



A Case Series Exploring the Paradox of Teeth as Both a Vital Tool and a Potential Harm

Busaidurai S¹, Aravindha Babu N², Masthan KMK³, Anitha N⁴,

¹PG Student, Department of Oral Pathology and Microbiology, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research (BIHER), Bharath University, Chennai, Tamil Nadu, India.

²Professor & Head, Department of Oral Pathology and Microbiology, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research (BIHER), Bharath University, Chennai, Tamil Nadu, India.

³Professor, Department of Oral Pathology and Microbiology, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research (BIHER), Bharath University, Chennai, Tamil Nadu, India.

⁴Reader, Department of Oral Pathology and Microbiology, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research (BIHER), Bharath University, Chennai, Tamil Nadu, India.

Corresponding Author:

Surekha Busaidurai

PG Student, Department of Oral Pathology and Microbiology, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research (BIHER), Bharath University, Chennai, Tamil Nadu, India.

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KEYWORDS

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ABSTRACT:

Background

Oral squamous cell carcinoma (OSCC) is a major public health burden, especially in the Indian subcontinent, where it ranks as the second most common cancer. While tobacco and alcohol use remain dominant risk factors, a growing number of cases in habit-free individuals point toward other overlooked etiologies—most notably, chronic mucosal trauma from sharp teeth or defective prostheses.

Objective

This case series aims to explore the underrecognized link between persistent dental trauma and the development of OSCC in patients without conventional risk factors, emphasizing the role of routine dental examination in early detection and prevention.

Methods

Three female patients, aged between 34 and 53 years, presented with lesions on the lateral border of the tongue. None had a history of tobacco or alcohol use. All reported a history of chronic irritation from sharp teeth or dental restorations near the lesion site. Clinical evaluation, imaging, and histopathological examination confirmed OSCC in each case.

Results

The lesions ranged from 2 × 1 cm to 2 × 2 cm, all localized to the lateral tongue—an area particularly susceptible to trauma. Two patients are undergoing multimodal treatment including surgery, radiotherapy, and chemotherapy. Importantly, all cases lacked habit-related risk factors, strengthening the hypothesis of trauma-induced carcinogenesis.

Conclusion

These cases underscore the importance of considering chronic dental trauma as a significant co-factor in OSCC pathogenesis, particularly among non-smokers. A routine check for sharp cusps and mucosal trauma should be integral to every dental examination. As this series demonstrates, early



recognition of seemingly minor injuries can prevent life-threatening outcomes reaffirming that the most advanced form of treatment remains prevention.

INTRODUCTION

The human dentition is a remarkable biological tool, indispensable for mastication, articulation, aesthetics, and overall oral functionality. However, under certain circumstances, this vital asset can paradoxically become a source of chronic harm, particularly when compromised by anatomical sharpness, misalignment, attrition, defective restorations, or ill-fitting prostheses. Despite its clinical significance, trauma from sharp teeth and prosthetic appliances is frequently underappreciated or ignored by both patients and dental professionals. Unfortunately, what is often perceived as a minor or routine discomfort may evolve into a catalyst for serious pathology.¹

Chronic mechanical irritation of the oral mucosa has long been speculated to play a role in carcinogenesis, especially when the trauma is persistent and occurs in anatomically vulnerable regions such as the lateral borders of the tongue. This area, due to its close proximity to occlusal and incisal surfaces, is particularly prone to repeated microtrauma, leading to sustained inflammation, cellular injury, and eventually, malignant transformation.^{2,3} The theory of trauma-induced carcinogenesis is further strengthened by the fact that many patients diagnosed with oral squamous cell carcinoma (OSCC) have no history of conventional risk factors such as tobacco or alcohol use.⁴

