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RESEARCH ARTICLE
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ORTHODONTIC CONSIDERATIONS IN PATIENTS WITH HISTORY OF ORAL SQUAMOUS CELL CARCINOMA (OSCC) TREATMENT

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ABSTRACT

This study was intended to assess the orthodontic considerations and treatment possibility in patients who had previous history of treating oral squamous cell carcinoma (OSCC), with special emphasis on the obstacles caused by the post treatment consequences.

Methods: A cross-sectional study was carried out at Frontier Medical and Dental College, Abbottabad, between June 2023 and March 2024. 79 patients had undergone prior treatment of OSCC to be evaluated in terms of demographic factors, tumour, mode of treatment, post-treatment complications and orthodontic possibilities. Data collection was carried out using clinical examination and patient records. A statistical comparison was done in SPSS version 25, where a p-value <0.05 was termed as important

Results: Most patients were male (64.6%) and aged between 40–60 years. The tongue was the most common tumor site, and over half the patients had received surgery combined with chemoradiotherapy. Xerostomia (51.9%), trismus (35.4%), and periodontal compromise (41.8%) were the most frequent complications. Although 53.2% of patients required orthodontic treatment, only 39.2% were considered suitable for fixed appliances due to clinical limitations. Significant associations were observed between treatment history and orthodontic contraindications.

Conclusion: Orthodontic care in OSCC survivors is complex and must account for the long-term effects of oncologic treatment. Careful assessment and tailored treatment planning are essential to ensure safe and effective outcomes in this vulnerable population.

Keywords: Oral squamous cell carcinoma, orthodontic management, trismus, xerostomia, osteoradionecrosis, radiotherapy, post-cancer rehabilitation

INTRODUCTION

Oral squamous cell carcinoma (OSCC) is among some of the predominant malignancies of the head and neck region, especially in developing nations, given that they are exposed to risk factors like smoking of tobacco. Due to medical and surgical improvements in oncology, the survival of cancerous patients has extended, and thus an increased number of patients who have recovered or undergone cancer treatment or surgery with OSCC need or seek dental and orthodontic care. Nonetheless, it is a distinctive category in terms of providing orthodontic care since cancer treatment induces structural and functional alterations in case of this population [1-3].

Long-term changes in the oral tissues, bone quality, and salivary functioning may be induced by any single form or combination of therapies (surgery, radiotherapy, and chemotherapy). Trismus, xerostomia, periodontal disease, and even osteoradionecrosis all may result, and may complicate or prohibit any standard orthodontic intervention. Also, the presence of irradiated tissues, decreased vascularity can complicate the process of healing making tooth movement susceptible to vascular complications [4-6].

In spite of these limitations, most OSCC survivors still need orthodontic treatment, to enhance esthetics, to have their occlusion restored, or to have prosthetic rehabilitation planned. However, treatment should be implemented on a careful consideration of the oncologic history of the patient, the actual oral status and possible risks [7-9].

This study was undertaken to assess the orthodontic needs, challenges, and treatment feasibility among patients with a history of OSCC. By identifying key factors that influence orthodontic decision-making in this population, the findings aim to guide clinicians in providing safer, more personalized care to cancer survivors.

METHODOLOGY

The study was a descriptive, cross-sectional study done at the Department of Orthodontics, Frontier Medical and Dental College, Abbottabad, during a year; June 2023 to March 2024. The study aimed at assessing the orthodontic concerns amongst individuals having past history of oral squamous cell carcinoma (OSCC) being treated. Before the study started, ethical approval was sought and received by the institutional Head Review Board of the Frontier Medical and Dental College. All participants provided informed consent and the confidentiality in their medical statistics of the participants was guaranteed.

Non-probability consecutive sampling included 79 patients. Participants who met the study criteria were either gender who were aged over 18 years had a proven medical history of OSCC and having undergone primary treatment (surgery, radiotherapy, chemotherapy or a combination). Due to the limitation of confounding bias and a drive to create a source of uniformity, recurring malignancy or incomplete treatment documentation excluded patients.

All the participants were taken through a thorough extraoral and intraoral screening. The patient interviews and hospital records were used as the sources of data in the field of clinical data, such as the location of the tumor, the stage, and the way of treatment. Particular consideration was given to any aspect of complication after therapy that could change treatment in a post-traumatic period trismus, xerostomia, osteoradionecrosis, and periodontal compromise were some of them.

