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# A clinico-epidemiological study on radiation induced dermatitis of head and neck malignancy patients at a teritiary care centre in south India

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ABSTRACT

**Introduction:** Radiotherapy is an important modality of treatment for head and neck malignancies. Radiation dermatitis is the most common adverse effect following radiotherapy.
**Materials and Methods:** A clinico-epidemiological study where in 84 subjects who were receiving radiation therapy for head and neck malignancy were included in the study. Clinico – epidemiological parameters were noted. Radiation dermatitis was graded using RTOG criteria.
**Results:** Eighty four patients were included in the study. The most common age group involved were in the range of 41-50 years. Males (69.05%) outnumbered females (30.95%). Carcinoma tongue (35.7%) was the most common malignancy observed. Past history of atopy and other skin diseases were found to increase the risk of radiation dermatitis.
**Conclusion:** Radiation dermatitis was more severe with patients with other contributing risk factors and other co-morbidities.



## 1. Introduction

Radiation therapy is the most common treatment modality used in the management of head and neck malignancies. Radiation dermatitis (RD) is the most common complication observed after radiation therapy. Radiation dermatitis can be defined as an adverse effect of radiotherapy which can manifest as acute erythema and desquamation, or as chronic effects including skin atrophy, telangiectasias and fibrosis. The skin is a continuously dividing organ, basal keratinocytes and melanocytes are radiosensitive. Exposure to radiation affects the cell cycle, and interferes with division. Repeated radiation exposure causes decreased time for the cell repair and increased cell injury. [1–3]

Each additional exposure leads to recruitment of inflammatory cells and direct tissue injury, wound healing is impaired by inhibition of formation of granulation tissue, fibrogenesis and angiogenesis. [4]

Radiation dermatitis can be classified into acute and chronic RD based on duration and type of clinical presentation. Acute RD usually manifests within hours to weeks and includes erythema, edema, pigment changes, epilation and dry or moist desquamation. (Table 1)

**Table 1:** Acute skin changes with localized radiation dose. [5,6]

| Acute skin effect | Radiation dose(Gy) | Onset |
|---|---|---|
| Early transient erythema | 2 | Hours |
| Faint erythema, epilation | 6-10 | 7-10 days |
| Definite erythema, hyperpigmentation | 12-20 | 2-3 weeks |
| Dry desquamation | 20-25 | 3-4 weeks |
| Moist desquamation | 30-40 | ≥ 4 weeks |
| Ulceration | >40 | ≥6 weeks |

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Chronic RD typically presents months to years after exposure. It is characterized by dermal fibrosis, poikilodermatous skin changes including both hyper and hypopigmentation, atrophy and telangiectasias. (Table 2)

**Table 2:** Chronic skin changes with localized radiation dose [7]

| Late skin effect | Radiation dose (Gy) | Onset |
|---|---|---|
| Delayed ulceration | >45 | Weeks after radiation |
| Dermal necrosis/atrophy | >45 | Months after radiation |
| Fibrosis | >45 | 6 months to ≥1 year after radiation |
| Telangiectasia | >45 | 6 months to≥ 1 year after radiation |

There are different classification systems used for grading RD such as Radiation Therapy Oncology Group (RTOG) criteria, National Cancer Institute Common Toxicity Criteria Adverse Event (NCI CTCAE) criteria and Radiation dermatitis severity score [8,9]

**Table 3:** Risk factors for acute Radiation dermatitis [10]

| Extrinsic factors | Patient related factors | other |
|---|---|---|
| Total radiation dose | Advanced age | Radiosensitivity disorders |
| Site of malignancy | Female sex | Drugs |
| Type of radiation used | Obesity | |
| Concurrent chemotherapy | Smoking | |
| | Nutritional status | |
| | Co-morbidities | |
| | Atopy | |

The present study aimed to study the clinico – epidemiological parameters affecting the severity of radiation dermatitis.

## 2. Materials and Methods

This was a hospital based observational study where in 84 patients who were receiving radiation therapy for head and neck malignancy attending department of radiotherapy, Father Muller Medical College, mangalore, Karnataka were included in the study. Institutional ethical clearance was obtained. All the patients developed radiation dermatitis.

Radiation dermatitis was graded by using RTOG criteria (Table 4) (Figure 1)

Erythema is defined as inflammatory reaction characterized by reddish skin that may be edematous. Dry desquamation is defined as an inflammatory reaction to radiation characterized by dry flaky skin and pruritus. Moist desquamation is defined as an inflammatory reaction characterized by serous discharge and occurs most likely in the region of friction. [11]

**Table 4:** RTOG Criteria

| Score | clinical description |
|---|---|
| 0 | No change over baseline |
| 1 | Erythema, dry desquamation, epilation |
| 2 | Bright erythema, moist desquamation, edema |
| 3 | Confluent moist desquamation, edema |
| 4 | Ulceration, hemorrhage , necrosis |

**Fig. 1:** Grade 1 RD

Data was analyzed for statistical significance using Chi-square and paired t–test for categorical variables. Results were expressed in mean, median, frequency and standard deviation.

