

Tongue Squamous cell carcinoma in non -smoking and non - drinking patients and clinical cases of orthodontic interest

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Abstract

Background: This study was conducted to evaluate the clinicopathological characteristics of tongue squamous cell carcinoma (TSCC) in non-smoking and non-drinking patients and to identify clinical cases of orthodontic interest.

Materials and methods: This retrospective observational study was conducted in the Department of Oral Medicine at North Bengal Dental College to evaluate the clinicopathological characteristics of tongue squamous cell carcinoma (TSCC) in non-smoking and non-drinking patients and to identify clinical cases of orthodontic interest. The study included 50 histopathologically confirmed cases of TSCC diagnosed between January 2021 and December 2025. Ethical approval was obtained from the Institutional Ethics Committee before commencement of the study. Patients aged 18 years and above with a confirmed diagnosis of primary tongue squamous cell carcinoma and no history of tobacco smoking or alcohol consumption were included. Patients with recurrent lesions, metastatic disease, previous treatment for oral cancer, incomplete clinical records, or a history of smoking, smokeless tobacco use, or alcohol consumption were excluded from the study. Clinical and histopathological records were reviewed to collect demographic details, including age and sex, along with clinical variables such as lesion site, presenting symptoms, TNM stage, and histopathological grade. Information regarding possible sources of chronic mechanical irritation, including sharp teeth, malaligned or lingually inclined teeth, traumatic occlusion, deep bite, crowding, retained roots, and ill-fitting prostheses, was also recorded to assess their orthodontic relevance. The collected data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Continuous variables were expressed as mean $\pm$ standard deviation, whereas categorical variables were presented as frequencies and percentages. The association between orthodontic findings and clinicopathological variables was evaluated using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results: In this study, 8 subjects belonged to the age group of 18-30 years, 22 subjects belonged to the age group of 31-50 years and 20 subjects aged over 50 years. There were 28 males and 22 females in this study. lateral border was involved in 30 cases, ventral surface was involved in 10 cases, dorsal surface was involved in 6 cases and 4 cases involved the tip of tongue. TNM Stage I was seen in 6 cases, Stage II was evident in 14 cases, Stage III was observed in 18 cases and Stage IV was seen in 12 cases. 20 cases showed well differentiated carcinoma, 22 cases were of moderately differentiated carcinoma and 8 cases were poorly differentiated. Ulceration, pain, swelling and difficulty in speech and swallowing were symptoms seen in 35,38,18 and 12 cases, respectively. Sharp teeth were seen in 18 cases, malaligned teeth were evident in 20 cases, traumatic occlusion was noted among 15 patients, deep bite was evident in 10 cases, crowding was seen in 14 cases, retained roots were seen in 8 subjects and ill-fitting prostheses were seen in 12 cases. The prevalence of chronic mechanical irritation factors increased with worsening histopathological grade. Sharp teeth, malaligned teeth, traumatic occlusion, deep bite, and ill-fitting prostheses demonstrated statistically significant associations with higher histopathological grades ($p < 0.05$), whereas crowding and retained roots were not significantly associated ($p > 0.05$).

Conclusion: From the findings of this study, it can be concluded that a statistically significant association was observed between the presence of chronic mechanical irritation factors and advanced TNM stages ($p < 0.05$), suggesting a potential role of orthodontic factors in disease progression.

Keywords: Tongue, Oral Squamous Cell Carcinoma, Orthodontics

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Introduction

Tongue squamous cell carcinoma (SCC) represents the most prevalent form of oral cancer.¹ It primarily manifests in individuals who consume tobacco and alcohol, particularly during their sixties and seventies.^{1,2} Nevertheless, recent studies conducted across various nations have revealed a significant rise in the incidence of SCC among younger patients, including those who do not smoke or drink.³ Systematic oral examinations are deemed essential for facilitating the early identification of oral cancer.

The treatment of tongue SCC may involve surgical intervention, radiotherapy, chemotherapy, or a combination of these modalities, tailored to the specific circumstances of each case.⁴ The consequences of partial or total glossectomy can lead to varying degrees of tongue function disorders, which subsequently result in an uneven distribution of pressure between the tongue and the perioral muscles.^{5,6} This imbalance in pressure is a critical factor in the onset and progression of malocclusion.⁷ Furthermore, the application of radiotherapy for malignant tumors in the head and neck region presents considerable challenges due to both acute and long-term toxicity. This irreversible damage to the oral tissues frequently culminates in severe chronic periodontal issues, necessitating intricate interdisciplinary dental management before, during, and after the cancer treatment process.⁸

