International Journal of Otorhinolaryngology and Head and Neck Surgery
Puthukudy PA et al. Int J Otorhinolaryngol Head Neck Surg. 2026 Dec;12(6):953-959
https://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20264277

Original Research Article

Prospective observational study of dermatological changes in head and neck cancer patients treated with radiotherapy

Preetham Achoor Puthukudy*, Musarrat Feshan, Roshini Adalarasu

Department of Otorhinolaryngology, Southern Railway Headquarters Hospital, Chennai, Tamil Nadu, India

Received: 08 September 2026
Revised: 13 October 2026
Accepted: 16 October 2026

***Correspondence:**
Dr. Preetham Achoor Puthukudy,
E-mail: preetham.ap@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Radiotherapy (RT) is central to managing head and neck cancers (HNC), but radiation-induced skin and mucosal toxicities frequently cause treatment interruption and morbidity. This study prospectively evaluated the incidence, temporal progression, and severity of dermatological and mucosal changes in HNC patients undergoing RT, alongside associated host and treatment factors.
Methods: A prospective observational study evaluated 20 HNC patients receiving RT (with or without concurrent chemotherapy) at a tertiary care center. Clinical parameters including Body Mass Index (BMI), baseline hemoglobin, and serum albumin were recorded. Skin and mucosal toxicities were monitored at baseline, day 11, day 21, end of RT, and 3 months post-RT using Radiation Therapy Oncology Group (RTOG) criteria. Non-parametric tests analyzed correlations between baseline factors and toxicity grades.
Results: Mean age was 65.65±8.73 years (95% Male; 5% Female). Mean RT dose was 67.35±3.95 Gy. 60% received concurrent chemoradiotherapy. By RT completion, 100% developed dermatitis (Grade 1: 40%, Grade 2: 20%, Grade 3: 40%) and mucositis (Grade 1: 5%, Grade 2: 70%, Grade 3: 25%). Advanced stage correlated with early-onset dermatitis (p=0.047) and mucositis (p=0.009) on day 11. At 3 months, persistent alopecia and localized subcutaneous fibrosis persisted in prior grade 3 cases. Baseline nutritional parameters showed no significant correlation with toxicity.
Conclusions: Radiation-induced skin and mucosal reactions are universal and dose-dependent. Patients with advanced tumor stage exhibit a higher risk of early onset toxicity, while severe acute dermatitis predisposes to late fibrotic changes.

Keywords: Head and neck neoplasms, Radiotherapy, Radiation dermatitis, Mucositis, Radiation toxicity

INTRODUCTION

Head and Neck cancers represent one of the most common types of cancer globally, with an incidence more than half a million cases annually.[1] Among various modes of treatment, radiotherapy remains a cornerstone modality, significantly improving locoregional control and survival rates.[2] While the primary goal of RT is the destruction of cancer cells via DNA damage, the unavoidable exposure to surrounding healthy tissues leads to significant morbidity.

Radiation-induced skin reactions occur in about 95% of patients.[3] The severity of damage to normal tissue depends on various factors such as treatment volume, total radiation dose, radiation schedule, and the specific delivery technique, such as external beam radiotherapy or brachytherapy.[4]

Furthermore, patient-related factors, including age, nutritional status, and individual susceptibility also play a

critical role.[5] Clinically, skin reactions progress from erythema and dry desquamation to confluent moist desquamation, while mucosal toxicity presents as painful erythema, mucosal breakdown, and pseudomembranous ulceration.[6]

These acute toxicities cause severe pain, difficulty swallowing, pain during swallowing and compromised oral intake, often necessitating treatment breaks or dose modifications that can adversely affect tumor control outcomes.[7] Most of these acute inflammatory changes typically subside post-treatment; however, severe acute toxicities can trigger chronic tissue remodelling, causing late sequelae such as localized subcutaneous fibrosis, telangiectasia, and permanent alopecia.[8]

This prospective study was conducted to evaluate the incidence, severity and temporal progression of dermatological and mucosal toxicities in HNC patients undergoing RT or CTRT and to correlate host factors (e.g., age, BMI, baseline hemoglobin and serum albumin) and tumor and treatment-related parameters (e.g., stage and total radiation dose) with toxicity severity using Radiation Therapy Oncology Group (RTOG) criteria.

