Dermatologica *168*: suppl. 1, pp. 36–42 (1984)

0011–9075/84/1687–0036 $2.75/0

Solcoderm as a Tool for the Plastic Surgeon

The Treatment of Verrucae

(with 2 colour plates)

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Key Words. Verruca · Plastic surgery

Abstract. In 243 cases of verruca vulgaris, about 85% of the epidermal efflorescences caused by the wart virus were cured by two or more applications of Solcoderm in ambulant therapy. Of 127 cases of verruca plantaris treated, about 70% were cured after an initial course of four applications and 80% after further courses of treatment. More than 80% of recurrences responded to retreatment. A favorable effect on the pain caused by the plantaris warts was reported by 95% of the patients treated. No delayed complications were observed after the use of Solcoderm. The rate of incapacity for work after Solcoderm treatment, a total of 41 man-days, was extremely low when compared with that following cryosurgery and other surgical measures which, unlike Solcoderm therapy, often require immobilization, dressings or avoidance of soap and water.

Introduction

The treatment of verruca vulgaris and verruca plantaris is not primarily a task for the plastic surgeon. Nevertheless, plastic surgeons see many patients in consultation who were not successfully managed by the usual measures employed by dermatologists. The results are often far worse than merely an unsuccessful treatment. It is the consequences of previous inappropriate treatment of verrucae, basically a harmless viral condition, which lead patients to seek the help of the plastic surgeon. For instance, there are the disastrous results of radiation therapy (fig. 1 and 2), appearing years after irradiation of warts and no longer controllable by surgical measures; there are defects after cryotherapy (fig. 3 and 4) which need to be corrected by grafts; there are painful scars resulting from the surgical excision of warts that require plastic surgery. In contrast to the wart itself, which can disappear quite spontaneously, these scars remain, and the discomfort and disturbance arising from them are permanent. In the worst cases per-

sistent ulcers may develop secondary to local infection, especially in elderly patients with circulatory disorders such as the case illustrated in figure 5. In this instance the condition led to osteomyelitis which rendered the patient unfit for work for more than 2 years, all as the delayed consequence of a surgically treated wart!

Since such sequelae of treatment are not acceptable in the management of this disease, we became interested in the use of a new therapeutic principle which seemed promising and which yielded particularly good results in the treatment of condylomata acuminata. We have employed a product based on this principle, Solcoderm, as adjuvant therapy in a total of 127 selected cases of verruca plantaris over a period of 5 years. In almost all the lesions selected, previous treatment by other methods had proved unsuccessful. More than 200 cases of verruca vulgaris were also treated with this agent during this period. The lesions selected had large, confluent, multicentered wart beds where primary healing after surgical excision, i.e. without the use of free grafts or sliding flaps, would not have been possible, or where the location of the warts, for example in the area of the nail bed, made surgical excision possible only with a significant risk of permanent deformity of the nail (fig. 6).

Etiology and Pathogenesis of Verruca

Both verruca vulgaris and plantaris are caused by the wart virus *Motilor verrucae*. In areas near mucous membranes, especially in the genital region, this same virus is responsible for condylomata acuminata. The virus is dermotropic and measures about 50 µm. It is transmitted from individual to individual either directly or through contaminated material such as fabrics. The aggression of the virus varies widely with individual susceptibility. Spontaneous remission and healing does occur.

Diagnosis of Verruca

Thanks to their characteristic morphology, the diagnosis of verruca plantaris and verruca vulgaris presents little difficulty and can almost always be made by clinical inspection. Typical sites for verruca vulgaris are the hands and the area of the knees, where skin-colored nodules are seen with a verrucous-papillomatous surface and hard consistency, either isolated or in clusters. After slowly enlarging over a period of weeks or months, they tend to become static and secondary efflorescences do not appear, although inflammatory irritation and bleeding due to scratching are frequent. Warts occurring on the sole of the foot (verruca plantaris) are not papular, probably because of the thick horny layer and the constant pressure. Deep-seated efflorescences appear as yellowish dense keratoses (fig. 12). Multiple verrucae plantares are called mosaic warts.

