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Frequency and Evolution of Acute Oral Complications in Patients Undergoing Head and Neck Radiotherapy

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Abstract

Introduction: Head and neck radiotherapy, although curative, is associated with significant toxicity affecting the oral cavity. This study aimed to evaluate the prevalence, severity, and weekly progression of acute oral complications in a Moroccan cohort. **Materials and Methods:** A prospective longitudinal observational study was conducted between June and December 2021. Twenty-one patients receiving a cumulative radiation dose of ≥ 60 Gy were followed on a weekly basis. Oral complications were assessed using the World Health Organization (WHO) scale for mucositis, the *Seminars in Radiation Oncology* (SRO) criteria for xerostomia, and the Common Terminology Criteria for Adverse Events version 5.0 (CTCAE v5.0) for dysphagia, dysgeusia, and trismus. **Results:** By the third week of treatment, 100% of patients had developed mucositis, xerostomia, and dysphagia. Severe complications (Grade 3/4) became predominant by the sixth week, with mucositis observed in 71.5% of patients, xerostomia in 47.6%, and dysphagia in 61.9%. Trismus affected 52.4% of the study population. Temporary interruption of radiotherapy due to treatment-related toxicity occurred in 28.5% of patients. **Conclusion:** Acute oral complications appeared earlier and were more severe than those reported in international studies. This finding may be attributed to the absence of systematic pre-treatment dental management and preventive care protocols.

Subject Areas

Dentistry

Keywords

Head and Neck Cancer, Radiotherapy, Acute Oral Complications, Quality of Life

1. Introduction

Head and neck cancer (HNC) represents the seventh most common cancer globally, accounting for approximately 890,000 new cases and 450,000 deaths annually, and has a profound impact on global health [1].

Patients with HNC often experience complex issues such as difficulties in swallowing, breathing, and communication, as well as significant psychosocial changes [2].

HNC and its treatments also have a direct and significant impact on oral and dental health, leading to acute complications such as mucositis, xerostomia, dysphagia, dysgeusia, and trismus, which further affect quality of life [2].

These complications may lead to treatment interruptions, thereby negatively impacting tumor control and survival rates.

Radiotherapy (RT), often combined with surgery or chemotherapy, remains a cornerstone of treatment, with curative doses ranging from 54 Gy to 70 Gy [3].

Despite the transition from conventional three-dimensional radiotherapy to Intensity-Modulated Radiation Therapy (IMRT), the oral cavity remains particularly vulnerable to treatment-related toxicities [4].

In Morocco, epidemiological data on the management and evolution of these complications remain limited. The present study aimed to document the prevalence and severity of these toxicities at Ibn Rochd University Hospital in Casablanca and to highlight the importance of multidisciplinary collaboration between oncologists and dental professionals in the management of cancer patients.

2. Materials and Methods

2.1. Study Design

A prospective longitudinal observational study was conducted at the Oncology Center of Ibn Rochd University Hospital, Casablanca, from June to December 2021.

2.2. Patient Selection

42 patients were initially screened. 21 patients fulfilled the inclusion criteria and completed the study. The remaining patients were excluded because they did not meet the eligibility criteria.

- **Inclusion criteria:** Adults (≥18 years) with a primary head and neck tumor, scheduled to receive a radiation dose of ≥ 60 Gy.
- **Exclusion criteria:** Previous head and neck radiotherapy, severe pre-existing functional limitations (e.g., tube feeding, severe trismus), or definitive treatment interruption for reasons unrelated to complications.

2.3. Ethical Considerations

All participants were informed about the purpose of the study and provided written informed consent before enrollment. Patient anonymity and confidentiality were maintained throughout the study in accordance with the principles of the Declaration of Helsinki.

2.4. Treatment Protocol

Patients received conventional 3D radiotherapy. The total dose (60 - 70 Gy) was delivered in daily fractions of 2 Gy, five days per week, over a period of 6 to 7 weeks.

2.5. Clinical Assessment

All clinical evaluations were performed by a single practitioner every Monday prior to radiotherapy sessions for six consecutive weeks. The following standardized grading systems were used.

- **Oral Mucositis:** assessed using the World Health Organization (WHO) scale (Grade 0: no mucositis; Grade 4: inability to ingest food).
- Xerostomia: assessed using the Seminar in Radiation Oncology (SRO) scale (Grades 0 - 3).
- **Dysphagia and Dysgeusia:** assessed according to the National Cancer Institute Common Terminology Criteria for Adverse Events (CTCAE), version 5.0 (Grades 0 to 4).
- **Trismus:** Subjective assessment using the Mandibular Function Impairment Questionnaire (MFIQ), adapted to the CTCAE grading system.