## 3. Results

A total number of 84 patients who were receiving radiotherapy for head and neck malignancy attending radiation oncology department from November 2016 to March 2018 who developed radiation dermatitis were included.

Age of the patients ranged between 29-80 years. Most of the patients were in between the age group of 41-50 years and the mean age was 52±6.2 years. (Table 5)

Fifty eight patients were males (69.05%) and twenty six were females (30.95%). (Table 6)

Males: Females=2.23: 1.

**Table 5:** Age distribution

| Age in years | Number of patients | Percentage (%) |
|---|---|---|
| <30 | 1 | 1.2 |
| 31-40 | 16 | 19 |
| 41-50 | 27 | 32.1 |
| 51-60 | 25 | 29.8 |
| 61-70 | 12 | 14.3 |
| 71-80 | 3 | 3.6 |
| Total | 84 | 100 |

**Table 6:** Sex distribution

| Sex | Number of patients | Percentage(%) |
|---|---|---|
| Males | 58 | 69.05 |
| Females | 26 | 30.95 |
| Total | 84 | 100 |

The most commonly observed malignancy was carcinoma tongue which was seen in 30 patients (35.7%) followed by carcinoma Buccal mucosa in 18 patients (21.4%) and the least common malignancy observed was carcinoma larynx which was seen in 1 patient (1.2%). (Table 7 )

**Table 7:** Site of malignancy

| Site of malignancy | Number of patients | Percentage (%) |
|---|---|---|
| Alveolar | 1 | 1.2 |
| Buccal mucosa | 18 | 21.4 |
| Glottis | 9 | 10.7 |
| Hypopharynx | 6 | 7.1 |
| Larynx | 1 | 1.2 |
| Oesophagus | 12 | 14.3 |
| Postcricoid | 3 | 3.6 |
| Sub glottis | 4 | 4.8 |
| Tongue | 30 | 35.7 |
| Total | 84 | 100 |

In our study out of 84 patients 5 were receiving concurrent chemotherapy and it was not associated with progression of radiation dermatitis (p>0.05) (Table 8).

**Table 8:** Concurrent chemotherapy

| Concurrent chemotherapy | Number of patients | Percentage(%) |
|---|---|---|
| Yes | 5 | 6 |
| No | 79 | 94 |
| Total | 84 | 100 |
| | P value >0.05 | Not significant |

In this study out of 84 patients 8 had history of atopy and other skin disorders which was associated with early onset of radiation dermatitis which was stastistically significant (p<0.05). (Table 9) (Figure 2, Figure 3)

**Table 9:** History of atopy

| History of atopy and other skin disorders | Number of patients | Percentage(%) |
|---|---|---|
| Yes | 8 | 9.5 |
| No | 76 | 90.5 |
| Total | 84 | 100 |
| | P | <0.05 |

**Fig. 2: 3:** Grade 2 R D (Patient had history of atopy)

During the observational period all the patients developed radiation dermatitis and it was graded using RTOG criteria. (Table 10)

**Table 10:** RTOG grade and number of patients

| RTOG Grade | Number of patients |
|---|---|
| Grade 1 | 54 |
| Grade 2 | 20 |
| Grade 3 | 08 |
| Grade 4 | 02 |
| Total | 84 |

Development of radiation dermatitis was directly proportional to the dose of radiation received (p< 0.05).

## 4. Discussion

Radiotherapy is the most common treatment modality used in the treatment of head and neck malignancies and radiation induced dermatitis is the most common complication encountered in clinical practice. Our study enrolled 84 patients, who were receiving radiation therapy for head and neck cancers, the age of the participants ranged from 29-80 years, and mean age was 51.4±4.6 years, the most common age group involved w ere in the range of 41-50 years.

A study conducted by Saini S et al.[12] enrolled 262 patients, out of which 47 patients developed acute radiation dermatitis, the age of the participants ranged from 40-70 years. Most common age group involved were in the range of 51-60 years. mean age of the participants was 48±5.4

years, but in this study all the patients who were receiving radiation for other malignancies were also included.

A study conducted by Haddad et al.[13] enrolled 60 patients who were receiving radiotherapy for head and neck, breast and pelvic cancers. The age of the participants ranged from 21-78 years and the mean age of the participants was 52 years.

### *4.1. Gender*

In our study out of 84 patients, 58 were males(69.05%) and 26 were females (30.95%), M: F = 2: 1, males outnumbered the females mainly because of incidence of smoking and alchohol intake was higher in males and these are considered to be important risk factors for head and neck malignancy. In a study conducted by Rao S et al.[14] enrolled 60 patients who were receiving radiation for head and neck malignancy, 50 were males (83.3%) and 10 were females (6.7%), M: F = 5: 1, which was similar to our study males most commonly developed radiation dermatitis.