In the Indian subcontinent, where oral cancer ranks as the second most common malignancy and accounts for a substantial proportion of global oral cancer cases, emphasis has traditionally been placed on tobacco-related etiology. However, a growing body of evidence suggests that in non-smoking, non-drinking individuals particularly females chronic mucosal trauma may represent an underrecognized yet critical contributing factor.⁵ The mechanism behind this involves persistent inflammatory stimulation, the release of cytokines, oxidative DNA damage, and the inhibition of normal apoptotic processes all of which create a fertile ground for oncogenic mutations.²

In clinical practice, the implications of this association are profound. Routine dental examinations often focus

on caries, periodontal status, and prosthetic integrity, while signs of mucosal trauma are frequently overlooked unless symptomatic.¹ This neglect can delay the diagnosis of trauma-induced lesions that may undergo malignant transformation over time.

This case series aims to highlight the oncogenic potential of chronic mucosal trauma by presenting four patients each diagnosed with oral squamous cell carcinoma in the absence of traditional risk factors where persistent irritation from sharp teeth or restorations was the common thread. All cases involved females, with lesions localized to the lateral tongue, and all had a history of chronic trauma at the lesion site. Through these clinical narratives, we seek to emphasize the importance of identifying and managing dental trauma as a part of routine oral cancer prevention, reinforcing the adage that even small clinical signs, when ignored, can lead to devastating consequences.

CASE PRESENTATION

Case 1

A 44-year-old female patient reported to our outpatient department with a chief complaint of a persistent ulcer on the left lateral border of the tongue, which had been present for the past one month. The patient recalled being asymptomatic prior to this period, after which she began to notice a small ulcerative lesion in the aforementioned region. Over time, the lesion progressively enlarged, eventually attaining its current size.

The ulcer was described as painless, though the patient experienced a burning sensation, particularly during the consumption of spicy foods. Additionally, she reported occasional bleeding from the lesion site while brushing her teeth. There was no history of dysphagia (difficulty swallowing), hoarseness of voice, or referred ear pain.

The patient did not have any significant medical history and denied any use of tobacco, alcohol, or other deleterious habits commonly associated with oral carcinogenesis. However, she did give a history of extraction of the lower left molars (tooth numbers 36 and



37) approximately three years ago. Although the extracted area had healed uneventfully, she was unable to recall if any sharp cusps or traumatic occlusion had developed post-extraction in the adjacent teeth.

The absence of traditional risk factors such as tobacco usage, combined with the lesion's location on the lateral tongue—an area frequently subjected to mechanical trauma—prompted a clinical suspicion of chronic irritation-induced pathology. Further clinical examination and diagnostic work-up were subsequently performed to evaluate the lesion.



Figure 1 : Traumatic ulcer on left lateral border of the tongue

On clinical examination, a 2×2 cm ulcero-infiltrative lesion was noted on the left lateral border of the tongue. The lesion extended anteriorly up to 1 cm from the tip of the tongue and posteriorly up to 1 cm anterior to the circumvallate papilla, without crossing the midline. It also extended slightly onto the ventral surface of the tongue, but there was no involvement of the floor of the mouth.

On palpation, the lesion was firm in consistency, non-tender, and the base was indurated. The floor of the ulcer was covered with slough, and there were no signs of secondary infection or necrosis.

Regional lymph nodes were not palpable, suggesting the absence of clinically evident nodal involvement at the time of examination. Tongue mobility was preserved, indicating that the lesion had not infiltrated the intrinsic or extrinsic musculature significantly.

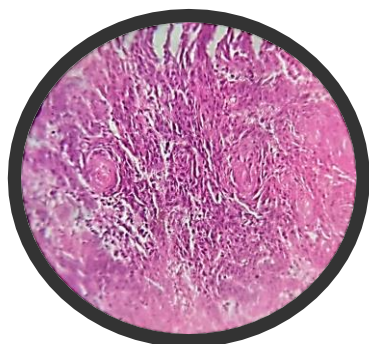
Radiographic evaluation with an orthopantomogram (OPG) revealed no evidence of bone erosion or involvement of the mandible. Further imaging with contrast-enhanced computed tomography (CT) of the maxilla and mandible was performed, which did not demonstrate any significant cervical lymphadenopathy or deep tissue invasion.

