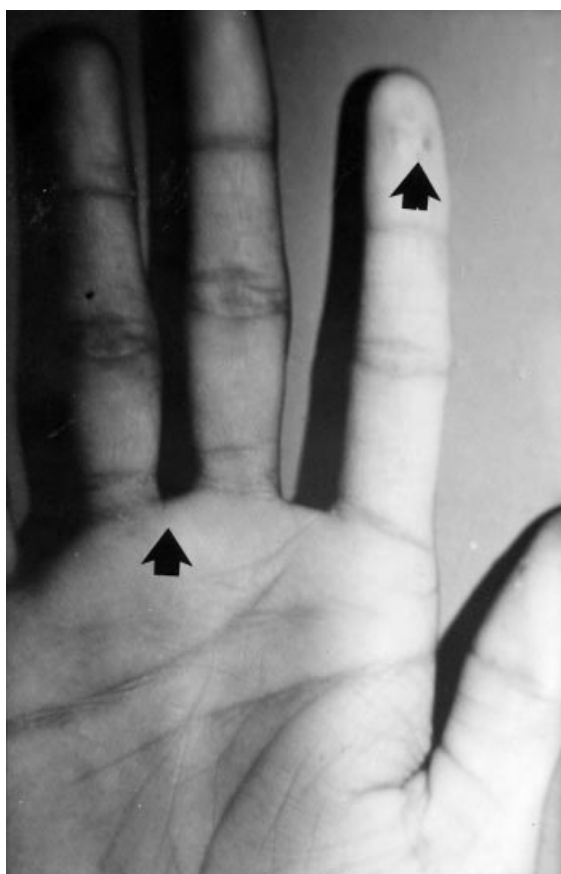
**Table 2** Applications required to achieve clinical cure by location in group I patients

Number of applications for clinical cure	Sites of warts					Total
	Scalp (n=3)	Face (n=8)	Periungual (n=10)	Hands (n=60)	Legs and feet (n=5)	
1				2		2
2	1		1	3		5
3	1		3	4		10
4	1	1	2	5	4	13
5			1	2	1	4
6			1	8		9
7		1	2	10		13
8		2		11		13
9		1		14		15
10		1				1
11						
12				1		1

Results of group II were not tabulated as only three patients showed complete resolution before 12 applications.



**Figure 1** Common warts on the palms before treatment



**Figure 2** Same case as in Fig. 1 after three applications of formic acid

The standard error of the difference is 1.728, whereas the observed difference is 86. This shows the efficacy of formic acid in the treatment of warts.

Twelve per cent of patients in the formic acid group developed secondary infections. These patients had pain, erythema, and seropurulent discharge which subsided after



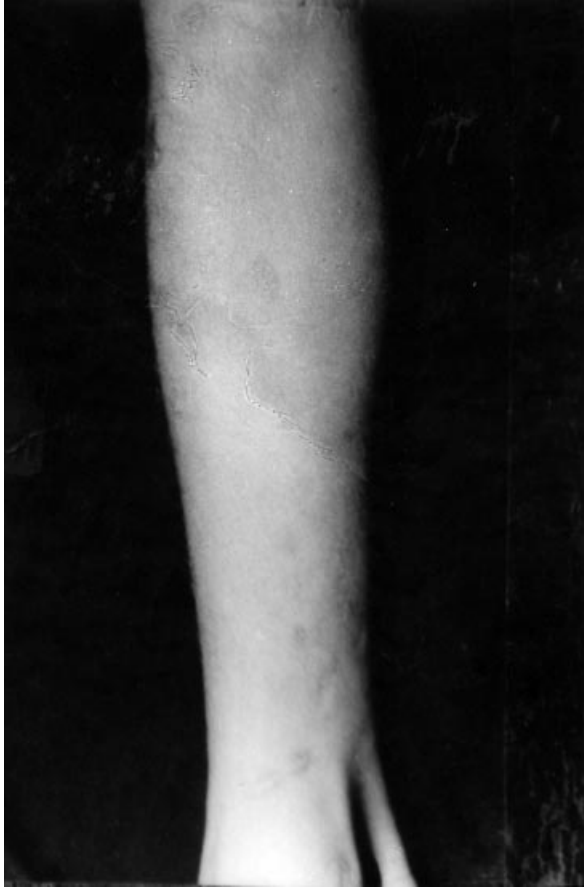
**Figure 3** Common warts on the leg before treatment

a course of systemic antimicrobials. Culture and sensitivity were not performed. A mild burning sensation was observed in all patients at the time of application of formic acid which disappeared within a few minutes. No scarring was observed in lesions on the face. Minimal scarring was seen in other areas. No other side-effects were observed in these patients.

### Discussion

In the patients described in this study, formic acid application for warts was safe and effective, with minimal side-effects. Formic acid is economical and does not require any sophisticated equipment. It is painless, can be used in children, and also for the treatment of periungual warts. It does not require any local anesthesia and scarring is minimal.

Among the various caustic acids used in the treatment of common warts, salicylic acid is the weakest, trichloroacetic acid is of medium strength, and bichloroacetic acid is the strongest. Formic acid is stronger than salicylic acid, but



**Figure 4** Same case as in Fig. 3 after four applications of formic acid



**Figure 5** Wart on the face



**Figure 6** Same case as in Fig. 5 after three applications of formic acid

less caustic than trichloroacetic acid. In the field of dermatology, 8% formic acid has been shown to be useful as a post-pediculicide nit removal system.<sup>8</sup> We have used 85% formic acid in the treatment of warts.

The mechanism of action of salicylic acid in warts involves keratolysis of virally infected tissues.<sup>3</sup> Trichloroacetic acid and bichloroacetic acid are powerful irritants that work by hydrolyzing the cellular proteins, leading to inflammation and cell death. The exact mechanism of action of formic acid is not known. It probably acts in a manner similar to formalin which causes destruction of the wart-infected tissue by dehydration.<sup>9</sup> After application of formic acid, the wart becomes slightly whitish in color and the superficial layer peels off indicating a keratolytic effect. Formic acid puncture may also help in inducing regression of the warts. Regression of plane warts following spontaneous inflammation has been reported.<sup>10</sup> In our study, however, the placebo group, who also underwent puncture with a needle, did not show the resolution of warts, indicating that puncture alone is not sufficient to

produce the resolution of warts. Induction of immunity may also be considered as a possible mechanism of action, as in squaric acid dibutylester contact immunotherapy for the treatment of recalcitrant warts.<sup>11</sup> Although 85% formic acid is caustic, careful application over the wart area only prevents its harmful effects on the skin.

We believe that 85% formic acid application can serve as a safe, cheap, and effective alternative in the treatment of common warts. A multicenter trial with 85% formic acid application for common warts may help to standardize the treatment regimen and safety.

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