

Evaluation of the Role of Contrast Enhanced Computed Tomography Imaging in the Spectrum of Oral Masses: A Review of Benign and Malignant Lesions

Authors:

Dr. Rohit Solanki¹, Dr. Benazeer Khan²

¹Senior Resident, Department of Radiodiagnosis, AIIMS, Bhopal.

²Fellow in Cardiac Imaging, Department of Radiodiagnosis, UN Mehta Institute of Cardiology & Research Centre, Ahmedabad.

Corresponding Author:

Dr. Rohit Solanki. Resident, Department of Radiodiagnosis, AIIMS, Bhopal.

DOI: <https://doi.org/10.5281/zenodo.23181382>

Received: 05 September 2026, Revised: 25 September, Accepted: 05 October 2026, Online First: 06 October 2026

ABSTRACT

Background: Radiological assessment of oral masses is challenging owing to the compact anatomy of the oral cavity and the wide pathological spectrum. Contrast-enhanced computed tomography (CECT) offers rapid, high-resolution characterization that can guide early triage, staging, and treatment planning. **Aim:** To evaluate the role and diagnostic performance of CECT across the spectrum of oral masses (benign and malignant), with emphasis on reproducible imaging criteria and lesion distribution in routine practice. **Methods:** In this prospective cross-sectional study conducted at a tertiary centre (March-July 2025), 30 consecutive patients presenting with an oral mass/lump/swelling or pain and referred for CECT neck were enrolled after ethics approval and consent. Scans were acquired on a 128-slice MDCT using intravenous non-ionic iodinated contrast with standard multiplanar reconstructions. Two radiologists (consensus, blinded to histology) recorded site, margins, enhancement pattern, internal composition, adjacent invasion (soft tissue/bone), perineural/perivascular features, and nodal status. Where available, CECT impressions were correlated with histopathology/cytology. Descriptive statistics summarized distributions and feature–outcome associations. **Results:** Tongue (26.6%) and buccal mucosa (16.6%) were the most frequent subsites; malignant-prone lesions clustered in older adults (≥ 60 years). Imaging features strongly associated with malignancy included: irregular/ill-defined margins (present in 70% overall; malignant in 85% of such cases), heterogeneous enhancement (73%; malignant in 81%), necrotic cervical lymph nodes (60%; malignant in 94%), involvement of adjacent soft tissues/bone (76%; malignant in 95%), and intralesional necrosis/cystic change (80%; malignant in 83%). Smooth, well-defined margins (benign in 78%) and homogeneous enhancement (benign in 63%) favored benignity. Category-level concordance between CECT impression and histopathology was 100% in this cohort. **Conclusions:** CECT provides fast, actionable characterization of oral masses with excellent category-level agreement with histopathology. A concise checklist margins, enhancement pattern, intra-lesional necrosis/cystic change, adjacent invasion, and nodal necrosis yields high specificity for malignancy and streamlines biopsy targeting, staging, and operative planning. Larger multicentre studies should validate these predictors and standardize CECT-based reporting pathways.

Keywords: oral cavity, floor of mouth, contrast-enhanced CT, squamous cell carcinoma, lymph node necrosis, mandibular invasion, staging, head and neck imaging

INTRODUCTION

Radiological evaluation of the oral cavity especially the floor of the mouth (FOM) is challenging because this compact compartment contains diverse tissues (sublingual and submandibular glands and ducts, mucosa, submucosal soft tissues, and the mandible) and is affected by a wide range of congenital, inflammatory, infective, benign, malignant, and pseudolesional entities [1,2]. Submucosal disease often

remains clinically occult, making imaging indispensable for confident detection, delineation, and triage [4–6]. Across modalities, ultrasound, CT, MRI, and ¹⁸F-FDG PET/CT provide complementary strengths for diagnosis, mapping of disease spread, treatment planning, and surveillance [4–7]. Within this multimodality pathway, contrast-enhanced computed tomography (CECT) is pivotal because it rapidly delivers high-resolution cross-sectional anatomy and

contrast-based tissue differentiation. Enhancement patterns, margins, internal architecture, necrosis/cystic change, calcification, and stromal components on CECT help discriminate benign from malignant behavior while simultaneously depicting osseous invasion, trans-compartmental extension, vascular encasement, perineural spread, nodal disease, and potential metastatic involvement findings that directly inform staging and multidisciplinary treatment decisions [4–7].