Based on the clinical and radiological findings, a provisional diagnosis of Carcinoma of the Left Lateral Border of the Tongue, staged as pT2N0, was made in accordance with the AJCC TNM classification.

To establish a definitive diagnosis, an incisional biopsy of the lesion was subsequently carried out.



Figure 2 : Macroscopic Image: Two soft tissue specimens were received, measuring $0.8 \times 1.0 \times 0.5$ cm in aggregate. The tissue fragments were irregular in shape, with a whitish-brown coloration and firm consistency on palpation. No surface ulceration, hemorrhage, or necrotic areas were grossly evident.



40X VIEW

Figure 3 : Histopathological section of the given specimen shows dysplastic surface epithelium in few areas which is of stratified squamous type and ulcerated in few areas with underlying connective tissue stroma. The epithelium shows dysplastic features such as nuclear hyperchromatism, cellular pleomorphism and intraepithelial keratin pearl formation. The malignant epithelial cells are seen invading the connective tissue in the form of islands. The islands also exhibit dysplastic features. The stroma is moderately collagenized with diffuse dense chronic inflammatory cells infiltrate. Vascularity is moderate.

Following the confirmation of diagnosis through incisional biopsy, the patient underwent wide local excision of the primary lesion involving the left lateral border of the tongue. In addition, a comprehensive neck dissection was performed, involving the removal of cervical lymph nodes from Level I to Level IV to address any potential microscopic metastatic spread.

The surgical procedure was meticulously executed to preserve vital anatomical structures, including the sternocleidomastoid muscle (SCM), internal jugular vein (IJV), and the spinal accessory nerve (SAN), thereby minimizing functional and aesthetic morbidity.

The postoperative period was uneventful, and the patient was planned for adjuvant radiotherapy (RT), which is scheduled to commence the following week. This treatment approach aims to enhance local-regional control and reduce the risk of recurrence, in line with current oncologic protocols for Stage T2N0 oral squamous cell carcinoma.

Case 2

A 34-year-old female reported to our department with a chief complaint of a persistent ulcer on the right lateral border of the tongue, present for the past three months. Initially, the lesion was small and asymptomatic, but over time it gradually increased in size and became progressively more symptomatic.

During the first two months, the patient attempted self-medication with over-the-counter topical agents and analgesics, assuming the ulcer to be benign and transient. However, with no relief and a progressive worsening of symptoms, she consulted a local dentist approximately one month prior to her hospital visit. On examination, the dentist identified a sharp, offending third molar (tooth 48) adjacent to the ulcer, which was subsequently extracted. Despite the removal of the suspected traumatic tooth, the ulcer persisted and continued to enlarge, prompting the patient to seek further evaluation at our center.

The patient reported that the ulcer had become painful, especially during mastication and consumption of spicy foods, which triggered a burning sensation. Additionally, she complained of bleeding from the ulcer site while brushing her teeth, along with odynophagia (painful swallowing) and occasional referred pain to the right ear. However, she did not experience any hoarseness of voice.

There was no significant medical history, and the patient denied any tobacco use, alcohol consumption, or other known high-risk habits. Apart from the recent extraction of tooth 48, her dental history was unremarkable. The absence of conventional carcinogenic exposures raised suspicion of a non-habit-associated etiological factor, potentially related to chronic mechanical irritation from the previously retained sharp molar.



Figure 4 : Ulcer on Right Lateral Border of Tongue

Clinical examination revealed a 2×1 cm ulcero-proliferative lesion located on the right lateral border of the tongue, approximately 2 cm from the anterior tip, extending posteriorly toward the circumvallate papillae. The lesion remained unilateral, did not cross the midline, and was not involving the floor of the mouth. It was anatomically situated in the region adjacent to tooth 47, correlating with the area previously subjected to chronic irritation from the now-extracted tooth 48.

