

Radiation Therapy for Chronic Vesicular Hand Dermatitis

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Background: Chronic vesicular hand dermatitis is a chronic disease that can be debilitating for patients, and many treatment options do not provide lasting remission.

Objective: We attempted to determine the efficacy of megavoltage irradiation in the treatment of this disease.

Methods: Between July 2001 and March 2005, 9 patients with severe chronic vesicular hand dermatitis had megavoltage radiation therapy to their sites of disease. Eight pairs of hands and seven pairs of feet were irradiated (15 total sites).

Results: All patients had an improvement in their disease during the course of radiation therapy. Patients were followed after radiation therapy for a median follow-up time of 20.2 months (range, 1 to 45 months). The disease completely resolved in 7 of the 15 (47%) sites irradiated. There was a decrease in the severity or frequency of flare-ups at the other 8 sites (53%).

Conclusion: Megavoltage radiation therapy may be effective in the treatment of chronic vesicular hand dermatitis and may provide durable remissions in some patients.

CHRONIC VESICULAR HAND DERMATITIS can be a debilitating and frustrating disease for both patients and clinicians. This disease has no known etiology and commonly affects patients between the ages of 20 and 40 years. It is characterized by vesicles on the palms of the hands or on the soles of the feet. There may be associated erythema, desquamation, fissuring, pruritus, pain, and skin tightness. Common therapies include topical steroids, other topical medications, oral steroids, methotrexate,¹ cyclosporine,² mycophenolate mofetil,³ and ultraviolet light.⁴ Patients typically cycle through several different topical and systemic medications and trials of ultraviolet light. Lasting remissions can be seen in some patients, but other cases are more difficult to control. This disease can be severe, can affect patients' quality of life, and may cause occupational disability.

For years, radiation in the form of grenz rays or superficial x-rays was used in the treatment of chronic vesicular hand dermatitis, with good results.⁵⁻¹⁸ Radiation therapy machines have improved, and machines that pro-

duce grenz rays or superficial x-rays are no longer commonly available. As a result, many clinicians do not use radiation to treat chronic vesicular hand dermatitis.

To date, there has only been one published report on the use of modern megavoltage radiation therapy machines in the treatment of chronic vesicular hand dermatitis.¹⁹ This case report showed that modern radiation therapy induced a complete remission in a 41-year-old woman with a 3-year history of dyshidrotic eczema.

Methods

This study was approved by the Institutional Review Board of Allina Hospitals and Clinics (United Hospital, St. Paul, MN). All patients signed an informed written consent prior to the initiation of radiation therapy.

Between July 2001 and March 2005, nine patients were referred to the Radiation Therapy Center at United Hospital in St. Paul, MN, for treatment of chronic vesicular dermatitis on their hands, feet, or both. All patients had disease that was refractory to conventional treatments. Two patients had their hands treated, one patient had their feet treated, and six patients had both their hands and feet treated. All patients were treated with megavoltage radiation.

Radiation Technique Used on the Hands

The patients stood at the side of a linear accelerator couch. One centimeter of bolus was placed on the couch, and the patients' hands, palms prone, were placed on top of the bolus. Another 1 cm of bolus was placed on top of the patients' hands. One patient had custom bolus placed

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between their fingers. The patients' hands were treated with an isocentric anterior-posterior and posterior-anterior technique with 6 MV photons. Field sizes ranged from 19×23 cm to 38×24.5 cm. The radiation dose was prescribed to the center of midplane between the two pieces of bolus. Radiation dose prescription depths ranged from 1.0 to 2.5 cm from the patients' skin surface (2.0 to 3.5 cm from the bolus).

Radiation Technique Used on the Feet

The patients lay on a linear accelerator couch in the supine position and reverse on the table. Their feet were placed in a water bath, and their knees were bent into a comfortable position. One centimeter of bolus was placed on the linear accelerator couch under the water bath. Their feet were treated with an isocentric right and left lateral technique with 6 MV photons. Field sizes ranged from 14×28 cm to 24×34 cm. The radiation dose was prescribed to the isocenter. Radiation dose prescription depths ranged from 10.5 to 12.5 cm.

Radiation Dose

Eight patients were treated with 1,200 cGy in 8 fractions, and 1 patient was treated with 900 cGy in 6 fractions. Patients were typically treated twice per week, either on Monday and Thursday or on Tuesday and Friday.

Results

A total of 15 sites were irradiated. Both hands are considered one site and both feet are considered one site. The right and left sides of all patients were irradiated. Eight pairs of hands and seven pairs of feet were irradiated. No patient had been previously treated with radiation therapy for their condition.