Orthodontic evaluation meant the assessment of the dental occlusal relationship, occlusal relationship and classification of malocclusions. Assessment of the degrees and existence of trinsum was assessed through mouth opening. When possible radiographic records were evaluated in order to assess quality of bones and identify contraindications towards orthodontic appliance. The possibility of the fixed apparatus treatment and the general necessity of orthodontic treatment was recorded in each of the cases.

Data were entered and analyzed using SPSS version 25. Descriptive statistics were presented as means with standard deviations for continuous variables and frequencies with percentages for

categorical variables. The chi-square test was applied to examine associations between categorical variables, with a p-value of <0.05 considered statistically significant.

RESULTS

A total of 79 patients with a history of treated oral squamous cell carcinoma (OSCC) were included in the study. The mean age was 56.3 ± 11.4 years. Males constituted the majority of the cohort. Most patients had undergone combined modality treatment, and several post-treatment complications were recorded that influenced orthodontic planning. The majority of patients were aged between 40–60 years, and a male predominance was observed. Smoking history showed a significant association with OSCC prevalence (p = 0.038), whereas socioeconomic status did not reach statistical significance.

Table 1: Demographic Characteristics of the Patients

Variable	Categories	Frequency (n)	Percentage (%)	p-value
Age Group	<40 years	9	11.4%	—
	40–60 years	38	48.1%	
	>60 years	32	40.5%	
Gender	Male	51	64.6%	—
	Female	28	35.4%	
Smoking History	Yes	45	57.0%	0.038*
	No	34	43.0%	
Socioeconomic Status	Low	36	45.6%	0.071
	Middle	29	36.7%	
	High	14	17.7%	

The tongue was the most common tumor site, followed by floor of mouth and gingiva. A significant number of patients presented at an advanced stage (III–IV) (p = 0.024). Most patients had undergone combination therapy, with surgery plus chemoradiotherapy being the most frequent (p < 0.001).

Table 2: Clinical Characteristics and Treatment History

Variable	Categories	Frequency (n)	Percentage (%)	p-value
Primary Tumor Site	Tongue	26	32.9%	—
	Floor of mouth	18	22.8%	
	Buccal mucosa	16	20.3%	
	Gingiva/alveolus	19	24.0%	
TNM Stage at Diagnosis	Stage I–II	35	44.3%	0.024*
	Stage III–IV	44	55.7%	
Treatment Modalities	Surgery only	11	13.9%	<0.001*
	Surgery + Radiotherapy	27	34.2%	
	Surgery + Chemoradiotherapy	31	39.2%	
	Radiotherapy only	5	6.3%	
	Chemoradiotherapy only	5	6.3%	
Time Since Treatment	<1 year	12	15.2%	—
	1–3 years	39	49.4%	
	>3 years	28	35.4%	

Post-treatment complications were common among patients, with xerostomia being the most prevalent. These complications showed statistically significant associations with potential limitations for orthodontic treatment, especially in cases of trismus and osteoradionecrosis.

Table 3: Post-treatment Complications Affecting Orthodontic Care

Complication	Presence (Yes)	Frequency (n)	Percentage (%)	p-value
Trismus	Yes	28	35.4%	0.015*
Osteoradionecrosis (ORN)	Yes	9	11.4%	0.042*
Xerostomia	Yes	41	51.9%	<0.001*
Periodontal Compromise	Yes	33	41.8%	0.028*

More than half of the patients required orthodontic intervention, yet only 39.2% were feasible candidates for fixed appliance therapy due to complications and contraindications. Significant associations were observed between orthodontic need and treatment feasibility ($p < 0.05$).

Table 4: Orthodontic Assessment and Treatment Feasibility

Variable	Categories	Frequency (n)	Percentage (%)	p-value
Type of Malocclusion	Class I	25	31.6%	—
	Class II	29	36.7%	
	Class III	25	31.6%	
Orthodontic Treatment Need	Yes	42	53.2%	0.019*
	No	37	46.8%	
Fixed Appliance Feasibility	Yes	31	39.2%	0.022*
	No	48	60.8%	
Contraindications Present	Yes	38	48.1%	0.034*
	No	41	51.9%	