METHODS

Study design and setting

This prospective observational study was conducted in the Department of Otorhinolaryngology at Southern Railway Headquarters Hospital, Ayanavaram, Chennai, a tertiary care referral center, after obtaining clearance from the Institutional Ethics Committee. Informed written consent was obtained from all participating patients before enrollment. The study was carried out over a period of one year, from April 2025 to March 2026.

Study population and selection criteria

Head and neck cancer patients scheduled for curative or adjuvant radiotherapy were screened.

Inclusion criteria

Patients aged ≥18 years with non-metastatic head and neck cancer. Patients planned for curative-intent radiotherapy or chemoradiotherapy. Patients willing to provide informed consent and attend regular follow-up visits.

Exclusion criteria

Patients with a prior history of radiation therapy to the head and neck region. Patients with pre-existing skin or mucosal lesions in the head and neck area before treatment. Patients with distant metastatic disease at presentation. Patients who defaulted or discontinued treatment midway.

Pre-treatment baseline evaluation

Before starting radiation, all patients underwent a detailed clinical history, physical examination and baseline blood investigations. Baseline parameters recorded included patient age, sex, primary anatomical site, disease stage as per the American Joint Committee on Cancer (AJCC) classification and planned radiation dose. Systemic comorbidities, specifically baseline Diabetes Mellitus, were also documented before the initiation of radiotherapy. Patient height and weight were measured to calculate Body Mass Index (BMI, kg/m^2). Baseline laboratory parameters including hemoglobin (g/dl) and total serum albumin (g/dl) were recorded before fraction 1.[9]

Radiation treatment protocol

All patients received megavoltage external beam radiation therapy (EBRT) delivered in daily fraction sizes of 1.8 to 2.0 Gy, five fractions per week. Prescribed radiation doses ranged between 50.0 Gy and 70.0 Gy (mean cumulative dose: 67.35±3.95 Gy) based on clinical stage and treatment intent (definitive vs. adjuvant). Sixty percent (60%) of patients received concurrent weekly cisplatin-based chemoradiotherapy (35–40 mg/m^2).

Toxicity grading and follow-up protocol

Skin and mucosal changes were prospectively examined and graded according to the Radiation Therapy Oncology Group (RTOG) acute radiation morbidity scoring criteria.[6]

Clinical evaluations were performed and documented at five specific intervals: baseline: before the commencement of radiotherapy; day 11 of RT: corresponding to approximately 10 fractions (20 Gy cumulative dose); day 21 of RT: corresponding to approximately 20 fractions (40 Gy cumulative dose); end of RT: immediately following completion of the prescribed cumulative dose; and 3 months post-RT: to assess resolution and persistent changes such as subcutaneous fibrosis and persistent alopecia.

Radiation dermatitis

Assessed at each visit and graded according to the Radiation Therapy Oncology Group (RTOG) acute radiation morbidity scoring criteria (Grades 0 to 4).[6] Specific cutaneous features including erythema, hyperpigmentation, radiation-site alopecia, and moist desquamation (classified as fold vs. non-fold area involvement) were individually recorded.

Radiation mucositis

Graded at each evaluation interval using the RTOG acute mucosal toxicity scoring system (Grades 0 to 4).[6]

Late tissue sequelae

Evaluated at the 3-month post-RT follow-up visit using late effects in normal tissues: subjective, objective, management, analytic (LENT-SOMA) criteria, focusing specifically on localized skin fibrosis, persistent leukoderma and chronic alopecia.[10]

Statistical analysis

The collected data were compiled and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean±standard deviation (SD), and categorical variables were presented as frequencies and percentages. The non-parametric Fisher's exact test was used to analyze associations between categorical variables (e.g., stage, CTRT administration) and toxicity grades.[11] The Kruskal-Wallis test was applied to compare continuous baseline parameters (age, BMI, hemoglobin, serum albumin) across ordered RTOG toxicity grades.[12] A two-tailed $p<0.05$ was considered statistically significant for all analyses.

