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ORIGINAL RESEARCH

Smoking influences the Occurrence of Radiodermatitis in Head and Neck-irradiated Patients

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ABSTRACT

Introduction: This study aimed to evaluate the occurrence of radiodermatitis in patients undergoing radiotherapy in the head and neck.

Materials and methods: Thirty-eight patients were evaluated 6 months after the end of radiotherapy to treat cancer in the head and neck region. The radiodermatitis was clinically classified as absent, acute, or chronic. Data, such as age, sex, race/color, drinking and smoking habits, number of radiotherapy sessions, and conduction of adjuvant chemotherapy were also obtained. Fisher's exact test and Pearson's test were used to analyze the correlation of the independent variables and the presence of radiodermatitis.

Results: The mean age of the patients was 59.71 (± 10.67), and 29 (76.3%) were men, 24 (63.2%) were non-white race/color, 28 (63.7%) were alcohol consumers, and 33 (86.8%) were smokers. The average number of radiotherapy sessions was 37.26 (± 7.66); 30 (78.9%) patients underwent chemotherapy; and 26 (68.4%) had chronic radiodermatitis. The only variable statistically related to the occurrence of radiodermatitis in the patients was smoking.

Conclusion: Radiodermatite was quite prevalent among the studied patients and was directly related to the smoking habit.

Keywords: Head and neck neoplasms, Radiodermatitis, Radiotherapy, Smoking.

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INTRODUCTION

Radiation therapy is currently the main treatment modality for malignant neoplasms of the head and neck. It is considered the first choice in their treatment, performed exclusively or in combination with surgery and chemotherapy.[1-3] However, despite increasing patient survival, such therapeutic measures are related to severe side effects.[4-6]

Living tissues are usually able to repair themselves when attacked, but when repeatedly irradiated, the tissue repair capacity is affected.[7] One effect of the repeated irradiation is the radiodermitis or radiodermatitis, a high incidence reaction characterized by skin lesions similar to superficial burns that may ulcerate and develop local infections.[8] These lesions tend to be quite painful, to limit the movements depending on the affected area[9] and to decrease the quality of life of patients.[10]

In its acute form, radiodermatitis occurs during the radiotherapy treatment, and initially presents itself with mild erythema, dryness, hair removal, and in more severe cases, swelling of the skin followed by dry and moist desquamation. When these skin reactions occur months after irradiation, they are considered as chronic radiodermatitis, and displays signs of hyperpigmentation, lack of collagen, connective tissue weakness, telangiectasia, or fibrosis.[11,12]

The severity of these lesions is related to treatment and patient characteristics. Factors related to treatment include the dose per session and total administered dose, the volume of treated tissue, type of radiation, and concomitant chemotherapy. The patient-related factors are smoking, age, and wound infection.[13]

Due to the lack of studies that analyze the radiodermatitis in the head and neck region, this study aimed to evaluate the occurrence of this alteration in a group of patients that underwent radiotherapy in the head and neck.

MATERIALS AND METHODS

This study was conducted in the Mato Grosso Cancer Hospital, Cuiabá, MT, Brazil. From the patients that underwent radiation therapy for cancer treatment in the head and neck, those whose treatment was completed within 6 months were selected. The patients were

informed about the study and invited to sign the Term of Informed Consent. Then, they underwent a brief anamnesis involving questions about their age, sex, race/color of skin, drinking, and smoking habits. Other data as use of adjuvant chemotherapy and radiotherapy, number of sessions were obtained from the patient hospital record.

Patients also underwent clinical examination to assess the presence of radiodermatitis lesions. Radiodermatitis was clinically classified according to previously established criteria in absent acute radiodermatitis, characterized by initial erythema, progressive edema, hyperpigmentation, wet and dry desquamation and ulceration, and chronic radiodermatitis, characterized by ischemia, pigmentary changes, thickening, telangiectasia, ulceration, and fibrosis.[13]

Descriptive and inferential statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 20.0. Fisher's exact test was used to analyze the independent variables gender, race/color of skin, drinking and smoking habits, adjuvant chemotherapy, and the occurrence of radiodermatitis. Pearson correlation test was used to analyze the correlation between age, radiotherapy sessions, and the occurrence of radiodermatitis. Statistical significance of 5% was assumed for all analyses.

This study was approved by the Research Ethics Committee of the University of Cuiabá (UNIC), Cuiabá, MT, Brazil, by the protocol #378,314.

RESULTS

The study population consisted of 38 patients with a mean age of 59.71 years (± 10.67) and the average number of radiotherapy sessions per patient was 37.26 (± 7.66). Data regarding sex, race/color of skin, drinking and smoking habits, and adjuvant chemotherapy are shown in Table 1.

Among the 38 patients, 26 (68.4%) had dermatitis, all of them chronic. The analysis of the association of radiodermatitis with the other variables is presented in Table 2.

