

A Case of Chronic Radiodermatitis with CML and Squamous Cell Carcinoma in Radiologist

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Chronic radiodermatitis may develop after repetitive exposure to small doses of ionizing radiation over an extensive period of time. Therefore, it is most likely to occur in people who work with ionizing radiation. The clinical symptoms of chronic radiodermatitis include atrophy, telangiectasia, sclerosis, pigmentary changes of the skin, ulceration and the development of malignancy. Cases of chronic radiodermatitis have occasionally been reported in physicians performing interventional procedures. Herein, we report a case of chronic radiodermatitis involving the 4th finger web and 5th finger of a radiologist, who suffered from chronic myelogenous leukemia shortly afterwards. The lesion on the 5th finger eventually progressed into squamous cell carcinoma.

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Key Words: Chronic myelogenous leukemia, Chronic radiodermatitis, Radiologist, Squamous cell carcinoma

INTRODUCTION

Chronic radiodermatitis is a disease that occurs after prolonged exposure (a few months to a few years) to repetitive doses of radiation¹. It is most likely to occur in people who work with ionizing radiation or in patients who undergo radiation therapy². The development of chronic radiodermatitis is directly related to the cumulative dosage of radiation in which 10-12 Gy is considered to be the threshold value³. Atrophy, hyper and hypopigmentation, telangiectasia, sclerosis, fibrosis, ulceration and the development of premalignant and malignant lesions are the characteristic features of chronic radiodermatitis⁵. Chronic radiodermatitis of

patients undergoing radiation therapy has frequently been reported in the past. With the recent increase in the development of radioactive interventional therapy and its common usage, reports of chronic radiodermatitis in health care workers (including doctors) who perform these treatments is increasing.

Herein, we report a case of chronic radiodermatitis in a radiologist who performed numerous fluoroscopic procedures over a 6-year period. The right 4th finger web and 5th finger were affected, of which squamous cell carcinoma eventually developed. The patient also suffered from chronic myelogenous leukemia (CML) shortly after being diagnosed with chronic radiodermatitis.

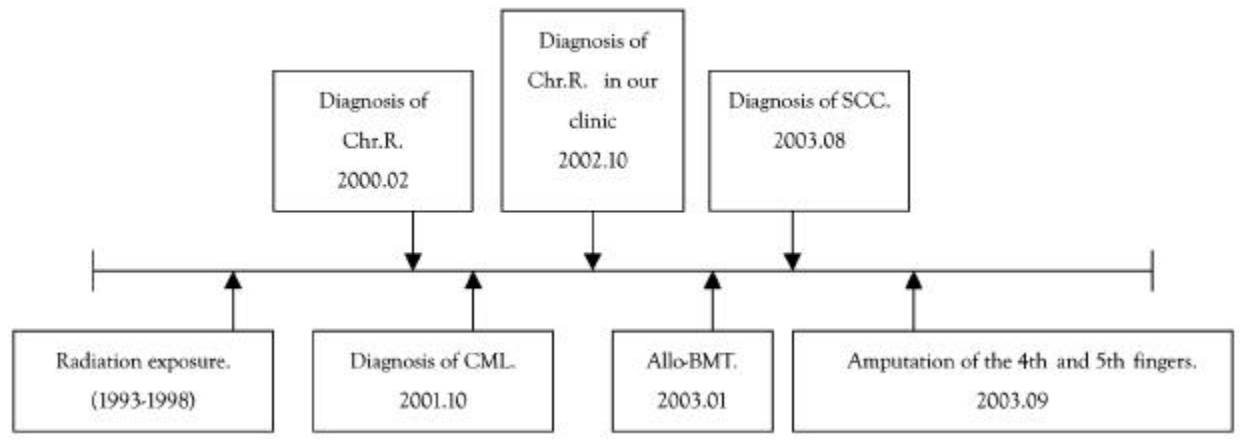
CASE REPORT

A 40-year-old man presented with painful, dark-brown, crusted papules and an erythematous patch on the right 4th finger web and 5th finger. The patient was a radiologist. He had been performing myelograms, which required fluoroscopic handling, 5 to 6 times a day, 5 days per week, for 6 years.