3. Results

3.1. Patient Characteristics

The cohort had a mean age of 60.5 years and was nearly gender-balanced, with 52.4% male patients. The most common tumor site was the larynx (33%), followed by the nasopharynx and tongue (19% each). Most patients (38.1%) presented with T4-stage tumors. Notably, 42.9% of patients exhibited poor oral hygiene, while an additional 42.9% were edentulous (See Table 1).

3.2. Evolution of Toxicities

A dose-dependent relationship was observed between the radiation dose and the severity of complications.

- **Oral Mucositis:** Clinical signs appeared as early as week 1, affecting 42.9% of patients. By week 3, all patients (100%) were affected. By week 6, 42.9% reached Grade 4, corresponding to inability to ingest food, while 28.6% presented with Grade 3 mucositis.
- **Xerostomia:** Symptoms were reported by 42.9% of patients during week 1, increasing to 100% by week 3. By the final week of treatment, 47.6% of patients suffered from Grade 3 xerostomia, which significantly interfered with speech and sleep.
- **Dysphagia:** Severity peaked during week 6, with 33.3% of patients presenting with Grade 4 dysphagia (complete obstruction or inability to swallow) and 28.6% at Grade 3. Two patients required emergency hospitalization due to severe dysphagia.
- **Dysgeusia:** All patients experienced taste alterations by **week 4**. By **week 6**,

66.7% reported severe distortion or complete loss of taste (Grade 2).

- **Trismus:** This represented a significant acute complication, affecting 52.4% of patients by week 3. By the end of treatment, 9.5% reached Grade 3, characterized by an inability to eat or maintain adequate hydration.

3.3. Treatment Disruptions

The severity of treatment-related complications led to temporary treatment interruptions in 28.5% of patients. Specifically, patients scheduled to receive radiation doses greater than 60 Gy were unable to complete their treatment within the planned timeframe due to treatment-related toxicities (See Tables 1-6).

Table 1. Patient characteristics.

Sex	Male	11	52.4
	Female	10	47,6
	Total	***21***	***100***
Tumor site	Nasopharynx (Cavum)	4	19.0
	Larynx	7	33.0
	Salivary glands	2	9.50
	Palate	1	4.80
	Tongue	4	19.0
	Lips	1	4.80
	Maxilla	1	4.80
	Sinuses	1	4.80
	Total	***21***	***100***
TNM stage	T1N0M0	1	4.80
	T2N0M0	4	19.0
	T2N1M0	1	4.80
	T3N0M0	3	14.3
	T3N1M0	1	4.80
	T3N3M0	1	4.80
	T4N0M0	8	38.1
	T4N2M1	1	4.80
	T4N3M1	1	4.80
	Total	***21***	***100***
Treatment	RT + C	4	19.0
	RT + S	9	42.9
	RT + S + CT	8	38.1
	Total	***21***	***100***
	Tobacco	5	28.3

Continued

Habits	Alcohol	3	14.3
	Drugs	4	19.0
	Total	***21***	***100***
Oral hygiene	Good	2	9.50
	Moderate	1	4.80
	Poor	9	42.9
	Edentulous	9	42.9
	Total	***21***	***100***

RT: Radiotherapy; CT: Chemotherapy; S: Surgery.

Table 2. Prevalence of acute mucositis.

	1st week		2nd week		3rd week		4th week		5th week		6th week	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Grade 0	12	(57.1%)	2	(9.50%)	0		0		0		0	
Grade 1	8	(38.1%)	5	(23.8%)	4	(19.0%)	2	(9.50%)	1	(4.80%)	1	(4.80%)
Grade 2	1	(4.80%)	11	(52.4%)	7	(33.3%)	9	(42.9%)	4	(19.0%)	5	(23.8%)
Grade 3	0		2	(9.50%)	9	(42.9%)	10	(47.6%)	14	(66.7%)	6	(28.6%)
Grade 4	0		1	(4.80%)	1	(4.80%)	0		2	(9.50%)	9	(42.9%)
Total	21	(100%)	21	(100%)	21	(100%)	21	(100%)	21	(100%)	21	(100%)

Table 3. Prevalence of acute xerostomia.

	1st week		2nd week		3rd week		4th week		5th week		6th week	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Grade 0	12	(57.1%)	1	(4.80%)	0		0		0		0	
Garde 1	9	(42.9%)	12	(57.1%)	7	(33.3%)	0		0		0	
Grade 2	0		7	(33.3%)	12	(57.1%)	18	(85.7%)	13	(61.9%)	11	(52.4%)
Grade 3	0		1	(4.80%)	2	(9.50%)	3	(14.3%)	8	(38.1%)	10	(47.6%)
Total	21	(100%)	21	(100%)	21	(100%)	21	(100%)	21	(100%)	21	(100%)

Table 4. Prevalence of acute dysphagia.