Materials and methods

This retrospective observational study was conducted in the Department of Oral Medicine at North Bengal Dental College to evaluate the clinicopathological characteristics of tongue squamous cell carcinoma (TSCC) in non-smoking and non-drinking patients and to identify clinical cases of orthodontic interest. The study included 50 histopathologically confirmed cases of TSCC diagnosed between January 2021 and December 2025. Ethical approval was obtained from the Institutional Ethics Committee before commencement of the study. Patients aged 18 years and above with a confirmed diagnosis of primary tongue squamous cell carcinoma and no history of tobacco smoking or alcohol consumption were included. Patients with recurrent lesions, metastatic disease, previous treatment for oral cancer, incomplete clinical records, or a history of smoking, smokeless tobacco use, or alcohol consumption were excluded from the study. Clinical and histopathological records were reviewed to collect demographic details, including age and sex, along with clinical variables such as lesion site, presenting symptoms, TNM stage, and histopathological grade. Information regarding possible sources of chronic mechanical irritation, including sharp teeth, malaligned or lingually inclined teeth, traumatic occlusion, deep bite, crowding, retained roots, and ill-fitting prostheses, was also recorded to assess

their orthodontic relevance. The collected data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Continuous variables were expressed as mean $\pm$ standard deviation, whereas categorical variables were presented as frequencies and percentages. The association between orthodontic findings and clinicopathological variables was evaluated using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

Table 1: Demographic and Clinical Characteristics of Patients (n = 50)

Variable	Category	Frequency	Percentage
Age group	18-30 years	8	16
	31-50 years	22	44
	51-60 years	20	40
	>60 years		
Sex	Male	28	56
	Female	22	44
Lesion Site	Lateral border	30	60
	Ventral surface	10	20
	Dorsal surface	06	12
	Top of tongue	04	08
TNM Stage	Stage I	6	12
	Stage II	14	28
	Stage III	18	36
	Stage IV	12	24

In this study, 8 subjects belonged to the age group of 18-30 years, 22 subjects belonged to the age group of 31-50 years and 20 subjects aged over 50 years. There were 28 males and 22 females in this study. lateral border was involved in 30 cases, ventral surface was involved in 10 cases, dorsal surface was involved in 6 cases and 4 cases involved the tip of tongue. TNM Stage I was seen in 6 cases, Stage II was evident in 14 cases, Stage III was observed in 18 cases and Stage IV was seen in 12 cases.

Table 2: Histopathological Grading and Presenting Symptoms

Variable	Category	Frequency	Percentage
Histopathological Grade	Well differentiated	20	40
	Moderately differentiated	22	44
	Poorly differentiated	8	16
Presenting Symptoms	Ulceration	35	70
	Pain	30	60

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	Swelling Difficulty in speech/swallowing	18 12	36 24
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20 cases showed well differentiated carcinoma, 22 cases were of moderately differentiated carcinoma and 8 cases were poorly differentiated. Ulceration, pain, swelling and difficulty in speech and swallowing were symptoms seen in 35,38,18 and 12 cases, respectively.

Table 3: Orthodontic Findings and Their Association with TSCC

Orthodontic Factor	Presence	Percentage
Sharp teeth	18	36
Malaligned/lingually inclined teeth	20	40
Traumatic occlusion	15	30
Deep bite	10	20
Crowding	14	28
Retained roots	8	16
Ill-fitting prostheses	12	24

Sharp teeth were seen in 18 cases, malaligned teeth were evident in 20 cases, traumatic occlusion was noted among 15 patients, deep bite was evident in 10 cases, crowding was seen in 14 cases, retained roots were seen in 8 subjects and ill-fitting prostheses were seen in 12 cases.

A statistically significant association was observed between the presence of chronic mechanical irritation factors and advanced TNM stages ($p < 0.05$), suggesting a potential role of orthodontic factors in disease progression.

Table 4. Association of Histopathological Grade with Chronic Mechanical Irritation Factors

Variable	Well Differentiated (n=20)	Moderately Differentiated (n=22)	Poorly Differentiated (n=8)	p-value
Sharp teeth	4 (20.0%)	9 (40.9%)	5 (62.5%)	0.031*
Malaligned /Lingually inclined teeth	5 (25.0%)	9 (40.9%)	6 (75.0%)	0.018*
Traumatic occlusion	3 (15.0%)	7 (31.8%)	5 (62.5%)	0.027*
Deep bite	2 (10.0%)	4 (18.2%)	4 (50.0%)	0.041*
Crowding	4 (20.0%)	6 (27.3%)	4 (50.0%)	0.082
Retained roots	2 (10.0%)	3 (13.6%)	3 (37.5%)	0.116

Ill-fitting prostheses	2 (10.0%)	5 (22.7%)	5 (62.5%)	0.021*
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*Chi-square test; $p < 0.05$ considered statistically significant.