The median age of the patients was 37.7 years (range, 26–59 years). Seven patients were male, and 2 patients were female. The median duration of symptoms prior to the initiation of radiation therapy was 4.1 years (range, 8 months to 9 years).

All patients showed an improvement in their disease during the course of radiation therapy. This improvement was noted after 2 treatments (300 cGy) in 1 patient, after 3 treatments (450 cGy) in 3 patients, after 4 treatments (600 cGy) in 2 patients, after 5 treatments (750 cGy) in 1 patient, after 6 treatments (900 cGy) in 1 patient, and after 7 treatments (1,050 cGy) in 1 patient.

After radiation therapy, patients were observed by their dermatologists and their radiation oncologists. Within 1 month after the completion of radiation therapy, 11 sites

(73%) showed a complete resolution of symptoms. The other 4 sites (27%) had a great improvement in symptoms and signs as reported by the dermatologists and the patients. Patients were followed up for a median period of 20.2 months (range, 1–45 months). Seven sites (47%) remained completely resolved at last follow-up examination, and eight sites (53%) remained greatly improved (Table 1); the severity and frequency of flares were decreased at these eight sites.

Six sites have been observed for longer than 1 year. The median follow-up for these sites was 38.7 months (range, 32–45 months). The disease completely resolved in 4 of these 6 sites. Three patients were lost to long-term follow-up at the time of preparation of this manuscript. Two of these three patients did have a flare of their disease; however, the flares were judged by their dermatologists to be much less severe than their disease prior to radiation. The third patient remained free of disease at the last follow-up examination.

Discussion

Many clinicians use the terms "chronic vesicular hand dermatitis," "dyshidrotic eczema," and "pompholyx" interchangeably. We use the terms used by Warshaw and colleagues.¹⁸ They described chronic vesicular hand dermatitis as "chronic, pruritic vesicular and mostly palmar. . . The vesicles sit on an erythematous base. The eruption often stops at the wrist. . . The soles of the feet may also be involved." Pompholyx is characterized by recurrent crops of vesicles on the lateral aspects of the fingers, as well as the palms and soles, on a background of non-erythematous skin. Because of the thick epidermis of the palms and soles, blisters tend to become large prior to bursting. Dyshidrotic eczema is characterized by small vesicles that do not progress to bullae as is seen with pompholyx.

Radiation therapy machines produce a type of radiation called ionizing radiation. One of the first machines was called a grenz ray therapy machine. Radiation therapy machines have changed significantly over the past 50 years in an attempt to use them to treat diseases anywhere in the body. There has been a progression of higher-energy machines, including contact therapy machines, superficial therapy machines, orthovoltage therapy machines, supervoltage therapy machines, and the now-almost-ubiquitous megavoltage therapy machines. These higher energy machines have deeper penetration into tissue than older radiation therapy machines and ultraviolet light. Megavoltage radiation therapy machines also deposit their energy below the skin surface; this is called "skin sparing," and it allows

Table 1. Patients' Characteristics and Long-Term Results after Treatment with Megavoltage Radiation Therapy

<i>Patient No.</i>	<i>Age (yr)</i>	<i>Sex</i>	<i>Duration of Symptoms (mo)</i>	<i>Site</i>	<i>Length of Follow-Up (mo)</i>	<i>Long-Term Result</i>
1	59	F	48	Hands	45	Completely resolved
			48	Feet	45	Completely resolved
2	46	F	8	Hands	45	Greatly improved* (first flare-up 1 month after RT, but less severe)
3	42	M	60	Hands	33	Greatly improved* (first flare-up 2 months after RT; second flare-up 6 months after RT)
4	26	M	96	Hands	32	Completely resolved
		M	96	Feet	32	Completely resolved
5	27	M	72	Hands	12	Greatly improved* (first flare-up 1 month after RT [resolved spontaneously]; second flare-up 12 months after RT)
			72	Feet	12	Greatly improved* (first flare-up 1 month after RT [resolved spontaneously]; second flare-up 12 months after RT)
6	40	M	12	Hands	9	Greatly improved* (first flare up 5 months after RT)
			12	Feet	9	Greatly improved* (first flare-up 5 months after RT)
7	38	M	108	Feet	3	Greatly improved* (first flare-up 1 month after RT, but less severe)
8	28	M	24	Hands	2	Completely resolved
			24	Feet	2	Completely resolved
9	33	M	18	Hands	1	Completely resolved
			18	Feet	1	Greatly improved*

F = female; M = male; RT = radiation therapy.