On palpation, the lesion was firm in consistency and elicited tenderness, particularly along its edges. The ulcer base was indurated, and the floor of the lesion was covered with slough, indicating ongoing necrosis and possible malignant infiltration. No evidence of secondary infection, hemorrhage, or exophytic growth was observed.

A right submandibular lymph node was palpable, mobile, and tender, suggestive of reactive or metastatic nodal involvement. Tongue mobility was preserved, with no signs of muscular infiltration or fixation, indicating localized disease without functional compromise at the time of evaluation.

Radiographic evaluation revealed no evidence of bone erosion in the mandible or surrounding bony structures, suggesting that the lesion had not infiltrated the osseous tissues.

Based on the clinical findings, including the firm, indurated lesion on the right lateral border of the tongue and the palpable right submandibular lymph node, a provisional diagnosis of oral squamous cell carcinoma (OSCC) of the right lateral tongue, staged as pT2N1, was made in accordance with the TNM classification.

An incisional biopsy of the lesion was performed to confirm the diagnosis. Once the histopathological diagnosis was established, the patient was thoroughly counseled regarding the nature of the disease, staging implications, and treatment options. Following discussion, the patient opted to seek further management at a specialized oncologic institute, and was referred accordingly.

To assess the extent of local and regional spread, a whole-body PET-CT scan was advised. The scan findings revealed infiltration of the base of the tongue on the right side, with involvement of the floor of the mouth, and extension across the midline into the left side. Additionally, the scan demonstrated tumor infiltration into adjacent anatomical structures, including the right pharyngeal wall, tonsillar fossa, and the retromolar trigone, indicating advanced local disease.

There was also significant involvement of Level I and Level II lymph nodes on the right side, consistent with nodal metastasis. However, no evidence of bony extension, erosion, or lytic changes was noted in the maxilla or mandible on imaging.

These findings collectively suggested locally advanced disease with nodal involvement, necessitating a multimodal approach to therapy including chemotherapy, radiation, and potentially targeted biological agents.

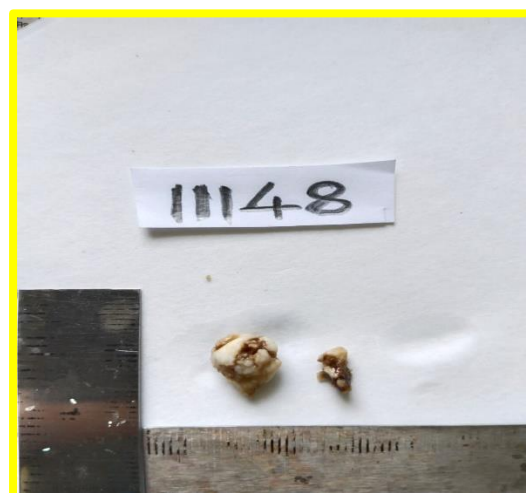
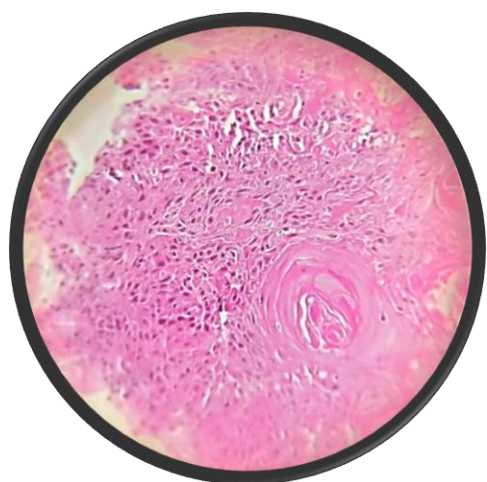


Figure 5 : Macroscopic Image: Two soft tissue fragments were received, collectively measuring $1.9 \times 1.9 \times 0.4$ cm.



The tissues were irregular in shape, exhibited a whitish-grey coloration, and were firm in consistency on palpation. No evidence of surface ulceration, hemorrhage, or necrosis was observed grossly.



