



Role of Computed Tomography in Evaluation of Oral Cavity Lesions

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Abstract

Background: The oral cavity and its floor are prone to various lesions that often require imaging for accurate assessment. CT is particularly valuable for evaluating bone involvement, soft tissue spread, and lesion extent. This study highlights CT’s role in diagnosing and characterizing oral lesions, guiding clinical decisions by mapping disease progression and adjacent structure involvement.

Materials & Methods: A prospective descriptive analysis of 60 patients presenting with lesions and associated symptoms of oral cavity had undergone computed tomography of the oral cavity for assessing various benign and malignant conditions of the oral cavity and their imaging appearance on the basis of enhancement pattern and intensity.

Results & Discussion: Out of 60 cases of oral cavity lesions were divided based on enhancement and intensity on computed tomography, showing contrast enhancement (71.7%), no contrast enhancement (15%), varying enhancement (13.3%) and on intensity, with lesions appearing iso/hyperdense (71.7%), hypodense (28.3%) Various cases reported as per different CT findings include –

- Benign (41.7%)- Branchial cleft cyst, Thyroglossal duct cyst, Lingual thyroid, dermoid, Ludwig’s angina, simple and diving ranula, polyostotic fibrous dysplasia and ameloblastoma
- Malignant (58.3%)- Squamous cell carcinoma of oral cavity

Conclusions: CT’s accuracy in distinguishing benign from malignant lesions is clinically meaningful, though histopathology remains the gold standard. A multidisciplinary approach that includes imaging, clinical

evaluation, and pathology is crucial for optimal management of oral cavity lesions.

Keywords: Oral cavity, benign, malignant, squamous cell carcinoma, enhancement pattern.

Introduction

The oral cavity and its floor are critical anatomical regions that serve as common sites for both benign and malignant disease processes. These areas are also susceptible to disease extension from adjacent spaces due to the complex anatomy and the close proximity of multiple soft tissue compartments. The mylohyoid muscle, which separates the sublingual and submandibular spaces, plays a key role in disease localization and dissemination.¹

Clinically, many oral lesions are submucosal, rendering visual and tactile examinations insufficient. Hence, imaging becomes indispensable in identifying the lesion's nature, extent, and anatomical involvement. Among available imaging modalities—ultrasound, MRI, and PET/CT—computed tomography (CT) has emerged as a vital tool due to its ability to accurately assess cortical bone involvement, detect calcifications, evaluate soft tissue structures, and produce multiplanar reconstructions rapidly.²

This study aims to explore and evaluate the specific role of CT in diagnosing and characterizing various oral cavity lesions, mapping their spread, assessing involvement of adjacent structures, and contributing to clinical decision-making.³

Aims and Objectives

Aim: To assess the utility of computed tomography in the evaluation of oral cavity lesions.

Objectives:

1. To classify oral cavity lesions as benign or malignant.

2. To evaluate the extent of lesion involvement including muscles, vasculature, and bones.
3. To determine the diagnostic accuracy of CT in identifying and characterizing oral cavity lesions.

Materials & Methods

Study Design: Prospective descriptive study at the Department of Radiodiagnosis, MGM Medical College, Navi Mumbai.

Duration: November 2022 – December 2023

Sample Size: 60 patients, aged 18–75 years, presenting with lesions and associated symptoms of oral cavity.

Inclusion Criteria

- Patients presenting with lesions and associated symptoms of oral cavity.
- Aged 18–75 years
- Informed consent

Exclusion Criteria

- Age <18 or >75 years
- Pregnant or lactating women
- Patient not willing to give consent

Materials

CT chest using Toshiba 16-slice and Fujifilm 128-slice machines.

Data Analysis

GraphPad InStat v3.0. Statistical significance set at $p < 0.05$.

Results & Discussion

Demographics and Risk Factors

- Gender: 73.3% were male; 26.7% female
- Age: Most patients (53.3%) were between 31–45 years; 38.3% were between 46–60 years
- Comorbidities: Hypertension (8.3%), Diabetes (11.7%)

Risk Factors

- Smokeless tobacco use: 75%

- Smoking: 21.7%
- Alcohol: 10%
- Poor oral hygiene: 55%
- History of radiation exposure: 15%

Clinical Presentation

Pain (33.3%), Swelling (61.7%), Dysphagia (46.7%), Redness (65%)

Lesion Characteristics

- Most common site: Buccal mucosa (53.4%), followed by floor of mouth (18.4%)
- Shape: Irregular (53.2%) was the most common
- Margins: Ill-defined in 65%, well-defined in 35%
- Consistency: Hard (38.3%) and soft (36.7%) lesions were most frequent
- Calcification: Present in 21.7%
- Bone invasion: Present in 15%

