

# CLINICAL AND PATHOLOGICAL CHARACTERISTICS OF BASAL CELL CARCINOMA ARISING FROM CHRONIC RADIATION DERMATITIS

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**Abstract-** Clinical and histopathological features of basal cell carcinoma (BCC) may differ according to the type of carcinogen involved. BCC arising from radiotherapy treatment has high incidence and its clinical and histopathological features may be different from BCCs caused by other carcinogens. The aim of our study was to investigate any possible association between specific histopathological or clinical features and chronic radiation dermatitis as the cause of BCC. In this study, 87 patients with previous history of radiotherapy on the site of BCC (exposed) were selected as group A and matched with 87 other patients with BCC without such a history as group B (unexposed). The two groups were compared based on certain clinical features such as size, number and location of the tumors and also based on the histopathological features. In the exposed group, the most frequent histopathological type was pigmented solid type (73.5%), while in the unexposed group solid type (66.7%) was the most frequent feature. Multiple tumors were found in 86.2% of the exposed patients, while just 12.6% of the unexposed patients had multiple tumors. In the unexposed group, the face was the most frequent location (94.3%) and the mean size was 1 cm in diameter, while in the exposed group the most frequent location was the scalp and the mean size was 0.5 cm. BCCs arising on a background of radiation dermatitis are usually of pigmented solid type, multiple, smaller in size and normally are seen on the areas exposed to X-ray therapy.

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**Key words:** Radiation dermatitis, basal cell carcinoma, pigmented basal cell carcinoma, tinea capitis, superficial radiotherapy

## INTRODUCTION

Basal cell carcinoma (BCC) is the most common malignant neoplasm of the skin (1-6). The clinical and pathological characteristics of BCC are numerous (2, 7). The etiology and pathogenesis of this disease are also varied and include radiotherapy, ultraviolet radiation, arsenic exposure and nevoid BCC syndrome (8-10). However, little is known about

the possible association between the clinical and histopathological characteristics of this tumor and the possible pathogenesis of BCC.

Several studies have reported the development of BCC in patients with chronic radiation dermatitis (CRD) (11, 12). In our experience, CRD is common in Iran (unpublished data), because tinea capitis used to be a very common health problem in the era in which out of date, presently abandoned, treatment mode of superficial radiotherapy was used. This provided the ground for us to undertake this study to examine and compare the incidence of certain clinical and pathologic characteristics of BCC arising on the background of CRD with those caused by other carcinogens.

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## MATERIALS AND METHODS

The present study was conducted in a university hospital, one of the biggest referral dermatology centers in Iran. A total of 87 patients with previous history of radiotherapy on the site of BCC (exposed) were selected as group A and matched with 87 other patients with BCC from other causes as group B (unexposed). None of the patients in group A had been exposed to other known environmental carcinogens (except normal life UV), taken immunosuppressive drugs, undergone PUVA therapy or had HIV. Care was taken to match the two groups based on age, gender and skin type so that the only difference between the two groups was the history of radiotherapy. All the patients had histopathological confirmation of the diagnosis of BCC. The patients' medical records were reviewed and updated to contain information regarding age, gender, and skin phototype, skin signs associated with chronic sun damage, previous radiotherapy, histopathological types of BCC, and the number of tumors, radiodermatitis, and the site of the tumors.

The incidence of each feature was compared across the two groups using Chi square and Fisher's exact test through SPSS software. The value for significance was  $P < 0.05$ .

## RESULTS

The age of patients ranged from 29 to 80 years in the unexposed group (mean, 59.01; SD, 12.01), and from 40 to 78 years in the exposed group (mean, 56.03; SD, 8.28). In the unexposed group, 51 (58.6%) were male and 36 (41.4%) were female. In the exposed group, 69 (79.3%) were male and 18 (20.7%) female.

The comparison between the two groups according to the eight histopathological types is shown in table 1. As table 1 indicates the pigmented solid type BCC had the highest frequency among the exposed group and the solid type had the highest frequency among the unexposed subjects. This finding was statistically significant ( $P < 0.001$ ; odds ratio, 37.6; 95% confidence interval, 14.4-97.8). The other subtypes of BCC had nearly the same distribution in both groups.