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Table 1. The periodic events in our patient

Chr.R.: Chronic radiodermatitis, CML: Chronic myeloid leukemia, SCC: Squamous cell carcinoma, BMT: Bone marrow transplant

The affected areas were continuously exposed to direct radiation, and surgical gloves had been the only means of protection during the procedure. The patient had been diagnosed with chronic radiodermatitis 2 years before visiting our clinic, with the initial findings of hyperpigmentation and hyperkeratosis of the right 5th finger. Despite treatment with liquid nitrogen at the local clinic, the lesion had gradually progressed, resulting in skin exfoliation and thick crusts on the finger. CML developed one year after diagnosis of chronic radiodermatitis. The condition was treated by chemotherapy, and a bone marrow transplantation was performed.

At the time of the patient's initial visit to our department, routine laboratory tests results were found to be normal, except for the slight elevation of liver enzyme levels (AST 41 U/l, ALT 38 U/l). Upon physical examination, other than the skin lesions of the right 4th finger web and 5th finger, no other abnormality was found.

On close examination, an erythematous and swollen finger with skin exfoliation and dark-brown, crusted papules was observed (Fig. 1). Malignancy was suspected in the area beneath the thick crust, and for a definite diagnosis, a biopsy was performed on the crusted papule and the perilesional skin. Histologically, hyperkeratosis, dyskeratosis and acanthosis were observed, but atypical cells were not found. In the dermis, vessel dilatation and fibrosis was significant (Fig. 2).

From the following clinical and histological characteristics, we supposed that the lesion represented

findings of chronic radiodermatitis without any malignant transformation. Therefore, conservative care with regular follow-up was recommended. After 1 year, we performed a second biopsy on a newly-developed, black-crust papule with diffuse thickening (Fig. 3). It had also developed on the 5th finger, but was located more distantly than the previous lesions. The previous thick-crust papules had all disappeared, but the skin of the distal finger had thickened and was arranged in a pastry-like fashion. The crusted papule was persistently painful and had a tendency to bleed. From the tissue sample, a histological diagnosis of squamous cell carcinoma was made (Fig. 4). The patient was promptly transferred to the department of orthopedic surgery, where amputation of both the 4th and 5th fingers was performed. After amputation, regular follow-up was made. No sign of recurrence or metastasis have been observed to date.

DISCUSSION

Extensive exposure to repetitive small doses of radiation can lead to chronic radiodermatitis. After a latent phase, dilatation of the vessels, atrophy and sclerosis of the skin, hypo and hyperpigmentation, freckle and partial or complete destruction of the glands can occur. Persistent ulceration, pre-malignant hyperkeratosis and malignant changes such as squamous cell carcinoma and basal cell carcinoma develop in the atrophic skin^{1,3}. The histological



Fig. 1. Painful, dark brown-colored, crusted papules with desquamation over an erythematous and swollen 5th finger.



Fig. 3. A new, black-crusted papule with a tendency to bleeding on the right 5th finger. Note that its location is more distal compared to the previous papules. The surrounding skin is arranged in pastry-like layers.

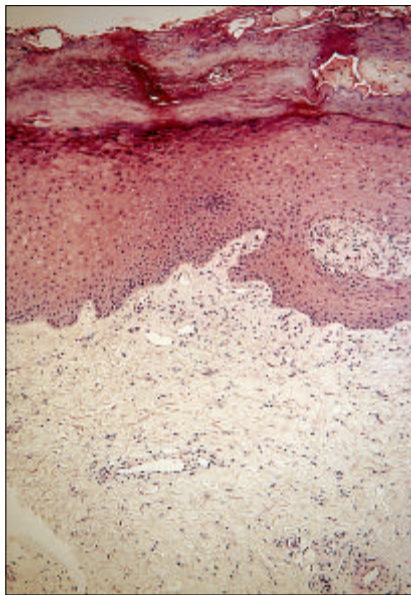


Fig. 2. The histopathologic examination revealed hyperkeratosis, parakeratosis and acanthosis with a serum crust in the epidermis and telangiectasia, fibrosis and mild inflammatory cell infiltrates in the dermis. Neither atypical cells, nor the loss of polarity is seen in the epidermis (H & E, $\times 100$).