40X VIEW

Figure 6: The histopathological section of the given specimen shows dysplastic parakeratinized stratified squamous epithelium. The epithelium exhibits hyperchromatism, altered nuclear cytoplasmic ratio, abnormal mitosis breach in the basement membrane. The malignant epithelial cells are seen invading the connective tissue in the form of single cell, sheets and islands. Numerous keratin pearl formation is noted. The stroma is moderately collagenized with chronic inflammatory cells infiltrate. Vascularity is moderate. Malignant cells are present adjacent to muscle fibres.

Based on the advanced nature of the disease as revealed by PET-CT, the patient was advised a multimodal treatment regimen comprising concurrent chemotherapy, targeted therapy, and radiotherapy, consistent with standard management protocols for locally advanced oral squamous cell carcinoma.

The patient was initiated on a treatment plan involving weekly administration of cisplatin, a platinum-based chemotherapeutic agent known for its radiosensitizing effects, in combination with nimotuzumab, a monoclonal antibody targeting the epidermal growth factor receptor

(EGFR). This targeted therapy was selected to enhance the therapeutic efficacy in tumors expressing EGFR, thereby improving local control and response rates.

In parallel, the patient was prescribed external beam radiotherapy (RT), delivered five days a week, over a course of seven weeks. As of the most recent follow-up, the patient had completed six weeks of therapy, including six cycles of concurrent cisplatin and nimotuzumab, and was continuing with the final phase of radiotherapy.

The patient is being closely monitored for treatment response and adverse effects, and the oncologic team plans to reassess disease status upon completion of the full treatment cycle using appropriate imaging and clinical evaluation.

Case 3

A 42-year-old female presented to the dental outpatient department with a primary complaint of decayed teeth in the right lower posterior region, accompanied by an ulcer on the right lateral border of the tongue that had been present for approximately three months.

The patient first became aware of a small ulcerative lesion on the right lateral side of her tongue around two months ago. The lesion progressively increased in size, but she attributed it to irritation caused by a decayed tooth in the same region. She described the decayed tooth as having sharp, irregular edges, which frequently came into contact with the tongue, particularly during chewing and speech. She also reported intermittent, sharp lancinating pain in the lower right jaw, exacerbated by cold food intake.

Believing the ulcer to be a result of the dental decay, the patient self-medicated with various over-the-counter analgesics and topical agents for nearly three months. Due to her focus on the dental pain, she did not initially seek treatment for the ulcer itself. She eventually presented to the hospital for evaluation of the decayed tooth, during which the ulcer was clinically examined for the first time.

The ulcer had become painful, and the patient reported a burning sensation during the intake of spicy foods, along with occasional bleeding while brushing. Despite the persistent nature of the lesion, she denied any associated dysphagia, ear pain, or hoarseness of voice.



The patient had no significant medical history, and she reported no tobacco use, alcohol consumption, or other known high-risk behaviors associated with oral carcinogenesis. The presence of a chronic traumatic dental source and a progressively enlarging lesion in a high-risk anatomical location—the lateral border of the tongue—raised strong clinical suspicion for trauma-induced malignant transformation.



Figure 7 : Ulcer on Right Lateral Border of Tongue

On intraoral examination, a 2 × 1 cm ulcero-proliferative lesion was identified on the right lateral border of the tongue. The lesion extended anteriorly up to 1 cm from the tip of the tongue and posteriorly to a point approximately 1 cm anterior to the circumvallate papillae. It remained localized, did not cross the midline, and extended partially onto the ventral surface of the tongue. Importantly, there was no involvement of the floor of the mouth.

On palpation, the lesion was firm in consistency and non-tender, with an indurated base, suggesting underlying fibrosis or infiltration. The floor of the ulcer was covered with necrotic slough, a common feature in malignancies, indicating ongoing tissue breakdown.