Histology and Differential Diagnosis

The microscopic diagnosis of an epidermal tumor is characteristically made after its surgical excision. This basic reality is inconsistent with conservative therapy which practically precludes histological diagnosis, since the required process of biopsy is essentially as traumatic as surgical excision. Consequently, truly conservative therapy has to be based on clinical diagnosis. Fortunately, the diagnosis of verruca vulgaris and verruca plantaris can almost always be made with confidence without histology.

Conservative treatment with Solcoderm, in contrast to ordinary caustics, presents an opportunity for histologic confirmation of

diagnosis. The action of Solcoderm results in intravital fixation of the epidermal tumor. The lesion becomes mummified and demarcated in practically all cases, and histological diagnosis can often be made on this material, although with certain limitations. The typical histology of acanthosis, papillomatosis and hyperkeratosis is often evident in the demarkated material. When normally fixed and prepared, typical large vacuolized cells, with few keratohyaline granules in the upper stratum spinosum and in the stratum granulosum can be seen. In contrast to the normal pyknosis of this layer, the cell nuclei are large, round and markedly basophilic. They contain the virus, which is often difficult to detect in preparations fixed with vital stain.

The differential diagnosis of verruca should consider the possibility of tuberculosis cutis verrucosa and, in the case of plantar warts, corns and syphilis. It is easy to make these differential diagnoses retrospectively on the demarkated preparation if necessary, although errors on the basis of a careful clinical examination are rare.

Materials and Methods

The topical preparation employed, Solcoderm, was supplied by the manufacturer and is described elsewhere. Only warts which were *not* altered or inflamed as a result of scratching or other mechanical action, were selected for this study. Other criteria for exclusion were diabetes mellitus not controllable by dietary measures, circulatory disturbances evidenced by an abnormal peripheral arterial pulse, clinically apparent post-thrombotic syndrome and previous radiation therapy.

Treatment Procedure

Verruca vulgaris. At least two 5-min treatments 1 or 2 days apart were employed, basically without pretreatment. The substance was applied with a pointed wooden applicator, taking great care to avoid mechanical injury of a degree leading to bleeding. Outpatient follow-up examinations were made at weekly intervals. A single repeat application was given after 4 weeks, if necessary.

Verruca plantaris. After 1 week of preparation with salicylic acid plaster and removal of the hyperkeratotic tissue, Solcoderm was applied to the individual efflorescences with a pointed wooden applicator for approximately 10 min on each of 4 successive days. For the last treatment, a plastic applicator was also used in almost all cases. Outpatient examinations were conducted 4 weeks later, with further treatment (2–4 applications at 2-day intervals) if necessary.

Follow-up Treatment

All patients were instructed to dab on 70% alcohol locally twice a day. Dressings were never used. Patients were permitted to go about their normal activities unrestricted throughout the treatment and observation period. They were not ordered to avoid water. When the demarkated lesions were recovered by the patients and brought to the clinic as instructed, they were cut up and prepared for histological examination in the cryostat without additional fixation.

Results

Verruca vulgaris

Cure Rate in Verruca vulgaris. Of 243 cases of verruca vulgaris treated according to the procedure described above, the warts disappeared completely in 183 after the initial therapy. The other 60 cases were subjected to a second treatment after 4 weeks and 31 of these achieved a complete cure. 6 of the remaining 29 did not appear for a follow-up examination and in the other 23 cases (less than 10%), there was a local recurrence of the warts or a new growth of warts in the immediate vicinity of the treated efflorescence in spite of a second treatment.

Complications. In 6 of the 243 cases local redness or tenderness was observed, characteristic of local infection. These signs disap-

peared under treatment with povidone-iodine, after 19 days in the longest case. Purulent secretion or other evidence of more extensive infection, such as lymphangitis, did not occur, and surgical intervention or antibiotic therapy were never necessary. Patients from this group of 243 cases were certified as unfit for work for a total of only 41 days. Except for one child, in whom treatment had to be discontinued because of pain, all patients tolerated the treatment well without analgesics.

Verruca plantaris

History of Previous Treatment. Of 127 patients treated with Solcoderm, 93 had previously been treated by other methods as follows: cryosurgery (cold probe) with local anesthesia (42); cryosurgery (cold probe) without local anesthesia (9); freezing with ethyl chloride (6); freezing with liquid nitrogen, without local anesthesia (5); excochleation with a sharp spoon, with local anesthesia (8); long-term treatment with podophyllin solution (11); 5-fluorouracil (1), and unspecified ointments and corn plasters (11).