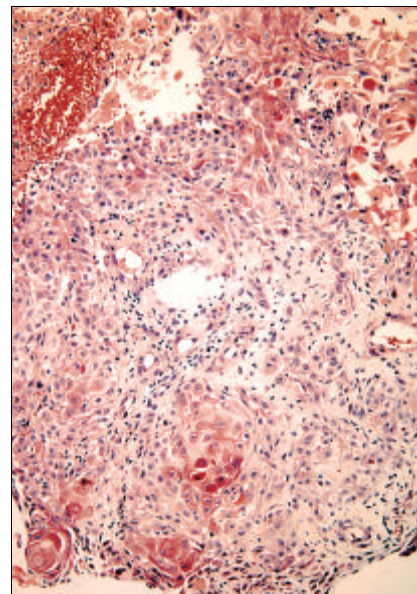


Fig. 4. An irregular tumor mass with atypical cells and variable keratinization is observed (H & E, $\times 100$).

changes observed in chronic radiodermatitis are known to be dependent on the cumulative radiation dosage⁶.

With the development of new radioactive interventional techniques and their popular usage, the FDA has warned patients undergoing such treat-

ments of possible cutaneous complications that may ensue, of which many case reports have been made⁷.

Chronic radiodermatitis is problematic to patients who are exposed to radiation during therapy, but also to healthcare workers who are equally exposed to the radiation source while administering treatment. An increasing number of case reports have been made concerning chronic radiodermatitis in health care workers. The cumulative radiation dosage of

healthcare workers is measured indirectly by wearing a film badge, thermoluminescent dosimeter or ionizing chamber⁸. The film badge, the most commonly used device at present, is convenient. But difficulty in interpretation and low compliance in wearing the badge can lead to unreliable data⁹. In our case, due to the repetitive exposure of the fingers to the radiation source, it was expected that there would be a higher accumulative dosage at the site, compared to the values recorded on the badge, which was located far away from the fingers.

The threshold value of the accumulative dosage of radiation, which causes chronic radiodermatitis, is 10-12 Gy³. During a single fluoroscopic procedure, one is exposed to 0.02-0.05 Gy of radiation per minute¹. The patient in this case was a radiologist who was a specialist in such radioactive intervention. He mainly performed the myelography, a fluoroscopic procedure, which is relatively simple and less time-consuming. The amount of radiation exposure after a single myelography treatment is small, but repetitive exposure to such radiation for 6 years is considered to be more than enough to produce an accumulative dosage of over 10-12 Gy. Neglect of proper protection may have played a minor role too. The low titer of radiation observed on the badge was thought to be the cause of neglect.

Chronic radiodermatitis of healthcare workers (including doctors), most commonly involves the dorsum of the hand and fingers. The lesion is a painful ulcer and superficial squamous cell carcinoma is frequently associated⁵. Either the left or a right hand may be involved, depending on the procedure¹⁰. In our case, chronic radiodermatitis occurred on the right 4th finger web and 5th finger, which was probably related to this hand's frequent usage and the resultant high exposure to radiation during myelography.

The somatic cells and germ cells are affected by exposure to radiation. Effects on somatic cells are caused by direct exposure to radiation. All dosages (even if not lethal) are known to affect the cell. The risk of cancer is dependent on the degree of exposure to radiation. Leukemia and lymphoma are malignancies, which occur after exposure to the lowest dosage, and are followed by cancers such as skin or lung cancer¹¹.

Two years before his initial visit to our department, the patient was diagnosed as having chronic radiodermatitis. The patient also suffered from CML,

which developed a year later. At the time of his visit to our department, only chronic radiodermatitis existed, but during follow-up, squamous cell carcinoma developed from the site of chronic radiodermatitis. Emergence of chronic radiodermatitis, CML and squamous cell carcinoma in a linear fashion is consistent with the effect of radiation on somatic cells. The risk of squamous cell carcinoma is increased in BMT patients^{12,13}, but since SCC developed from the exact sites where chronic radiodermatitis persisted, it is likely that SCC is a result of chronic radiation exposure in our patient.

The neglect of proper protection by health care workers when administering interventional procedures requires correction. Most of the healthcare workers (including doctors) wear a lead apron and a thyroid shield during intervention, but due to lack of information and inconvenience, fail to wear lead gloves¹⁰. Since chronic radiodermatitis can occur after repeated exposure to low dose radiation, we need to pay more attention to the protective clothing, even when administering a minor intervention. With regards to the hands, flexible lead gloves are strongly recommended¹⁰.

In our case, chronic radiodermatitis of the right 4th finger web and 5th finger occurred in an interventional radiologist after repetitive exposure to low dose radiation. We consider this a rare case of chronic radiodermatitis with subsequent development of CML and squamous cell carcinoma. We herein report this case to emphasize the importance of protective clothing, care and awareness needed by healthcare workers involved in radioactive intervention.

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