There were no signs of secondary infection, necrosis, or exophytic growth. The underlying mucosa appeared unremarkable. Regional lymph node examination revealed no palpable cervical lymphadenopathy, and tongue movements were within normal limits, indicating that the lesion had not invaded deep muscular planes or impaired tongue mobility.

10X VIEW



Figure 8 : Macroscopic Image : Multiple soft tissue fragments were received, collectively measuring 1.5 × 1.4 × 0.9 cm. The tissue pieces were irregular in shape, exhibited a greyish-black coloration, and were firm in consistency. No surface ulceration, hemorrhage, or necrotic areas were grossly identified.

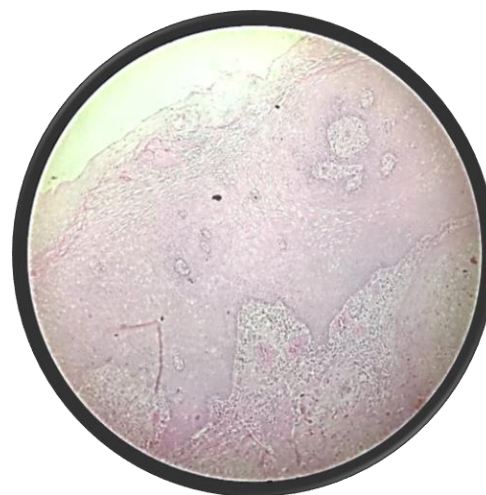


Figure 9: The Hematoxylin and Eosin stained histopathological section of the given specimen shows dysplastic surface epithelium with underlying connective tissue stroma. The epithelium is hyperplastic in nature and exhibits dysplastic features such as hyperchromatism, abnormal mitosis, altered nuclear cytoplasmic ratio, cellular and nuclear pleomorphism, loss of cellular cohesion, intraepithelial keratin pearl



formation and breach in the basement membrane. The malignani epithelial cells are seen invading the stroma in the form of sheets and islands. The sheets and islands also exhibits dysplastic features. Numerous attempt to form keratin pearls are seen. The stroma is moderately collagenized with dense chronic inflammatory cells infiltrate. Numerous endothelial lined blood vessels and extravasated RBCs are seen.

DISCUSSION

Oral cancer ranks as the sixth most common type of cancer worldwide, with India contributing significantly to the global burden. It is estimated that India records approximately 77,000 new cases and 52,000 deaths annually due to oral cancer, making it the second highest contributor globally after China.⁶ The incidence in India is considerably higher than in Western countries, and unfortunately, nearly 70% of cases are diagnosed at advanced stages, as per the American Joint Committee on Cancer (AJCC) reports.⁶ This delayed detection correlates with poor prognosis, with five-year survival rates as low as 20%, especially in late-stage presentations³.

While tobacco use remains the most established and significant etiological factor for oral squamous cell carcinoma (OSCC), several other risk factors have been recognized. These include poor oral hygiene, nutritional deficiencies, viral infections (such as Epstein-Barr Virus), and human papillomavirus (HPV) infection, particularly in younger individuals¹. However, an often overlooked but increasingly recognized factor is chronic mucosal trauma—a result of sharp teeth, ill-fitting prostheses, or faulty restorations.^{1,7}

The sharp tooth, although a part of normal dentition, may act as a “silent saboteur” - an entity that is readily accessible but seldom scrutinized in routine dental practice⁸. Often perceived as innocuous by both patients and practitioners, these sharp dental structures may cause persistent mechanical irritation to the oral mucosa. The adage "Devils disguise as angels" aptly describes this paradox, where a vital structure like a tooth becomes a potential carcinogen due to prolonged trauma.^{1,7}

Mechanism of Carcinogenesis in Mucosal Trauma

The biological plausibility of trauma-induced carcinogenesis lies in its chronic inflammatory pathway.