	1st week		2nd week		3rd week		4th week		5th week		6thweek	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Grade 0	18	(85.7%)	2	(9.50%)	0		0		0		0	
Grade 1	2	(9.50%)	9	(42.9%)	3	(14.3%)	0		0		0	
Grade 2	1	(4.80%)	8	(38.1%)	9	(42.9%)	12	(57.1%)	8	(38.1%)	8	(38.1%)
Grade 3	0		1	(4.80%)	9	(42.9%)	8	(38.1%)	11	(52.4%)	6	(28.6%)
Garde 4	0		1	(4.80%)	0		1	(4.80%)	2	(9.50%)	7	(33.3%)
Total	**21**	**(100%)**	**21**	**(100%)**	**21**	**(100%)**	**21**	**(100%)**	**21**	**(100%)**	**21**	**(100%)**

Table 5. Prevalence of acute dysgeusia.

	1st week		2nd week		3rd week		4th week		5th week		6th week	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Grade 0	15	(71.4%)	3	(14.3%)	1	(4.80%)		0		0		0
Grade 1	6	(28.6%)	15	(71.4%)	12	(57.1%)	12	(57.1%)	9	(42.9%)	7	(33.3%)
Grade 2		0	3	(14.3%)	8	(38.1%)	9	(42.9%)	12	(57.1%)	14	(66.7%)
Total	21	(100%)	21	(100%)	21	(100%)	21	(100%)	21	(100%)	21	(100%)

Table 6. Prevalence of trismus.

	1st week		2nd week		3rd week		4th week		5th week		6th week	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Grade 0	21	(100%)	19	(90.5%)	11	(52.4%)	10	(47.6%)	10	(47.6%)	10	(47.6%)
Grade 1		0	2	(9.50%)	3	(14.3%)	2	(9.50%)	3	(14.3%)	2	(9.50%)
Grade 2		0		0	7	(33.3%)	8	(38.1%)	6	(28.6%)	7	(33.3%)
Grade 3		0		0		0	1	(4.80%)	2	(9.50%)	2	(9.50%)
Total	**21**	**(100%)**	**21**	**(100%)**	**21**	**(100%)**	**21**	**(100%)**	**21**	**(100%)**	**21**	**(100%)**

4. Discussion

Head and neck cancer is the seventh most common type of cancer worldwide and includes a diverse group of tumours affecting the upper aerodigestive tract. Although many histological types exist, squamous cell carcinoma remains the most common [5].

Head and neck malignancies remain challenging to treat and require a multidisciplinary approach. Among the available treatment modalities, radiotherapy is one of the most widely used treatment modalities worldwide for head and neck squamous cell carcinoma due to its proven efficacy. Numerous advanced radiotherapy techniques have been developed to reduce radiation-induced toxicities, including intensity-modulated radiotherapy (IMRT) [6].

IMRT has become a standard technique because of its ability to selectively target the primary tumour and lymph node regions at risk, while sparing adjacent healthy tissues [7]. This improves the therapeutic index by reducing acute and chronic morbidity and enhancing both target volume coverage and locoregional control [8].

Despite these advances, acute oral complications remain common. These complications including mucositis, xerostomia, dysphagia, dysgeusia and trismus are well documented and can substantially compromise patients' quality of life [9].

Oral mucositis is one of the most common and clinically significant complications of cancer therapy, particularly in patients receiving radiotherapy for head and neck cancers. It is an inflammatory lesion of the oral mucosa induced by chemotherapy and/or radiotherapy, resulting from radiation-induced damage to basal epithelial cells and disruption of normal epithelial turnover, followed by an

inflammatory cascade [10]. Clinically, mucositis typically develops during the second week of radiotherapy, worsens with cumulative radiation dose, and peaks between the third and sixth weeks of treatment. According to the World Health Organization (WHO) grading system, oral mucositis ranges from grade 0 (no oral mucositis) to grade 4 (inability to eat or drink, requiring enteral or parenteral nutrition). Severe forms are characterized by painful ulcerations, impaired oral intake, an increased risk of infection, and significant deterioration in quality of life, often necessitating opioid analgesics and, in some cases, leading to treatment interruptions, which may negatively impact tumor control and patient survival [11].