**Table 1.** The frequency of histopathological types of BCC in exposed and unexposed groups\*

Histopathological type	Unexposed	Exposed
Pigmented solid	6 (6.9%)	64 (73.5%)
Solid	58 (66.7%)	6 (6.9%)
Adenoid	3 (3.4%)	5 (5.7%)
Sclerotic	13 (14.9%)	4 (4.6%)
Superficial spreading	2 (2.3%)	3 (3.4%)
Mixed adenoid and solid	1 (1.1%)	3 (3.4%)
Pigmented solid and adenoid	3 (3.4%)	2 (2.2%)
Metatypical	1 (1.1%)	0

Abbreviation: BCC, basal cell carcinoma.

\*Data are given as number (percent).

The comparison between the two groups according to the site of the tumors is shown in table 2. As table 2 indicates the frequency of the tumors on the scalp is significantly higher in the exposed group, while in the unexposed group the frequency of the tumors is significantly higher on the face.

A comparison was also made between the number and size of tumors in each group. A total of 86.2% in the exposed and 12.6% in the unexposed groups had multiple tumors, indicating that the incidence of multiple tumors was significantly higher in the exposed subjects (Chi square, 91.25;  $P$  value  $< 0.001$ ).

The mean size of the tumors was half a centimeter and one centimeter among the exposed and unexposed groups, respectively (S.D of 0.1 and 0.12, respectively) with a range of 0.3-0.6 centimeter for the exposed and 0.5-1.1 centimeter for the unexposed groups. For patients with multiple tumors, the overall average size was taken into consideration.

**Table 2.** The frequency of the tumors according to the site in exposed and unexposed groups\*

Site	Unexposed	Exposed
Scalp	2 (2.3%)	87 (100%)
Hand	1 (1.1%)	0
Trunk	2 (2.3%)	0
Face	82 (94.3%)	13 (14.9%)

\* Data are given as number of patients, not tumors.

## DISCUSSION

The results of the study indicated that there were considerable associations between the pathogenesis of BCCs and certain features such as histopathological types and number, and size of tumors.

The scalp was more frequently affected by the tumors among the exposed patients, suggesting the radiological effect of previous exposure. The fact that the face was more frequently affected by the tumors among the unexposed patients suggests that other carcinogens affect the face more than other places. All the patients who were in the exposed group had undergone radiotherapy treatment of the scalp for their childhood tinea capitis, which had a very high incidence in Iran until 50 years ago, the time at which griseofulvin was not available yet. Radiation appears to act as a complete carcinogen, an initiator and a tumor converter (7).

The smaller size of the tumors among the exposed group can be attributed to a slower rate of growth, although because of their possible previous BCCs, they may have been put under special dermatologic care and their next BCCs detected earlier in a smaller size.

The low frequency of solid pigmented type among the unexposed group is in accordance with other studies (8-10). However the significant higher frequency of solid pigmented type among the exposed group can be defined as the complications of exposure to radiology treatment, and this is the most important finding in this study. As we know this histopathology type does not belong to the aggressive category BCCs. Squamous cell carcinomas (SCCs) arising on a site of previous radiotherapy have been considered to be more aggressive (1), however, the results of this study suggest that the reverse may be true for BCC; we observed much less cases of aggressive subtypes of BCC in the X-ray exposed group. Perhaps this finding could be explained on the basis of genetic heterogeneity of the individual tumors and the fact that they (SCC and BCC) are essentially different in basic properties such as metastasis and degree and incidence of anaplasia. Another explanation could be made regarding their difference in the

vulnerability of the genes to X-ray that is the mutation caused in SCC is more profound than in BCC. Finally, perhaps it would be more convenient to leave it to tumor biologists to explain the reason more definitely.

Further studies are recommended to compare the course and progression of BCC in two groups with and without radiodermatitis and also to compare radiation-induced SCC to radiation-induced BCCs.

### Conflicts of Interests

We have no conflicts of interest.

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