Continuous mechanical irritation leads to repetitive tissue damage, resulting in a pro-inflammatory microenvironment characterized by the release of cytokines, prostaglandins, and tumor necrosis factor (TNF).^{2,3} This cascade promotes oxidative stress, which, in turn, leads to genetic and epigenetic alterations.²

These alterations may result in:

- DNA damage and impaired repair mechanisms
- Aberrant transcriptional activity
- Suppression of apoptosis
- Induction of angiogenesis

Collectively, these events create a permissive environment for neoplastic transformation of oral epithelial cells.^{2,3}

Site-Specific Vulnerability: The Lateral Border of the Tongue

Epidemiological studies have consistently reported that the lateral border of the tongue is the most frequent site for OSCC development in both habit-associated and habit-free individuals.^{5,6} Interestingly, studies show that OSCC at this site occurs twice as often in non-smokers than in smokers.⁵ This further implicates mechanical trauma as a causative factor.

An Australian retrospective study highlighted that among non-habit-associated oral cancer patients, 61 % were females, and 40 % had dental abnormalities (such as sharp teeth or defective restorations) in direct proximity to the tumor site.⁷ This demographic pattern challenges the conventional notion that oral cancer is exclusively a disease of tobacco users and suggests a broader risk profile.

Relevance to the Present Case Series

Our case series underscores this overlooked correlation. All three patients were female, ranging from young to middle-aged adults, with no history of tobacco or alcohol use. All presented with lesions on the lateral border of the tongue, and in each case, a source of chronic trauma (sharp tooth or decayed molar) was identified adjacent to the lesion.



- Two patients are currently undergoing active treatment.
- One patient is awaiting incisional biopsy after consultation with family.

These findings emphasize the need for early detection and timely intervention. In each of these cases, a simple dental check-up with evaluation of occlusal interferences and sharp cusps could have potentially prevented the malignant transformation or led to an earlier diagnosis, significantly improving prognosis.¹

Clinical Implications and Recommendations

This case series serves as a strong reminder that oral health assessments must not merely focus on caries and periodontal status, but also include routine inspection of sharp cusps, broken teeth, and prosthesis integrity.¹ Just as "master health checkups" are encouraged for systemic diseases, "master dental checkups" should be promoted for oral health surveillance.

Furthermore:

- Dental professionals must be trained to recognize early mucosal changes due to trauma.⁸
- Public awareness should be raised about non-habit-related causes of oral cancer.^{4,5}
- Multidisciplinary collaboration between oral pathologists, oncologists, and dental surgeons is essential for early diagnosis and comprehensive management.^{1,8}

CONCLUSION

Oral squamous cell carcinoma, particularly in individuals without traditional risk factors, compels the dental community to re-examine subtle yet significant causes—chief among them being chronic mucosal trauma from sharp teeth, ill-fitting prostheses, or faulty restorations. This case series underlines how easily such causes can be overlooked by both patients and practitioners, yet how profoundly they may contribute to carcinogenesis. In the journey of healing, one truth stands immutable: the most advanced treatment ever since the evolution of mankind till date is prevention. No surgical precision, chemotherapeutic innovation, or targeted therapy can

rival the power of preventing disease before it takes root. As oral healthcare professionals, we are not just restorers of function but gatekeepers of early detection and prevention. The role of the clinician must extend beyond the tooth and into the microenvironment that harbors early pathological changes. That vigilance begins with mastering the fundamentals: a mirror, a probe, a light source, and most importantly a keen and trained eye. Every dental visit must be viewed as a golden opportunity to screen, educate, and intervene early. We must reinforce that oral cancer is not solely a smoker's disease. Chronic trauma, even in habit-free individuals, is a real and rising threat.

Negligence, whether in clinical practice or personal health, is no longer affordable. To reduce the burden of oral cancer, we must instill a culture of awareness, thorough examination, and proactive management. Just as "master health checkups" have become a staple in systemic care, "master dental checkups" must be normalized and emphasized across all age groups. Let us remember that to be a great physician—or a great dentist—is not only to cure, but to prevent, to educate, and to detect what others may dismiss. In doing so, we uphold our highest duty: to protect life with the wisdom of simplicity and the strength of foresight.

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