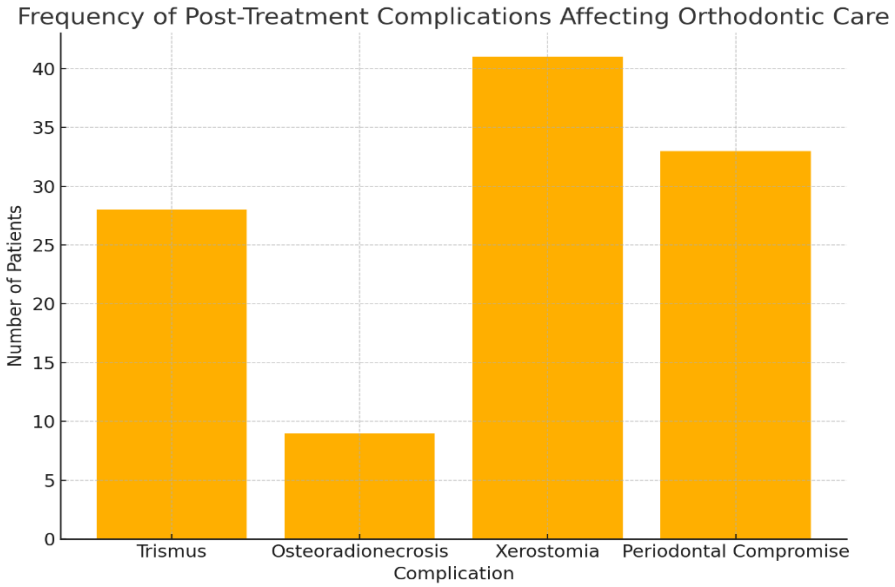

Figure 1: graph showing the frequency of post-treatment complications among patients with a history of OSCC that impact orthodontic care.

DISCUSSION

This study explored the orthodontic implications in patients with a history of oral squamous cell carcinoma (OSCC) treatment, a population often presenting with complex clinical challenges due to the consequences of oncologic therapy. The findings highlight how post-treatment effects such as

trismus, xerostomia, osteoradionecrosis, and periodontal compromise can significantly influence both the planning and execution of orthodontic interventions [10-12].

A substantial portion of the study population was male and middle-aged, which aligns with global epidemiological trends showing a higher OSCC incidence in males, particularly those with a history of tobacco use. The tongue and floor of the mouth were the most commonly affected anatomical sites, consistent with previously reported patterns in South Asian cohorts [13-15].

Most patients in this study received multimodal therapy, primarily combining surgery with chemoradiation. This aggressive approach, while effective for cancer control, is often associated with long-term complications. Xerostomia, reported in over half the patients, is particularly problematic as it predisposes to dental caries, mucosal discomfort, and reduced appliance tolerance. Similar observations emphasized the burden of salivary gland hypofunction in head and neck cancer survivors [16, 17].

Trismus was noted in more than one-third of patients, significantly limiting oral access and complicating the placement and adjustment of orthodontic appliances. This finding parallels the studies documented persistent mandibular hypomobility as a common sequela following radiotherapy and surgical intervention in the orofacial region [18].

Furthermore, nearly 42% of patients in this cohort exhibited periodontal compromise. Periodontal health is essential for orthodontic movement, and its deterioration often exacerbated by radiation has been reported by studies to influence tooth mobility and anchorage planning [19].

Another important observation was that only 39.2% of the patients were deemed suitable for fixed orthodontic appliances. Many were ruled out due to contraindications such as irradiated bone, poor oral hygiene, or insufficient anchorage, echoing conclusions of study, who recommended cautious orthodontic planning in post-oncology cases [20].

Despite these challenges, over half the participants expressed a clinical or personal need for orthodontic treatment, often for aesthetic or functional reasons. This underlines the importance of integrating orthodontic consultations into the long-term rehabilitation plans for OSCC survivors.

CONCLUSION

Patients who have undergone treatment for oral squamous cell carcinoma often face multiple residual complications that can complicate orthodontic care. Factors such as xerostomia, trismus, and compromised periodontal health are common and significantly influence treatment feasibility. While the need for orthodontic intervention remains considerable, careful case selection, multidisciplinary coordination, and a modified approach to appliance design are crucial to ensure safe and effective outcomes. Personalized treatment strategies should be tailored with consideration of each patient's oncologic history, oral function, and long-term prognosis.