Radiodermatitis was associated with smoking habit among the irradiated patients (p = 0.027). There was no statistically significant correlation between the occurrence of radiodermatitis and the number of sessions of radiotherapy (p = 0.129) and age of patients (p = 0.057). However, for age, the value found was close to statistical significance.

DISCUSSION

Radiodermatitis is a common reaction in individuals who undergo radiotherapy. Its development and severity have been strongly associated with intrinsic and extrinsic factors.[14] However, there are few studies that have examined the occurrence of radiodermatitis in the head and neck region and have sought to analyze its correlation with treatment and patients variables.

Although this is not a study of prevalence and the population has been selected for convenience among patients undergoing radiotherapy at the institution, age (59.60 years ± 10.35) and sex (76.3% male) of patients are similar to other studies that encompassed patients with tumors in the head and neck.[15-17]

Radiodermatitis was present in 68.4% of patients 6 months after completion of radiotherapy treatment in this study, i.e., two out of three patients. All lesions were of chronic type, as established by Harper et al.[13] The number of patients with radiodermatitis was higher than that found by Cardoso et al study,[18] which

Table 1: Distribution of patients according to sex, race/color of skin, drinking and smoking habits and adjuvant chemotherapy

Variable	*n*	*(%)*
Sex		
Female	9	(23.7)
Male	29	(76.3)
Race/color of skin		
White	14	(36.8)
Non-white	24	(63.2)
Drinking habit		
Yes	28	(73.7)
No	10	(26.3)
Smoking habit		
Yes	33	(86.8)
No	5	(13.2)
Adjuvant chemotherapy*		
Yes	30	(78.9)
No	7	(18.4)

* One patient did not have information about chemotherapy

Table 2: Analysis of the association between radiodermatitis and race/color of skin, drinking and smoking habits and adjuvant chemotherapy

	Radiodermatitis				
	Absent		*Present*		*p-value*
Variable	*n*	*(%)*	*n*	*(%)*	
Sex					0.599
Female	3	(33.3)	6	(66.7)	
Male	9	(31.0)	20	(69.0)	
Race/color of skin					0.472
White	5	(35.7)	9	(64.3)	
Non-white	7	(29.2)	17	(70.8)	
Drinking habit					0.385
Yes	8	(28.6)	20	(71.4)	
No	4	(40.0)	6	(60.0)	
Smoking habit					0.027*
Yes	8	(24.2)	25	(75.8)	
No	4	(80.0)	1	(20.0)	
Adjuvant chemotherapy					0.136
Yes	8	(26.7)	22	(73.3)	
No	4	(57.1)	3	(42.9)	

also analyzed patients 6 months after the end of radiotherapy in head and neck and found radiodermatitis in 25% of those.

Although individuals with light-colored skin have increased risk for the development of radiodermatitis,[11] in this study there was no statistical difference in the occurrence of the lesion between individuals of white and non-white race/color of skin.

No study was found to assess the relationship between alcohol consumption and the incidence of radiodermatitis and in this work, the relationship was not established.

Yet for smoking, the habit has been associated with the occurrence of radiodermatitis before,[19,20] which was confirmed in this study. Chronic exposure to tobacco smoke causes changes in the physiology of many organ systems, including the skin. These changes can lead to harmful responses after different interventions.[21] Smoking has been identified previously as a serious risk factor for skin reaction in patients undergoing radiotherapy for breast cancer.[20] The longer the smoking habit, the higher and more severe will be the skin reactions; and the concomitant application of radiotherapy makes the habit even more harmful for the skin.[19]

It is important to highlight the high number of smokers found in this study population (86.8%). This fact is not surprising though, since smoking is related to the occurrence of cancers in the head and neck.[16]

The use of chemotherapeutic agents increased the risk of development of radiodermatitis and enhanced the severity of the lesions in a previous study that also evaluated patients under radiotherapy in the head and neck.[22] In the present study, 78.9% of patients received chemotherapy in combination with radiation therapy. However, no association was found between the use of concomitant chemotherapy and the higher incidence of radiodermatitis among patients.

Although the patients' age was not associated with the occurrence of radiodermatitis in this study, the value found was very close to statistical significance. The relation of aging and skin alterations can be explained as the elderly go through a decrease in the production of collagen and fibroblasts, thereby hindering the healing of the skin lesions.[23,24]

Different agents have been indicated for the prevention and treatment of skin lesions induced by radiation;[8,14] there is, however, still no robust scientific evidence that points to one specific intervention.[25] Thus, radiodermatitis remains an adverse effect of the oncological treatment of high incidence,[8] which requires further studies for its understanding and the establishment of strategies for tis prevention and treatment.[25]

In addition to the known relationship between smoking and the incidence of different types of cancer, this study demonstrates the pernicious role of this habit also in the occurrence of radiodermatitis, a major adverse effect of antineoplastic therapy that impacts on patient's quality of life.[13,15,16,20]

CONCLUSION

Two-thirds of the study patients had chronic radiodermatitis after 6 months of completion of radiotherapy for cancer treatment in the head and neck region. Smoking was associated with the occurrence of radiodermatitis in this group.

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