Cure Rate in Verruca plantaris. Of the 127 cases of verruca plantaris treated, the warts disappeared after the initial treatment in 69, after a second treatment in 18, and after a third course of treatment (3–5 applications at intervals of 1–2 days) in 16 additional subjects. Thus 103 of the 127 were eventually cured by Solcoderm treatment.

24 patients were considered therapeutic failures after 2 or 3 courses of therapy and received no further treatment.

Of the 93 patients previously treated by other means, 78 were free of any recurrence at follow-up examination 6 months or more after successful Solcoderm treatment. However, 11 of these required retreatment between 6 and 27 months after the first treatment. 4 were lost to follow-up after the prescribed period of 6 months and are therefore excluded from further assessment.

Complications. There were no noteworthy complaints in 46 patients. Some degree of pain for a maximum of 12 h was reported by 10 patients (8%), and some difficulty in walking for 2–5 days after treatment by 62 patients. However, difficulty in walking was a common complaint prior to treatment and was described as 'improved' by 118 patients immediately after treatment.

Discussion

Evaluation of the results described above is complicated by several factors. With the usually complete absence of scarring after Solcoderm, it is often extremely difficult or even impossible, in spite of photographic documentation, to detect whether the reappearance of a lesion is a local recurrence, dissemination of the virus to adjacent cell structures or the development of new efflorescences in the vicinity of the originally treated area. Recurrence, especially of *verruca plantaris*, may take a very long time, so that conclusions about definitive cure within a period of 6 months must be considered tentative.

Verruca vulgaris

At follow-up examination carried out not less than 4 weeks after completing treatment of verruca vulgaris, we saw no signs of the persistence or recurrence of warts in 183 of the 243 patients treated. None of these 183 patients required further treatment by us.

and we therefore consider them cured. In 37 cases with persistent or recurrent warts 4 or more weeks after treatment, a second course of Solcoderm treatment was applied. 25 of these patients were assessed as cured when examined after 4 or more weeks; 13 had reccurrences again at examination after 3–12 weeks, and a further 23 did not return for follow-up examination, so that no judgment of cure can be made. While these facts preclude calculation of a specific success rate, the data show success in at least 85% with a negligible complication rate of less than 2.5% consisting of minimal local infections. These figures indicate a good therapeutic result, particularly in view of the fact that the patients treated were almost exclusively confluent warts or warts in difficult locations, as exemplified by figures 6, 9, 10, 12. The characteristic location of warts in the nail bed, illustrated in figure 6, 7, represents a particular indication for Solcoderm, the action of which on the growing nail bed is shown in figures 7 and 8. The clearly visible coloration on the nail marks the extent of 5-months growth following treatment.

Verruca plantaris

The interpretation of the results in the treatment of *verruca plantaris* is particularly difficult because of the variety of previous treatments. Considering the unsatisfactory results and the very troublesome complications occurring after surgical treatment and almost all other types of therapy, the uncomplicated, confirmed cures obtained in 87 (69%) of this group of 127 patients represents per se a good result, even though many of these patients were not yet followed beyond 6 months.

In spite of the number of patients who were not followed-up long term, a high success rate is indicated by the results of the second and third treatments. The fact that there was no recurrence after 6 months of observation in 78 of the 93 Solcoderm-treated patients who were previously treated unsuccessfully elsewhere, indicates that lasting success may be expected in about 85% of the cases with repeated therapy. Taking into account the additional 34 cases who were free of warts for at least 3 months after a second or third treatment, a success rate of over 80% can be assumed. The essentially complete absence of complications and the painful nature of other treatments encourage us to recommend this approach as the primary treatment of verruca plantaris. The typical course of the treatment is shown in figures 12–14.

Figures 15 and 16 are graphic presentations of the results reported. At each time point the number of cases treated is represented by the white portions of the column and the healed efflorescences by the shaded portions. The portion within the dotted line represents the group which was not available for follow-up examination at the indicated time.