REFERENCES

1. Qureshi, T., D. Mishra, and H. Priya, *Role of orthodontics in prevention of oral cancer: An appraisal of controversies.* Cancer Research, Statistics, and Treatment, 2023. **6**(1): p. 128-130.
2. Alam, M.K., et al., *A Systematic Review and Meta-Analysis of the Impact of Cancer and Its Treatment Protocol on the Success of Orthodontic Treatment.* Cancers, 2023. **15**(22): p. 5387.
3. Mitus-Kenig, M., et al., *Quality of life in orthodontic cancer survivor patients—a prospective case–control study.* International Journal of Environmental Research and Public Health, 2020. **17**(16): p. 5824.
4. Ahmad, P., et al., *Risk factors associated with the mortality rate of oral squamous cell carcinoma patients: A 10-year retrospective study.* Medicine, 2021. **100**(36): p. e27127.
5. Haverman, T.M., et al., *Oral chronic graft-versus-host disease: what the general dental practitioner needs to know.* The Journal of the American Dental Association, 2020. **151**(11): p. 846-856.
6. Sami, A., et al., *The role of the microbiome in oral squamous cell carcinoma with insight into the microbiome–treatment axis.* International Journal of Molecular Sciences, 2020. **21**(21): p. 8061.

7. Menditti, D., et al., *Personalized medicine in oral oncology: Imaging methods and biological markers to support diagnosis of oral squamous cell carcinoma (OSCC): A narrative literature review.* Journal of Personalized Medicine, 2023. **13**(9): p. 1397.
8. Zettermann, P., et al., *MALIGNANT TRANSFORMATION OF PROLIFERATIVE VERRUCOUS LEUKOPLAKIA INTO ORAL SQUAMOUS CELL CARCINOMA AFTER A LONG FOLLOW-UP: SERIES OF 3 CASES.* Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology, 2022. **134**(3): p. e116-e117.
9. Yusuf, C.T., et al., *Ill-Fitting Dental Appliances and Oral Cancer: A Systematic Review and Case Report.* Face, 2023. **4**(3): p. 417-425.
10. Spoerl, S., et al., *Statin use ameliorates survival in oral squamous cell carcinoma—data from a population-based cohort study applying propensity score matching.* Biomedicines, 2023. **11**(2): p. 369.
11. Saravana Murthy, P., et al., *Evaluating the expression of microRNA-15a-5p and YAP1 gene in oral squamous cell carcinoma in comparison with normal tissue: A cross-sectional study.* Journal of Oral Pathology & Medicine, 2023. **52**(7): p. 593-600.
12. Zheng, S., et al., *RETRACTED ARTICLE: Dihydroartemisinin represses oral squamous cell carcinoma progression through downregulating mitochondrial calcium uniporter.* Bioengineered, 2022. **13**(1): p. 227-241.
13. Radermacher, A., et al., *HLA-E and Its Soluble Form as Indicators of a Sex-Specific Immune Response in Patients with Oral Squamous Cell Carcinoma.* International Journal of Molecular Sciences, 2023. **24**(23): p. 16699.
14. Khan, A., R.A. Warraich, and S. Ali, *Reconstruction of Intra-Oral Defects with Submental Artery Flap: A Comparison of pN+ and pN0 Oral Squamous Cell Carcinoma Patients.* Pakistan Journal of Medical & Health Sciences, 2023. **17**(09): p. 2-2.
15. Niu, Q., et al., *Progress of nanomaterials-based photothermal therapy for oral squamous cell carcinoma.* International Journal of Molecular Sciences, 2022. **23**(18): p. 10428.
16. Costa, I.F.V.D.J., et al., *INTRAMUCOSAL MELANOCYTIC NEVUS: CASE REPORT.* Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology, 2022. **134**(3): p. e109.
17. Cheng, H.-C., et al., *Evaluation of factors associated with the risk stratification of survivorship for stage IV squamous cell carcinoma of the oral cavity: A 10-year retrospective study.* Journal of the Chinese Medical Association, 2020. **83**(5): p. 491-499.
18. Lu, Y., et al., *The emerging role of exosomes in oral squamous cell carcinoma.* Frontiers in cell and developmental biology, 2021. **9**: p. 628103.
19. Maqsood, A., et al., *Expression of CD34 and α-SMA markers in oral squamous cell carcinoma differentiation. A histological and histo-chemical study.* International Journal of Environmental Research and Public Health, 2021. **18**(1): p. 192.
20. Lopes, A.D.A.L.B., et al., *SQUAMOUS CELL CARCINOMA IN A NONSMOKER YOUNG PATIENT: A CASE REPORT.* Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology, 2022. **134**(3): p. e109.