RESULTS

Demographic and clinical baseline characteristics

A total of 20 patients diagnosed with mucosal head and neck squamous cell carcinoma (HNSCC) receiving radiotherapy (RT) with or without concurrent chemotherapy (CTRT) were prospectively evaluated (Table 1). The study population demonstrated a mean age of 65.65±8.73 years (range: 48-80 years), with a marked male predominance of 95% (n=19; male-to-female ratio: 19:1).

The primary anatomical sites involved were the tonsillar fossa (n=4, 20%), base of tongue (n=4, 20%), pyriform sinus (n=4, 20%), Glottis (n=3, 15%), anterior 2/3rd tongue (n=2, 10%), Posterior pharyngeal wall (n=1, 5%), Post cricoid (n=1, 5%) and nasal cavity (n=1, 5%) (Figure 1).

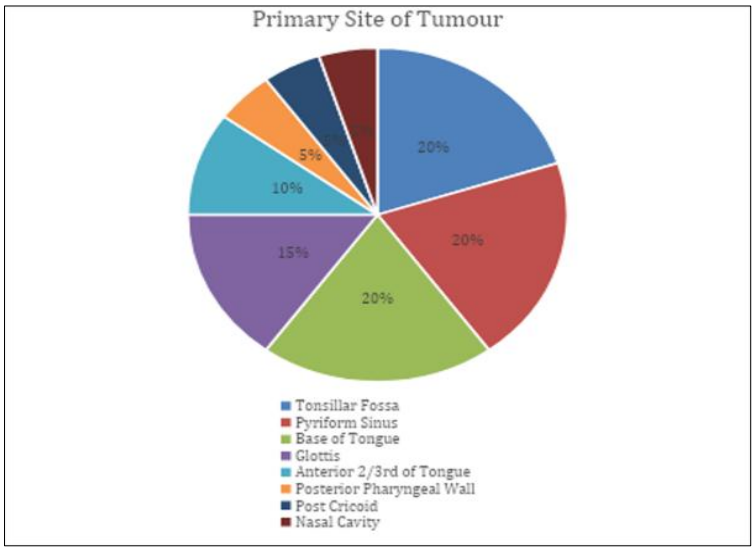

Figure 1: Pie chart showing distribution of patients according to the primary site of tumor.

According to the American Joint Committee on Cancer (AJCC) staging system, 90% (n=18) presented with Stage IV disease, while 10% (n=2) presented with Stage III disease. Advanced primary tumor stage (T3–T4a) was observed in 40% (n=8), and regional lymph node involvement (N1–N2c) was documented in 80% (n=16).

Prescribed cumulative primary RT doses ranged from 50.0 Gy to 70.0 Gy, with a cohort mean dose of 67.35±3.95 Gy. Concurrent weekly cisplatin-based chemoradiotherapy was administered to 60% (n=12) of the cohort, while 40% (n=8) received RT alone. Baseline host nutritional and laboratory parameters showed a mean Body Mass Index (BMI) of 23.96±5.01 kg/m^2, a mean baseline hemoglobin of 12.32±1.39 g/dl, and a mean baseline total serum albumin of 3.81±0.45 g/dl.

Temporal progression of acute radiation dermatitis

Cutaneous toxicity followed a cumulative dose-dependent progression across the treatment timeline (Table 2 and Figure 2).

Baseline: all patients (100%, n=20) had grade 0 skin status. Day 11 (≈20 Gy): early cutaneous changes emerged in 10% (n=2) of patients as grade 1 dermatitis (faint erythema and epilation), while 90% (n=18) maintained grade 0 status. Day 21 (≈40 Gy): 65% (n=13)

demonstrating grade 1 dermatitis and 20% (n=4) progressing to grade 2 dermatitis (tender, bright erythema and focal moist desquamation confined to skin folds). End of RT (≈66–70 Gy): overall incidence of acute radiation dermatitis reached 100% (n=20). Maximal toxicity distribution comprised grade 1 in 40% (n=8), grade 2 in 20% (n=4), and grade 3 (confluent moist desquamation outside skin folds) in 40% (n=8). No grade 4 toxicities (ulceration or necrosis) occurred. Predominant cutaneous features: at treatment completion, hyperpigmentation was recorded in 95% (n=19), radiation-site alopecia in 90% (n=18), and moist desquamation in 55% (n=11, with 15% restricted to skin folds and 40% involving non-fold areas).