In a study conducted by Haddad et al.[13] enrolled 60 patients out of which 40 were females (67%) and 20 were males (33%) and M: F = 2: 1, Females were more compared to males but in this study patients with other malignancies who were receiving radiotherapy were also included.

### *4.2. Site of Malignancy*

In our study, out of 84 patients diagnosed with head and neck malignancies, most common malignancy observed was Ca tongue in 30 patients(35.7%) followed by Ca Buccal mucosa in 18 patients(21.4%) and the least common site was Ca Larynx which was observed in one patient (1.2%), These results were comparable with a study conducted by Rao S et al[14] where Ca tongue was the most common malignancy observed, out of 60 patients 13 patients (20.8%) were diagnosed with carcinoma tongue followed by Ca Supraglottis in 10 patients (17.8%).

### *4.3. Concurrent chemotherapy*

Richardson et al.[15] reviewed the use of aloe vera for the prevention of radiation dermatitis. They found five published randomized trials , which showed that concurrent chemotherapy along with radiotherapy increased the risk of radiation dermatitis, in our study out of 84 patients 5 patients were receiving concurrent chemotherapy and it was not statistically significant ($p>0.05$).

### *4.4. History of atopy and other skin disorders*

History of atopy and other skin disorders are known to increase the risk of radiation dermatitis[10] which was significant in our study. Out of 84 patients 8 patients had h/o atopy and h/o skin diseases (urticaria in 3 and foot Eczema in 5 patients) who developed radiation dermatitis earlier compared to other patients and it was statistically significant ($p<0.05$).

## 5. Conclusion

It was found that additional risk factors and co- morbidities increases the severity of radiation dermatitis.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

## References

1. Brown KR, Rzucidlo E. Acute and chronic radiation injury. *J Vasc Surg*. 2011;53:15S–21S.
2. Hall EJ, Cox JD. Physical and biological basis of radiation therapy. In: Cox JD, Ang KK, editors. Radiation Oncology. Radiation Oncology ; 2003,. p. 3–62.
3. Singh M, Alavi A, Wong R, Akita S. Radiodermatitis: A review of our current Understanding. *Am J Clin Dermatol*. 2016;17:277–292.
4. Denham JW, Hauer-Jensen M. The radiotherapeutic injury - a complex wound. *Radiother Oncol*. 2002;63:129–145.
5. Jensen JM, Gau T, Schultze J, Lemmnitz G, Holst RF, et al. Treatment of acute radiodermatitis with an oil in water emulsion following radiation therapy for breast cancer : a controlled , randomized trial. *Strahlenther Onkol*. 2011;187:378–386.
6. Mendelsohn FA, Divino CM, Reis ED, Kerstein. Wound care after radiation therapy. *Adv Skin Wound Care*. 2002;15:216–224.
7. Salvo N, Barnes E, Drannen JV, Stacey E, Mitera G, et al. Prophylaxis and management of acute radiation induced skin reactions: a systematic review of literature. *Curr Oncol*. 2010;17:94–112.
8. Cox JD, Stetz J, Pazak TF. Toxicity criteria of the Radiation Therapy Oncology Group (RTOG) and the European Organization for Research and Treatment of cancer (EORTC). *Int J Radiat Oncol Biol Phys*. 1995;31:1341–1346.
9. Khanna NR, Kumar DP, Laskar SG, Laskar S. Radiation dermatitis : An overview. *Indian J of Burns*. 2013;21:24–31.
10. Omidvari S, Saboori H, Mohammadianpanah M, Mosalaei A, Ahmadloo N, Mosleh-Shirazi MA. Topical Betamethasone for prevention of radiation dermatitis. *Indian J Dermatol Venereol Leprol*. 2007;73:209–209.
11. Ryan JL. Ionising radiation: The good, the bad and the ugly. *J invest Dermatol*. 2012;132:985–1093.
12. Saini S, Pai V, Shukla P, Ranglani H. A study of clinical patterns of acute radiation dermatitis among patients attending dermatology outpatient department at teritiary center in Western India. *Clin Dermatol Rev*. 2018;2:8–12.
13. Haddad P, Amouzgar-Hashemi F, Samsami S, Chinichian S, Oghabian MA. Aloe vera for prevention of radiation -induced dermatitis : a self controlled clinical trial. *Curr Oncol*. 2013;20:e345–348.
14. Rao S, Hegde SK, Baliga-Rao MP, Palatty PL, George T, Baliga MS. An Aloe vera- based cosmoceutical cream delays and mitigates ionizing radiation Induced dermatitis in head and neck cancer patients undergoing curative radiotherapy. A Clinical study. *Med*. 2017;4:44–46.
15. Richardson J, Smith JE, Mcintyre M, Thomas R, Pilkington K. Aloe vera for preventing radiation induced skin reactions : a systematic literature review. *Clin Oncol*. 2005;17:478–484.

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