In our cohort, oral mucositis appeared as early as the first week of treatment in 43% of patients and reached a prevalence of 100% by the third week. Severe forms were frequent, with 71.5% of patients developing grade 3 or 4 mucositis, considerably higher than the 34% - 50% prevalence often reported. More than half of the patients showed clinical improvement following corticosteroid administration, a phenomenon rarely described in previous studies, which usually focus on antiviral or antifungal interventions. Dysphagia developed concurrently with mucositis, also reaching 100% prevalence by the third week, with severe cases (62%) frequently leading to treatment interruptions. The resolution of dysphagia in some patients appeared closely associated with the management of oropharyngeal mucositis, confirming mucosal injury as a primary driver of acute swallowing difficulties. Dysphagia not only impairs oral intake and nutritional status but also contributes to weight loss, malnutrition, dietary modifications, feeding tube dependence, aspiration risk, and a decline in overall health-related quality of life [12]-[15].

Xerostomia is another highly prevalent acute oral complication of radiotherapy in head and neck cancer patients. It results from dose-dependent , often irreversible radiation-induced damage to salivary glands within the radiation fields [16]. Xerostomia may appear early during treatment and frequently persists long-term, affecting up to 80%-90% of survivors. Reduction in salivary flow and qualitative changes in saliva lead to persistent oral dryness, thickened saliva, taste impairment, and difficulties in speaking, chewing, and swallowing [17]. Consequently, xerostomia significantly impairs patient's quality of life and predisposes patients to severe and long-term oral disorders, including dental caries, periodontal disease, and oral infections. In our study, xerostomia appeared in all patients by the third week, with nearly 48% reaching grade 3 severity. Unlike some literature suggesting that treatment of candidiasis may improve xerostomia symptoms, no such improvement was observed in our cohort during treatment [18].

Alongside other well-established oral complications of radiotherapy, patients with head and neck cancer frequently develop dysgeusia, which typically manifests during the second or third week of treatment due to the radiosensitivity of the taste buds, structural degeneration of their histology, and biochemical and mechanical changes in saliva, which reduce effective contact between the tongue and food. Patients often experience an early loss of sweet taste, followed by general

taste alterations and a decline in umami perception, negatively affecting appetite, food enjoyment, and overall quality of life. In our cohort, dysgeusia appeared aggressively, with 66.7% of patients experiencing grade 2 taste loss by the sixth week. Recovery generally occurs between 60 and 120 days after the completion of radiotherapy, but some taste deficits may persist long-term, impacting nutritional intake and overall patient well-being [19].

Trismus, defined as a limitation in mouth opening, is typically considered a late complication, but in our study, it was observed acutely in 52.3% of patients, sometimes as early as the second week of treatment . It results from radiation-induced fibrosis of the masticatory muscles and surrounding tissues, leading to impaired speaking, chewing, swallowing, and oral hygiene, and contributing to a significant reduction in quality of life [20]-[23].

Overall, our findings indicate that acute oral complications including mucositis, dysphagia, xerostomia, dysgeusia, and trismus appear earlier and with greater severity than previously reported in much of the literature [24]. Although classified as acute, their combined and cumulative effects during radiotherapy place a considerable physical and psychological burden on patients and may persist beyond treatment completion. Early onset and severe forms can significantly compromise nutritional status, oral function, and overall quality of life, highlighting the need for proactive monitoring and supportive care throughout treatment [25].

Several factors likely contributed to the observed early onset and severity of toxicities. In our cohort, 62% of patients received no oral preparation before radiotherapy, and 43% presented with very poor baseline oral hygiene. The lack of continuous oral monitoring and limited patient compliance often due to inability to afford prescribed medications further exacerbated outcomes. Additionally, the use of conventional radiotherapy rather than Intensity-Modulated Radiotherapy (IMRT) likely increased the severity of toxicities, as IMRT is known to better spare the parotid glands and reduce acute oral complications [25].

These observations underscore the importance of a multidisciplinary approach involving radiation oncologists, dental professionals, nutritionists, speech and swallowing therapists, and psychologists [26]. Current MASCC/ISOO guidelines and recent literature emphasize pre-treatment dental stabilization, systematic oral hygiene control, and the use of photobiomodulation (PBM), which has demonstrated significant potential in reducing the severity of mucositis, pain, and xerostomia, thereby helping to minimize treatment interruptions [27]-[30].

5. Conclusion

Head and neck radiotherapy profoundly affects oral structures, significantly compromising patients' quality of life and treatment outcomes. In our study, severe oral complications were highly prevalent and were closely associated with cumulative radiation dose and treatment duration. Effective management requires close collaboration between dentists and oncologists, including pre-treatment dental assessment, management of acute side effects (such as mucositis and xerostomia),

and long-term follow-up. This interdisciplinary approach is essential for preventing complications and optimizing overall patient outcomes.

Patient Permission

The patients were informed and gave their consent for the presentation and publication of this work.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Conflicts of Interest

The authors declare no conflicts of interest.

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