

HOT-WATER TREATMENT FOR WARTS

JOHN LoCRICCHIO, JR., M.D.,* and JOHN R. HASERICK, M.D.

Department of Dermatology

RECENTLY Crile¹ reported an investigation of the local application of heat as an adjunct to the treatment of cancer. His methods suggested the use of heat locally for treating some dermatologic conditions, one of which is the common wart, *verruca vulgaris*.

Our reason for choosing to treat warts by local heat was based on these facts: (1) verrucae are circumscribed lesions caused by viruses growing within and being confined to the epidermal cells; (2) viruses as a heterogenous group of organisms are inactivated by heat, (3) the skin can take definite amounts of local hyperthermia without blistering.

It seemed logical that it might be possible to inactivate or to slow down the growth of viruses within the skin—a wart—by external application locally of heat below blistering temperature. To aid the process, the wart would be pared so as to eliminate the keratotic overgrowth and to enable the heat to penetrate deeper within the lesion.

Since it was our purpose to study the effect of a 45 to 48 C. range of temperature on warts, the hot-water bath provided an easy means of application. It offered several advantages. The heat would simultaneously conform to all contours of the lesion. It would treat both the obviously infected tissue and the apparently normal but possibly infected skin surrounding the lesion. It would expose the skin to the highest temperatures where the infection was localized; the corium would be exposed to milder degrees of heat. It would offer good cosmetic results; and would make treatment in the patient's home possible.

This report presents the study of the treatment of verrucae with local water baths in the temperature range of 45 to 48 C.

Method

Fifteen patients who had verrucae on the feet, the hands, or the face, comprise the series of patients in this study.

For treating the verrucae on the feet, a thermostatically controlled foot bath was built, for the temperature range of 45 to 48 C. A support was placed in the bottom of the bath. Gauze packs were fashioned to support the foot to prevent pressure. The foot was immersed so that the part affected would be entirely under water, no attempt being made to protect the rest of the foot from the heat by applying a coating of grease or ointment. The foot was immersed for from one-half hour to one and one-half hours. The patient was instructed that when he felt pain he was

*Fellow in the Department of Dermatology.

to remove the immersed part, and as soon as he felt relieved he was to reimmerse the part. Retreatment took place once or twice a week. Duration of treatment depended on response. If the wart became smaller, the treatments were continued until there was no wart tissue visible or stationary improvement was encountered. If there was no change in the size of the wart after six or eight treatments the method was discontinued.

For treating verrucae on the hands, a simple wash basin was used. The drain was stoppered and the hot and cold faucets were adjusted to give water of the desired temperature at such a speed as to remain within the capacity of the overflow drain. For home treatment patients were instructed to use a receptacle in which the affected part could be immersed in water, and in which the water could be readily changed to keep the temperature within the desired range.

Patients selected for the study had lesions of many months' to several years' duration; all had prior treatment. A few patients originally scheduled for the heat treatment gave it up after the first or second application because of the discomfort, or because other forms of therapy seemed to offer more speedy cure; they are not included in the series of this report. Our series comprises the 15 patients who continued with treatment and who were examined at intervals, and whose reactions are evaluated in this report.

Results

Our results show that treating the warts locally by hot water in the 45 to 48 C. temperature range was successful in more than half of the patients. No patients showed blistering of the skin, but all showed some degree of hyperemia. Nine patients had regression and disappearance of the lesions; in each case the lesion disappeared within three months of onset of treatment, and no recurrence was noted at the time of progress examination within at least three months. Four patients improved: there was visible decrease in the size of each lesion, and decrease or absence of discomfort on compression of the lesions. There were two failures; there was no change from pretreatment status after many heat applications.

Illustrative Case Reports

Case 1. In January, 1961, a 24-year-old man, a newspaper reporter, was examined because of a large and symptomatic verruca on the ball of the left foot (*Fig. 1A and B*), which had existed for about two years. As a child the patient had been successfully treated with roentgentherapy and acids for a small wart in the same location. Many agents used with the hope of curing the present wart, when he was serving with the Armed Forces, included application of liquid nitrogen, trichloroacetic acid, and ingestion of vitamin capsules; none was successful.

Our treatment included giving the involved foot a course of seven immersions (one each week) for one and one quarter hours in water of 47 C. The keratotic portion was pared before each treatment. Within six weeks the wart had regressed and disappeared. It did not recur within 10 months posttreatment.