Temporal progression of acute radiation mucositis

Mucosal toxicity demonstrated earlier onset and greater peak severity than cutaneous changes (Table 3 and Figure 3).

Baseline: All patients (100%, n=20) showed normal mucosa (Grade 0). Day 11 (≈20 Gy): Acute mucosal involvement was observed in 15% (n=3) of patients, consisting of Grade 1 mucositis (mild mucosal hyperemia and soreness) in 10% (n=2) and grade 2 mucositis (patchy fibrinous exudates) in 5% (n=1). Day 21 (≈40 Gy): Severe reactions escalated, with Grade 1 mucositis present in 60% (n=12), grade 2 mucositis in 30% (n=6) and grade 3 mucositis (confluent fibrinous membranes and severe pain requiring opioids) in 5% (n=1). Only 5% (n=1) remained at grade 0. End of RT (≈66 – 70 Gy): All 20 patients (100%) experienced acute mucositis. Peak severity distribution comprised grade 1 in 5% (n=1), grade 2 in 70% (n=14), and grade 3 in 25% (n=5). No grade 4 mucosal reactions occurred.

Table 1: Baseline demographic and clinical characteristics of the study cohort (n=20).

Parameters	Sub-category / Unit	Value
Age (years)	Mean±SD (Range)	65.65±8.73 (48–80)
Sex	Male / Female, n (%)	19 (95%) / 1 (5%)
AJCC Clinical Stage	Stage III, n (%)	2 (10%)
	Stage IV, n (%)	18 (90%)
Treatment Modality	Concurrent CTRT, n (%)	12 (60%)
	Radiotherapy alone, n (%)	8 (40%)
Total Prescribed Dose	Mean±SD (Gy)	67.35±3.95 Gy
Baseline BMI	Mean±SD (kg/m^2)	23.96±5.01 kg/m^2
Baseline Hemoglobin	Mean±SD (g/dl)	12.32±1.39 g/dl
Baseline Serum Albumin	Mean±SD (g/dl)	3.81±0.45 g/dl

Table 2: Temporal progression of RTOG acute radiation dermatitis (n=20).

Evaluation Timepoint	Grade 0, N (%)	Grade 1, N (%)	Grade 2, N (%)	Grade 3, N (%)	Grade 4, N (%)
Baseline	20 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Day 11 (≈ 20 Gy)	18 (90%)	2 (10%)	0 (0%)	0 (0%)	0 (0%)
Day 21 (≈ 40 Gy)	3 (15%)	13 (65%)	4 (20%)	0 (0%)	0 (0%)
End of RT (≈ 66-70 Gy)	0 (0%)	8 (40%)	4 (20%)	8 (40%)	0 (0%)
3 Months post-RT	20 (100%)*	0 (0%)	0 (0%)	0 (0%)	0 (0%)

*Represents complete resolution of acute dermatitis.

Table 3: Temporal progression of RTOG acute radiation mucositis (n=20).

Evaluation timepoint	Grade 0, N (%)	Grade 1, N (%)	Grade 2, N (%)	Grade 3, N (%)	Grade 4, N (%)
Baseline	20 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Day 11 (≈ 20 Gy)	17(85%)	2 (10%)	1 (5%)	0 (0%)	0 (0%)
Day 21 (≈ 40 Gy)	1 (5%)	12 (60%)	6 (30%)	1 (5%)	0 (0%)
End of RT (≈ 66 – 70 Gy)	0 (0%)	1 (5%)	14 (70%)	5 (25%)	0 (0%)
3 months post-RT	20 (100%)*	0 (0%)	0 (0%)	0 (0%)	0 (0%)

*Represents complete resolution of acute mucosal ulceration.