*Patients whose disease "greatly improved" are those for whom the severity and frequency of flares-ups were decreased.

patients with deep-seated tumors to be treated without the development of a severe radiation-induced skin reaction. The bolus is a "tissue-equivalent" material placed on the skin surface; it allows radiation energy to be deposited on the skin surface to treat skin lesions or superficial tumors. A water bath has the same effect. With these techniques, the radiation energy deposited is relatively constant in regard to depth; there is very little gradient from the skin surface to far beyond the subcutaneous tissues. This is in contrast to the older radiation machines, which produce a larger gradient of radiation energy. Megavoltage radiation therapy machines can also treat with electrons. We believe our technique is superior to electron beam therapy because the radiation energy deposited from electrons can change significantly when used on the complex surfaces of the hands and feet.

We used modern megavoltage radiation therapy to treat 9 patients with chronic vesicular hand dermatitis. Our report evaluates the results of treating these 9 patients,

with variable follow-up. In the short term, all patients experienced improvement of their disease during the course of irradiation. This response appears to be lasting in some. In 4 of the 6 sites observed for longer than 1 year, there was a complete resolution of signs. We believe that megavoltage radiation therapy can be used successfully in the treatment of chronic vesicular hand dermatitis. Patients who are being treated for this disease may begin to develop toxicities from oral steroids, methotrexate, or cyclosporine. Radiation therapy can provide a "break" from these medications and may ultimately provide a lasting remission. In our experience, patients who did not achieve a durable response to radiation still had a reduction in the severity or frequency of relapses. Their disease was more easily controlled with topical medications than it was prior to radiation therapy.

As we gain experience using radiation to treat chronic vesicular hand dermatitis, we are trying to improve our irradiation technique. The purpose of using a bolus and a

water bath as described above was to ensure adequate radiation dose delivery to all the convexities of the skin of the hands and feet. In the treatment of hands, we initially placed bolus above and below the patients' hands. In a recently treated patient, we placed bolus between the fingers. At the time of the writing of this article, a new patient is undergoing radiation treatment for chronic vesicular hand dermatitis. We are treating this patient's hands with the use of a water bath. We believe this set-up may improve radiation dose homogeneity and may be easier for our radiation therapists and our patients.

The long-term side effects of this dose of radiation to the hands or feet are difficult to characterize. The literature describes the side effects that follow treatment of an extremity. These side effects include subcutaneous fibrosis, joint stiffness, and edema.²⁰ However, no report specifies treatment of the hands only or the feet only. Furthermore, the side effect profile for treatment of the extremities is based on patients who are treated for cancers, typically sarcomas. These patients are treated to higher doses of radiation (5000–7000 cGy) with larger treatment volumes. The radiation tolerances of the components of the hands and feet have all been reported. In particular, skin, mature cartilage, adult bone, arteries, veins, and lymphatics can all be safely irradiated with doses greater than 5,000 cGy.^{21,22} It is extremely unlikely that 1,200 cGy of radiation will have any negative impact on the hands or feet.

It is possible that exposure to ionizing radiation can cause a radiation-induced cancer. This has been reported as a risk following the treatment of other cancers. One of the largest experiences reported the incidence of a radiation-induced sarcoma after radiation therapy for breast cancer. Yap and colleagues evaluated over 250,000 breast cancer patients identified from the Surveillance, Epidemiology and End Results Cancer Incidence Public-Use Database.²³ They found that at 15 years, the cumulative incidence of the development of a sarcoma after radiation treatment for breast cancer was 0.32%. Again, these patients were treated to much higher doses of radiation with potentially larger treatment volumes. Furthermore, because these patients were treated for a cancer, they may have had a genetic predisposition toward carcinogenesis and may have been treated with other carcinogenic agents, namely, chemotherapy. It is clear that the risk of a radiation-induced cancer after 1,200 cGy of radiation is extremely low. However, this risk in our population of patients with benign dermatoses is ultimately unknown. Patients should also limit sun exposure; because of their disease process and its local therapies, they may be at a higher risk of developing skin cancer on their hands and feet.

While irradiation has proven to be effective in the treatment of chronic vesicular hand dermatitis, we are careful to recommend this treatment only for those patients for whom other treatments have failed. We are awaiting further experience in treating this disease with megavoltage radiation therapy. As with all treatments, patients should be counseled on potential long-term side effects. Further investigation is required to determine if some patients are actually cured of their disease after radiation therapy.

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