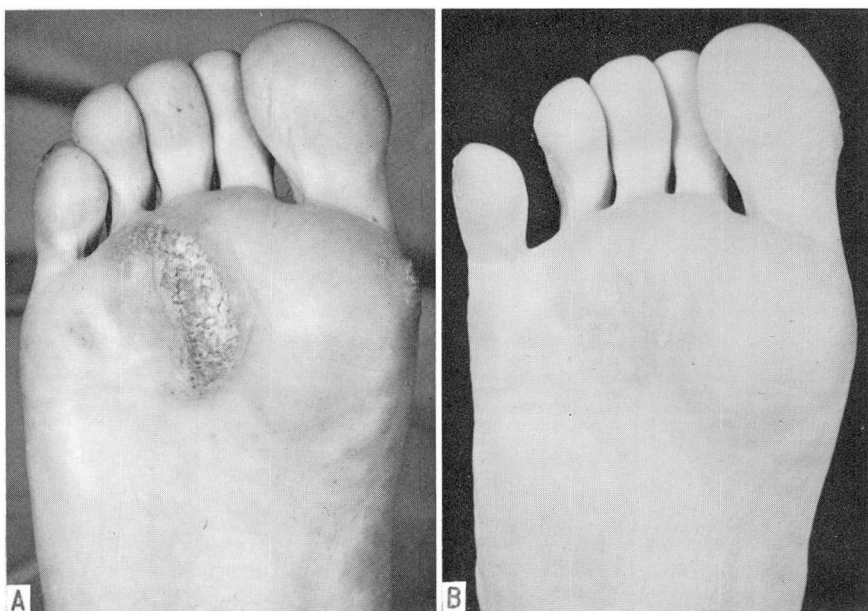


Fig. 1. Case 1. A, Verruca plantaris before treatment with 47 C. water bath. B, Foot one week after the seventh treatment with 47 C. water bath.

Case 2. In August, 1960, a 77-year-old woman was examined because of a large and disfiguring verruca acuminata of the lower lip (Fig. 2A and B). A biopsy study confirmed this diagnosis. This growth was unchanged after five local applications of a solution of nitrogen mustard applied in an attempt to achieve a radiomimetic effect. In January, 1961, this topical therapy was again tried without any change. She was then instructed to immerse the lip in a cup of water as hot as she could tolerate it for a few minutes several times a week. In March, 1961, at the time of a progress examination, the wart had cleared in the region that had been immersed, but remained as small nubbins where her fingers had supported the lip. In May, 1962, she reported that she was free of warts for one year; they started to recur in April, 1962. No hot-water treatment was used the past year.

Case 3. In January, 1961, a 55-year-old man, an accountant, was examined for a verruca that had grown through his thumbnail; it had been present for several years, and had received a variety of treatments. We instructed the patient to immerse the thumb in water of about 48 C. for about 20 minutes each day. After two weeks the wart had visibly regressed. The treatment was continued for three more weeks. When the patient was examined in March, 1961, the wart tissue had disappeared. It did not recur within the ensuing 10 months.

Discussion

In applications of local heat we saw a method that had the potential for inactivating viruses within the skin. Used carefully they would not cause blistering, scarring, or permanent damage to the skin. However, two important questions were posed: (1) How much local heat could the skin absorb and still recover? (2) To what depth



Fig. 2. Case 2. Verruca acuminata of lip before hot-water bath treatment. Photo was taken August, 1960; appearance was unchanged in January, 1961. B, Appearance of lip in March, 1961, after about eight weeks of hot-water applications.

would surface temperatures penetrate; that is, would the entire depth of epidermis be involved?

Henriques and Moritz²⁻⁴ reported basic studies from which are obtained good working rules. They showed that tissue edema followed the application of 44 C. local heat. Below that temperature the processes of skin repair were faster than those of skin destruction or damage. The lowest external temperature the skin could tolerate and show blistering was 44 C. At that temperature, and higher, it was just a question of time when blistering would occur. At 44 C. about six hours' exposure was needed to cause blistering, or irreversible damage to the basal layer of epidermis. At 51 C. the exposure time necessary to destroy the epidermis was from 3 to 5 minutes. Between the two extremes, from 44 to 51 C., the time required to cause transepidermal necrosis, leading to blistering, was roughly reduced by one half for each degree of rise in temperature. The process was reversible, provided that the end point was not passed. Williamson and Scholtz⁵ demonstrated the same time-temperature relationship.