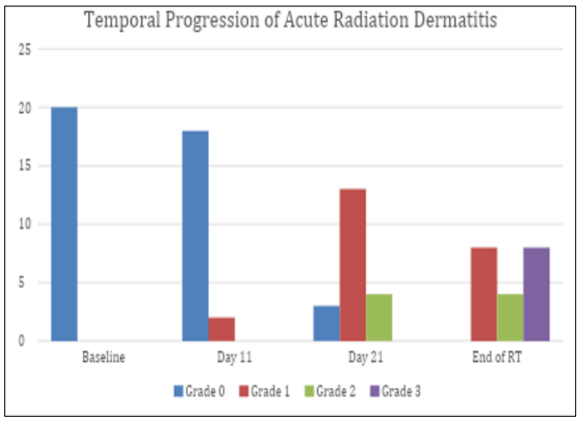

Figure 2: Grouped bar chart showing the temporal progression of RTOG acute radiation dermatitis.

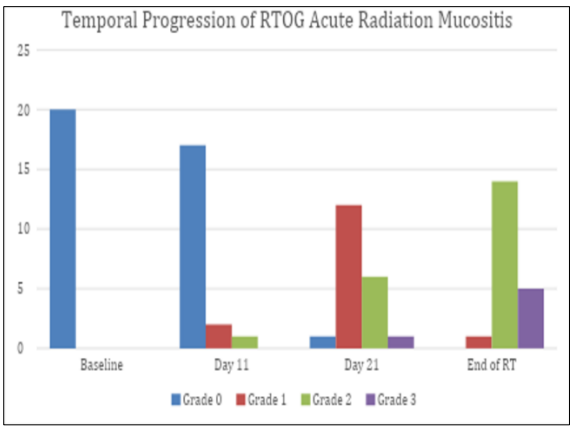

Figure 3: Grouped bar chart showing the temporal progression of RTOG acute radiation mucositis.

Association between clinical predictors and toxicity severity

Non-parametric Fisher's exact and Kruskal-Wallis testing revealed significant correlations between tumor parameters and early toxicity onset.

AJCC overall stage: advanced stage (stage IV vs. stage III) significantly correlated with the early onset of Grade 1–2 dermatitis at day 11 (p=0.047) and grade 1–2 mucositis at day 11 (p=0.009).

Treatment modality (CTRT vs. RT alone): patients receiving concurrent chemoradiotherapy exhibited a higher proportion of Grade 3 dermatitis at RT completion (50.0% in CTRT vs. 25.0% in RT alone) and Grade 3 mucositis at RT completion (33.3% in CTRT vs. 12.5% in RT alone); however, these trends did not reach statistical significance (p=0.361 for dermatitis; p=0.312 for mucositis).

Baseline nutritional and hematological factors: baseline age (p=0.624), BMI (p=0.485), baseline hemoglobin (p=0.512), and total serum albumin (p=0.703) showed no statistically significant correlation with peak dermatitis or mucositis grades at the end of RT.

Diabetic status: patients with diabetes mellitus had a higher incidence of Grade 3 acute dermatitis at the end of RT than non-diabetic patients (57.14%, n=4/7 vs. 30.76%, n=4/13). However, this association did not reach statistical significance (p=0.227, Fisher's exact test).

Resolution and early late-sequelae at 3 months post-RT

At the 3-month post-radiotherapy follow-up evaluation using LENT-SOMA criteria: acute inflammatory Resolution: Acute mucosal ulcerations, pseudomembranes, and active cutaneous moist desquamation completely resolved in 100% (n=20) of patients; Subcutaneous fibrosis: localized grade 1–2 subcutaneous skin fibrosis was observed in 35% (n=7) of patients, occurring exclusively among those who had developed grade 3 acute dermatitis during treatment; Persistent alopecia and skin changes: radiation-site persistent alopecia remained in 40% (n=8) of patients. Localized leukoderma/hypopigmentation occurred in 20% (n=4) of cases (Figure 4).

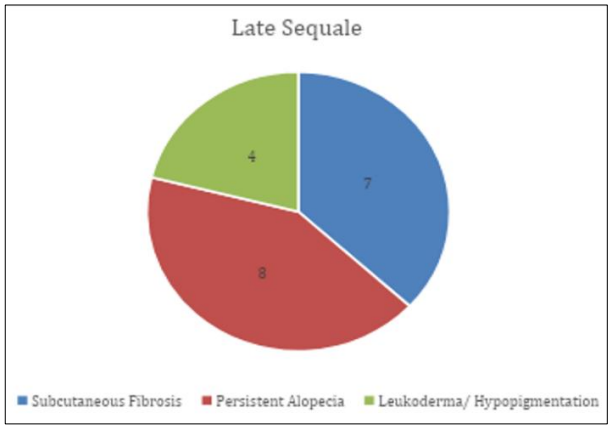

Figure 4: Pie chart showing the resolution and early late-sequelae at 3 months post-RT.