Adverse Effects

At Time of Application. Very different degrees of pain were reported during the application of Solcoderm. In general, local anesthesia was not used to avoid the risk of local dissemination. However, 5 cases of verruca plantaris did require regional anesthesia. All these cases had been treated previously and considerable horny calluses had developed. Nevertheless, they were less sensitive than at the time of previous salicylic acid therapy.

We were obliged to discontinue the treatment of verrucae vulgaris on the hand of a 7-year-old boy who would not tolerate the

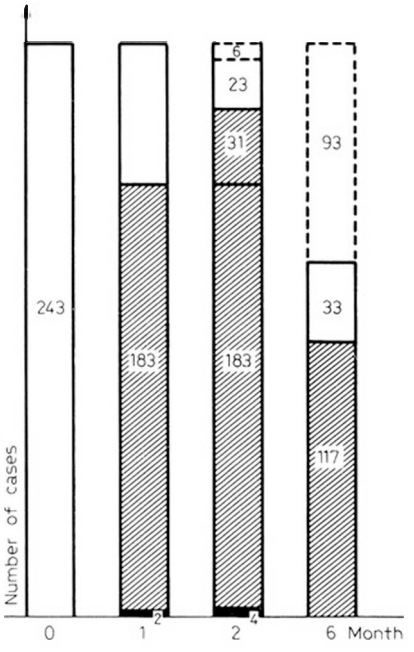

Fig. 15. Results of treatment of *verruca vulgaris* in 243 patients after one or more courses of treatment with Solcoderm as observed at monthly intervals. The numbers of cases with inflammation are shown in the lower field of each column. The dotted line portions at the top of the last two columns indicate patients who were not available for follow-up examination at these times. □ = Number of treated cases; ▨ = number of cured cases; ■ = infected cases.

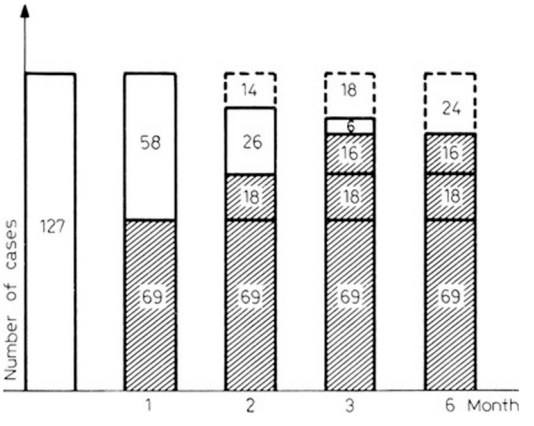

Fig. 16. Results in 127 *verruca plantaris* patients after one or more courses of treatment with Solcoderm as observed at monthly intervals. The dotted line portions at the top of the last 3 columns indicate patients who were not available for follow-up examination at these times. □ = Number of treated cases; ▨ = number of cured cases.

pain when the warts were pricked. This child also refused regional anesthesia.

Effect of the Treatment on Discomfort due to the Disease. There were no painful syndromes in verruca vulgaris patients before the start of treatment. In contrast, of 127 verruca plantaris patients, 124 complained of pain on walking and 29 also complained of pain at rest before the start of treatment. Improvement of their discomfort after treatment was reported in 118 patients. Only 3 of those patients who previously had pain felt no perceptible improvement. All 3 had previously been treated surgically, so that the prior operation rather than the wart may have been responsible for the pain.

Local inflammation due to the treatment, but without further consequences, was observed in 6 cases, all of which were treated successfully with local measures without sequelae. The few cases of local inflammation may be largely attributed to lack of immobilization and to washing with soap and water during the treatment period, since there were no inflammatory reactions

among patients who avoided contact with soap and water.

Incapacity for work, supported by a medical certificate, was reported for a total of 41 man-days, all in patients with verruca vulgaris on the hands. In the group with verruca plantaris a number of patients had days during which they were unfit for work, but not as a result of treatment. In fact the 4 patients who were unfit for work were already unfit prior to treatment and all were able to resume work within 1 week of treatment. Pain always improved after the first course of therapy. In none of the cases observed was there any painful cicatrization or cosmetically disfiguring scars which would have required surgical correction and consequent absence from work.

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