CT Imaging Findings

- Enhancement: Present in 71.7%
- Density: Iso-/Hyperdense in 71.7%; Hypodense in 28.3%
- Lesion classification: 58.3% malignant; 41.7% benign

Diagnostic Correlation

- CT vs Histopathology:

14 benign lesions correctly identified

24 malignant lesions correctly identified

Out of 60 cases of oral cavity lesions were divided based on enhancement and intensity on computed tomography, showing contrast enhancement (71.7%), no contrast enhancement (15%), varying enhancement (13.3%) and on intensity, with lesions appearing iso/hyperdense (71.7%), hypodense (28.3%)

Various cases reported as per different CT findings include –

- Benign (41.7%)- Branchial cleft cyst, Thyroglossal duct cyst, Lingual thyroid, dermoid, Ludwig's angina, simple and diving ranula, polyostotic fibrous dysplasia and ameloblastoma
- Malignant (58.3%)- Squamous cell carcinoma of oral cavity

Discussion

CT imaging proved effective in delineating oral cavity lesions, especially for assessing:

- Lesion morphology (size, shape, margins)
- Bone involvement
- Lesion enhancement and density
- Anatomical relationships to adjacent muscles and vascular structures

The findings demonstrated that CT was moderately accurate in differentiating benign from malignant lesions. In 24 of 35 malignant cases, CT findings were consistent with histopathology. CT also facilitated early detection of complications like bone erosion and lymphadenopathy, vital for staging and treatment planning.

Compared with similar studies:

- Abdeldayem et al. noted CT's role in defining lesion consistency and margins.
- Close et al. emphasized CT's utility in detecting nodal metastases, with high correlation to histopathology.
- Shah et al. found CT scans reliable for TNM staging of SCC.
- Arijji et al. showed deep learning with CT imaging can match radiologist-level accuracy in lymph node metastasis prediction.

Despite limitations such as radiation exposure and reduced soft tissue contrast (compared to MRI), CT remains indispensable, particularly in acute cases or when MRI is contraindicated or unavailable.



Figure 1: The right submandibular gland and the right sternocleidomastoid muscle are displaced anteriorly and posteriorly, respectively, as a result of a rounded cystic structure (arrows) shown on an axial postcontrast CT scan taken at the level of the floor of the mouth and anterolateral to the carotid artery. The pathology imaging showed a second branchial cleft cyst.

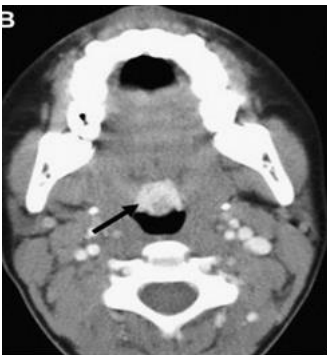


Figure 2: Lingual thyroid: A 20-year-old woman's axial CT scan at the base of her tongue and foramen cecum shows a sizable hyperdense mass (black arrow). A lingual thyroid is indicated by uptake at the foramen cecum level on a radioiodine scan. The rest of the neck showed no thyroid tissue.

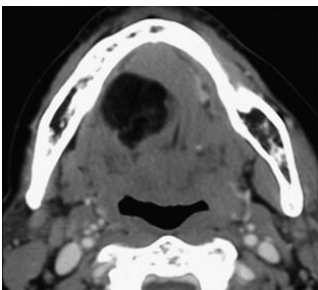


Figure 3: Fat-containing lesion in the floor of the mouth in a 28-year-old man is consistent with dermoid

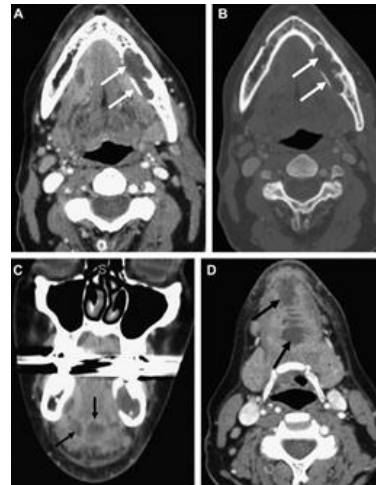


Figure 4: Ludwig's odontogenic infection-related angina. An enormous lytic region with irregular edges in the left mandible (white arrows) and concomitant widespread inflammatory changes (cellulitis) involving the floor of the mouth are shown on axial and coronal postcontrast CT scans of a 38-year-old male with severe odynophagia. Black arrows indicate areas of peripheral augmentation and central hypodensity in the oral tongue and floor of the mouth.