DISCUSSION

Radiation dermatitis and oral mucositis remain two of the most prevalent and distressing acute toxicities encountered during the non-surgical management of head and neck squamous cell carcinomas.[7] In the present prospective observational study, 90% of patients had no visible skin reaction at D11.

However, toxicity progressed steadily, and by the completion of treatment, 100% of patients had developed dermatitis. This universal toxicity rate correlates with extensive international clinical literature, which consistently documents cutaneous and mucosal side effects in 90% to 100% of patients undergoing definitive or adjuvant radiotherapy for head and neck malignancies.[7]

During the initial phase of treatment (Day 11; 20 Gy), cutaneous manifestations were relatively mild, with faint erythema observed in 10% of patients. By the end of RT, (mean dose, 67.35±3.95 Gy), 40% of patients progressed to grade 3 dermatitis characterized by moist desquamation. Crucially, despite the high incidence of severe acute dermatitis after treatment (at the end of RT), clinical assessment at the 3-month post-radiotherapy follow-up revealed that acute inflammatory findings in the majority of subjects had resolved, with complete re-epithelialization of moist desquamation and mucosal ulcerations. However, late radiation sequelae such as localized subcutaneous fibrosis and hypopigmentation (leukoderma) were seen in patients who experienced severe grade 3 dermatitis at end of RT. Subcutaneous tissue fibrosis was documented in 35% (n=7) of patients, while localized leukoderma/ hypopigmentation and radiation-field alopecia persisted in 20% (n=4) and 40% (n=8) of patients, respectively.

Similar to cutaneous reactions, radiation-induced oral mucositis exhibited a cumulative, time-dependent escalation. By the end of RT, all patients (100%) developed mucositis, with grade 2 (patchy mucositis) being the most prevalent finding, affecting 70% of patients, while grade 3 (confluent fibrinous mucositis with severe pain) affecting 25% of the cohort. No grade 4 reactions were recorded. A critical finding of this study is the statistically significant association between advanced clinical stage (Stage IV) and early-onset toxicity at day 11 for both dermatitis (p=0.047) and mucositis (p=0.009). Patients presenting with advanced locoregional disease typically have larger primary tumors and nodal burdens, necessitating wider radiation fields.[13]

Although comorbidities such as Diabetes Mellitus did not show a statistically significant correlation with maximum toxicity grade (p=0.227) this finding may be attributable to our limited sample size. Diabetic patients demonstrated a noticeably higher incidence of severe Grade 3 dermatitis at the end of RT compared to non-diabetics (57.14% vs. 30.76%). Chronic hyperglycemia induces microvascular compromise, reduces local tissue perfusion, alters baseline inflammatory responses, and delays epithelial wound healing.[13] These findings highlight the necessity of integrating standardized, protocol-driven skin hygiene regimens from day 1 of radiotherapy. Avoidance of topical irritants or unverified traditional applications, early application of evidence-based emollients and prompt clinical intervention upon the first signs of moist desquamation are essential to maintain skin barrier integrity, prevent secondary bacterial superinfections, and avoid unplanned treatment interruptions.

Limitations

This study has certain limitations that should be acknowledged. First, it was conducted at a single tertiary center with a relatively small sample size (N=20), which limited the statistical power needed to detect significant differences across secondary host parameters, such as baseline nutritional indices or diabetic subgroup interactions.[14,15] Second, while patients were followed up at 3 months post-radiotherapy, an extended longitudinal follow-up (6 to 12 months) would allow for a more thorough evaluation of progressive late normal tissue complications, such as soft tissue necrosis and persistent trismus, alongside validated patient-reported quality-of-life (PRO_QoL) assessments. Larger, multi-center prospective studies are recommended to validate these findings across broader demographic populations and advanced radiation delivery techniques.[16]