The prevalence of chronic mechanical irritation factors increased with worsening histopathological grade. Sharp teeth, malaligned teeth, traumatic occlusion, deep bite, and ill-fitting prostheses demonstrated statistically significant associations with higher histopathological grades ($p < 0.05$), whereas crowding and retained roots were not significantly associated ($p > 0.05$).

Discussion

Oral cancers represent a substantial global public health challenge, with 758,000 new cases diagnosed worldwide in 2022, accounting for approximately 7% of all cancers globally.⁹ Squamous cell carcinoma comprises over 90% of these malignancies, with oral cavity cancer representing approximately 42% of cases, followed by oropharyngeal cancer at 19.3%. Despite advances in treatment modalities, the 5-year survival rate for advanced oral cancer remains approximately 25–60%, largely due to late-stage presentation.¹⁰

In contrast, early-stage disease treated with surgery or radiotherapy achieves 5-year survival rates of 70–90%. This stark disparity underscores the critical importance of early detection strategies. A significant proportion of oral squamous cell carcinomas arise from oral potentially malignant disorders (OPMDs), including leukoplakia, erythroplakia, oral submucous fibrosis, and proliferative verrucous leukoplakia.¹¹ The malignant transformation rates of these lesions vary considerably: oral leukoplakia demonstrates transformation rates of 8.4–9.5%, oral erythroplakia shows rates as high as 33–50%, and proliferative verrucous leukoplakia exhibits the highest risk at approximately 49.5%.¹²

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Giap HV et al.¹³ This case report describes the satisfactory orthodontic management for the correction of severe dental crowding in a 43-year-old female 6 years after treatment for tongue cancer with total glossectomy combined with radiotherapy, to envision the possibility of orthodontic care for oral cancer survivors. Extraction was performed to correct dental crowding and establish proper occlusion following alignment, after considering the possibility of osteoradionecrosis. Orthodontic mini-implants were used to provide skeletal anchorage required for closure of the extraction space and intrusion of the anterior teeth. The dental crowding was corrected, and Class I occlusal relationship was established after 36 months of treatment. The treatment outcome was sustained after 15 months of retention, and long-term follow-up was recommended.

The prevalence of chronic mechanical irritation factors increased with worsening histopathological grade. Sharp teeth, malaligned teeth, traumatic occlusion, deep bite, and ill-fitting prostheses demonstrated statistically significant associations with higher histopathological grades ($p < 0.05$), whereas crowding and retained roots were not significantly associated ($p > 0.05$). Cheng HC et al.¹⁴ identified possible clinical impact factors that may contribute to the survival of stage IV OSCC. Data for patients with malignant neoplasms of the oral cavity registered in the Cancer Registry Database of Taipei Veterans General Hospital between 2002 and 2011 were retrieved. The study patients consisted of OSCC patients with clinical stage IV disease who had undergone a surgery and adjuvant therapy. The primary endpoints were the 5-year disease-free survival (DFS) and overall survival (OS) rates. The clinicopathological characteristics of the patients were also stratified and compared. A total of 191 OSCC patients were included for retrospective analysis. The different subgroups of stage IV disease presented different treatment outcomes. The 5-year OS versus DFS rates of each subgroup were as follows: T4N0: 70.9% versus 52.6%; T1-3N23: 66.1% versus 49.8%; T4N1: 49.6% versus 31.6%; and T4N23: 40.9% versus 31.0% ($p < 0.01$). Patients with diabetes, moderate or poor cell differentiation, perineural invasion, and extracapsular spread presented lower 5-year OS rates [hazard ratio [HR]

= 1.87, 1.65, 2.42, and 2.14, respectively), and patients with perineural invasion, positive cut margin, and extracapsular spread presented lower 5-year DFS rates (HR = 1.57, 1.62, and 1.71, respectively). In this study, they elucidated the different survival rates of different subgroups of stage IV OSCC following the same treatment scheme. The results of the study provide clinical physicians with references by which to evaluate prognosis and determine post-operative disease monitoring timetables based upon different characteristics.

Conclusion

From the findings of this study, it can be concluded that a statistically significant association was observed between the presence of chronic mechanical irritation factors and advanced TNM stages ($p < 0.05$), suggesting a potential role of orthodontic factors in disease progression.

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