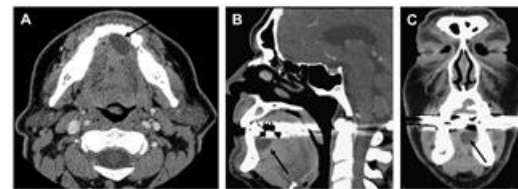


Figure 5: Simple ranula. Axial, sagittal, and coronal images at the floor of the mouth demonstrate a well-defined hypodense lesion (black arrows) in the left sublingual space consistent with a simple ranula.

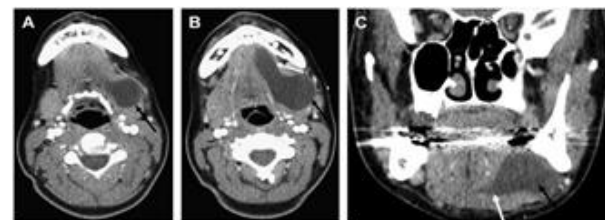


Figure 6: Diving ranula. Axial and coronal ontrast-enhanced CT images reveal a cystic lesion in the submandibular region (black arrows) with a tail-like extension (white arrow) into the sublingual space.

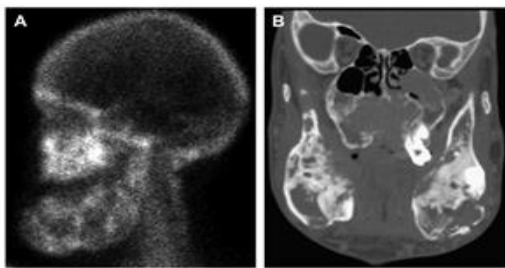


Figure 7: (A, B) Polyostotic fibrous dysplasia. An aberrant growth of the mandibular condyles, rami, and body, along with areas of sclerosis and cystic lucency associated with fibrous dysplasia, are seen on a coronal CT scan performed at the mandibular level. An abnormal thickening, expansion, and uptake in the mandible is shown by a bone scan. [16]



Figure 8: Ameloblastoma. A 64-year-old man with ameloblastoma has a massive multiloculated expansile lucent lesion (white arrows) with thick enhancing septae and solid sections of enhancement on axial and coronal postcontrast pictures. (black arrow) [45]

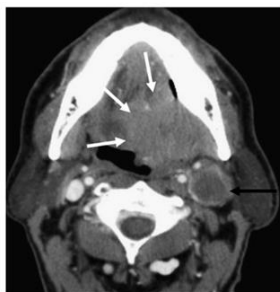


Figure 9: Contrast-enhanced CT axial image in a 55-year-old male smoker with SCC of the tongue demonstrates an enhancing soft tissue mass involving the left oral tongue (white arrows) with extension to the

midline. There is also a large necrotic-appearing left level 2 lymph node (black arrow) consistent with nodal metastasis.

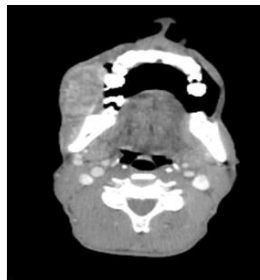


Figure 10: Contrast-enhanced CT axial image in a 45-year-old male smoker with SCC of buccal mucosa demonstrates an enhancing soft tissue mass involving the Right buccal space. There is also involvement of inferior and superior gingivobuccal sulcus.

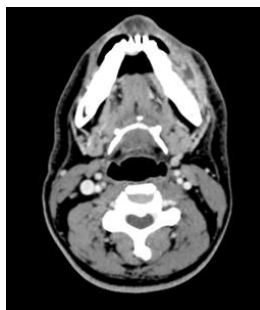


Figure 11: Contrast enhanced CT scan (Axial section) in a 54-year old male with SCC of Buccal mucosa demonstrates an enhancing soft-tissue mass involving the Left buccal space.

Table 1: Features observed on CT scan

Features	Frequency (n)	Percentage (%)
Enhancement		
Present	43	71.7
Absent	09	15.0
Varying	08	13.3
Intensity		
Iso/ Hyperdense	43	71.7
Hypodense	17	28.3
Total	60	100

Table 2: Type of lesions on the basis of CT scan

Type of Lesion on the basis of CT scan.	Frequency (n)	Percentage (%)
Benign	25	41.7
Malignant	35	58.3
Total	60	100

Conclusion

Imaging the oral cavity is complex due to its intricate anatomy and potential for overlapping benign and malignant pathologies. CT serves as a pivotal imaging modality due to its rapid acquisition, spatial resolution, and ability to assess bone and calcified structures. It plays an essential role in:

- Early detection and differentiation of lesion types
- Mapping lesion spread to adjacent structures
- Surgical and radiation planning
- Assessing risk for complications and metastasis

CT’s accuracy in distinguishing benign from malignant lesions is clinically meaningful, though histopathology remains the gold standard. A multidisciplinary approach that includes imaging, clinical evaluation, and pathology is crucial for optimal management of oral cavity lesions.

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