CONCLUSION

This prospective observational study demonstrates that acute radiation dermatitis and oral mucositis represent universal, dose-dependent complications during the curative management of head and neck squamous cell carcinomas. Cutaneous and mucosal toxicities escalate predictably across treatment, reaching peak severity upon completion of radiotherapy. Advanced clinical stage (Stage IV) is a statistically significant predictor of early-onset acute toxicity (p=0.047), defining a distinct high-risk subgroup requiring early clinical vigilance. Furthermore, severe acute moist desquamation (Grade 3) acts as a direct precursor to late structural tissue remodeling, including localized subcutaneous fibrosis, persistent hypopigmentation, and radiation-site alopecia at 3 months post-treatment. Proactive risk stratification, systematic toxicity grading, and early initiation of evidence-based supportive skin care are essential to maintain treatment continuity, minimize acute morbidity, and prevent late cosmetic and functional sequelae.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Vigneswaran N, Williams MD. Epidemiologic trends in head and neck cancer and aids in diagnosis. Oral Maxillofac Surg Clin North Am. 2014;26(2):123-41.
2. Chow LQM. Head and neck cancer. N Engl J Med. 2016;374(17):1654-65.
3. Ryan JL. Ionizing radiation: the good, the bad, and the ugly. J Invest Dermatol. 2012;132(3 Pt 2):985-993.
4. Duzgun G, Celik A, Yildirim Y, Usta Yesilbalkan O, Sert F. Skin toxicities and practices of patients receiving radiotherapy. Int J Caring Sci. 2019;12(1):454-64.
5. Maryum H, Wahid Z, Ahmed I, Alam MZ. Frequency of cutaneous manifestations of radiotherapy. J Pak Assoc Dermatol. 2013;23(4):371-7.

6. Cox JD, Stetz J, Pajak 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(5):1341-6.
7. Trotti A, Bellm LA, Epstein JB, Noguti J, Stepanski EJ, Rehberg H, et al. Mucositis incidence, severity and associated outcomes in patients with head and neck cancer receiving radiotherapy with or without chemotherapy: a systematic review. Radiother Oncol. 2003;66(3):253-62.
8. Yarnold J, Brotons MC. Pathophysiology of normal tissue damage induced by therapeutic radiation. Radiat Oncol. 2010;5:100.
9. Unisal M, Kockar MC. Nutritional status and its relation with radiation-induced side effects in head and neck cancer patients. Support Care Cancer. 2020;28(8):3741-3748.
10. Pavy JJ, Denekamp J, Letschert J, Littbrand B, Mornex F, Bernier J, et al. Late effects toxicity scoring: the SOMA scale. Radiother Oncol. 1995 Apr;35(1):11-5.
11. Fisher RA. Statistical methods for research workers. 11th ed. Edinburgh: Oliver and Boyd; 1950.
12. Kruskal WH, Wallis WA. Use of ranks in one-criterion variance analysis. J Am Stat Assoc. 1952;47(260):583-621.
13. Argiris A, Karamouzis MV, Raben D, Ferris RL. Head and neck cancer. Lancet. 2008;371(9625):1695-1709.
14. Porock D, Kristjanson L. Skin reactions during radiotherapy for breast cancer: the use and impact of topical agents and dressings. Eur J Cancer Care (Engl). 1999;8(3):143-53.
15. Schmuth M, Wimmer MA, Hofer S, Sztankay A, Weinlich G, Linder DM, et al. Topical corticosteroid therapy for acute radiation dermatitis: a prospective, randomized, double-blind study. Br J Dermatol. 2002;146(6):983-91.
16. Cooper JS, Pajak TF, Forastiere AA, Jacobs J, Campbell BH, Saxman SB, et al. Postoperative concurrent radiotherapy and chemotherapy for high-risk squamous-cell carcinoma of the head and neck. N Engl J Med. 2004;350(19):1937-44.

Cite this article as: Puthukudy PA, Feshan M, Adalarasu R. Prospective observational study of dermatological changes in head and neck cancer patients treated with radiotherapy. Int J Otorhinolaryngol Head Neck Surg 2026;12:953-9.