In treating verruca plantaris we were dealing with skin thicker than that treated by Williamson and Scholtz.⁵ Their material consisted of pigskin or thin human skin. With the thicker skin exposed to the hot water we believed we could have some leeway. Accordingly, with a water bath that ranged in temperature from about 45 to 48 C., a one-hour time limit was set. For a device that would give less variance a more critical time limit would have to be set. We kept strictly below 50 C.

The matter of whether or not the heat would penetrate deeply enough to affect the entire wart (that is, to the basal epidermal layer) is answered by Henriques and Moritz.² Within two or three minutes of exposure the temperature of the basal layer was that of the skin surface. Thompson⁶ had shown that the fibroma virus of rabbits

could be inhibited when their skin temperature was raised to equal the anal temperature. On the other hand, Boak, Carpenter, and Warren⁷ showed that the herpes simplex virus was extremely resistant, the in vitro inactivation time for the dermotropic factor being 50 hours at 41.5 C. Only recently Mendelson and Kligman⁸ isolated the common wart virus and grew it in tissue culture. Its true characteristics have yet to be determined. In 1935, Templeton⁹ demonstrated long incubation periods after inoculation with Beckfeld wart filtrates. His results suggested that at least in some instances the wart virus could withstand a single half-hour exposure at 50 C.

Thus with heat we hoped to kill or at least to slow up the growth of the wart virus and to preclude its invasion of adjacent tissues so that the normal reparative processes of the skin would move the infected portion to a higher and higher level in the spinous layer of the epidermis, toward the surface, so that it would be shed with the stratum corneum. Paring of the keratotic portion at regular intervals would hasten the process.

The fact that the visible infection regressed after local heating does not ipso facto prove our thesis of thermal inactivation of the infecting agent. Another possible mechanism could be activation of an immune process by thermal hyperemia.

Conclusion

Local heat in the temperature range of 45 through 48 C., as applied in a water bath, offers another method of treating certain verrucae vulgaris. It is suggested that this process works by thermal inactivation of the wart virus, or the slowing up of its growth, and the permitting of the skin to rid itself of the infection.

The series of 15 patients, 9 of whom were cured, is not large enough to be statistically significant, nor is this report an attempt to recommend the hot-water treatment in place of other therapy. The method involves care in attaining the proper temperatures, to avoid blistering, and in discriminating between the degrees of discomfort to each patient. It provides a method for use on large warts, widespread small warts, verruca acuminata, and resistant or persistent warts that have withstood other types of therapy.

References

1. Crile, G., Jr.: Heat as adjunct to treatment of cancer; experimental studies. *Cleveland Clin. Quart.* 28: 75-89, 1961.
2. Henriques, F. C., Jr., and Moritz, A. R.: Studies of thermal injury; conduction of heat to and through skin and the temperatures attained therein; theoretical and experimental investigation. *Am. J. Path.* 23: 531-549, 1957.
3. Moritz, A. R., and Henriques, F. C., Jr.: Studies of thermal injury; relative importance of time and surface temperature in causation of cutaneous burns. *Am. J. Path.* 23: 695-720, 1947.

HOT-WATER TREATMENT FOR WARTS

4. Moritz, A. R.: Studies of thermal injury; pathology and pathogenesis of cutaneous burns; experimental study. *Am. J. Path.* 23: 915-941, 1947.
5. Williamson, C., and Scholtz, J. R.: Time-temperature-relationships in thermal blister formation. *J. Invest. Dermat.* 12: 41-47, 1949.
6. Thompson, R. L.: Influence of temperature upon proliferation of infectious fibroma and infectious myoxma viruses in vivo. *J. Infect. Dis.* 62: 307-312, 1938.
7. Boak, R. A.; Carpenter, C. M., and Warren, S. L.: Thermal inactivation time at 41.5° C. of 3 strains of herpes simplex virus. *J. Exper. Med.* 71: 169-173, 1940.
8. Mendelson, C. G., and Kligman, A. M.: Isolation of wart virus in tissue culture; successful reinoculation into humans. *Arch. Dermat.* 83: 559-562, 1961.
9. Templeton, H. J.: Long incubation period of warts. *Arch. Dermat. & Syph.* 32: 102-103, 1935.