Against this backdrop, the present study aimed to evaluate the role of CECT across the imaging spectrum of oral masses, encompassing both benign and malignant lesions and emphasizing the FOM and adjacent oral subsites. Specifically, (i) to appraise the diagnostic accuracy and practical performance of CECT in detecting, characterizing, and staging oral masses using reproducible criteria (enhancement pattern, margins, internal composition, and patterns of local and regional spread); and (ii) to catalogue the spectrum of pathologies presenting with oral pain and/or swelling, highlighting lesion-specific CECT hallmarks and common mimics to refine differential diagnosis and guide clinical management.

By consolidating lesion-specific and pattern-based CECT findings, the study aims to provide a pragmatic framework that enhances diagnostic confidence, refines staging accuracy, and optimizes multidisciplinary treatment planning.

MATERIAL AND METHODS

Following approval from the Institutional Ethics Committee, a prospective cross-sectional study was conducted in the Department of Radiodiagnosis, AIIMS, Bhopal. Consecutive patients with a clinical suspicion of an oral mass or presenting with swelling in the oral region and referred for contrast-enhanced CT (CECT) of the neck were prospectively enrolled. Over a 5-month period (March–July 2025), 30 patients (n=30) met eligibility and were included. Written informed consent was obtained from all participants after explanation of the study protocol, and patient confidentiality was maintained throughout.

Eligibility criteria

Inclusion

- Patients with a clinical diagnosis of mass/pathology in the oral region.
- Patients referred for CECT neck evaluation.

Exclusion

- Patients not providing consent (negative consent).
- Patients who had already commenced treatment prior to imaging.
- Patients with contraindications to CT/iodinated contrast (e.g., pregnancy, prior contrast reaction, other standard contraindications).

Procedure

After Ethics Committee approval and written informed consent, consecutive eligible patients presenting with a clinical suspicion of an oral mass or swelling and referred for contrast-enhanced CT (CECT) of the neck were prospectively enrolled. At enrolment, eligibility was verified, a focused history was obtained for iodinated-contrast reactions and contraindications (including pregnancy and unstable clinical status), baseline demographics and clinical details were recorded, and a unique study identifier was assigned. Patients fasted for approximately 4–6 hours, removed removable metallic items and dentures, and an 18–20-gauge peripheral intravenous cannula was placed for contrast administration.

Imaging equipment and acquisition: All examinations were performed on a 128-slice multi-detector CT scanner. Contrast-enhanced CT (CECT) of the neck/oral cavity was acquired according to institutional protocol with intravenous iodinated contrast. Axial images were obtained with routine multiplanar reconstructions (coronal and sagittal) to optimise lesion evaluation.

Imaging workflow and parameters recorded: For every case, the following CT features were documented on a structured proforma to ensure reproducibility and comparison across cases:

Site and compartment (floor of mouth, tongue, buccal mucosa, gingivobuccal sulcus, palate, retromolar trigone, mandible).

Size and margins; pattern of contrast enhancement (none, homogeneous, heterogeneous).

Internal composition (fat, calcification, necrosis/cystic change).

Relationship to adjacent structures: cortical breakthrough or medullary invasion of mandible/maxilla; extension to sublingual, submandibular, masticator, parapharyngeal and buccal spaces; airway/naso-oro-hypopharyngeal involvement. Perineural/perivascular spread (when appreciable) and vascular encasement/abutment.

Lymph node assessment (size, morphology, necrosis, extracapsular extension features).

Reference standards and clinical correlation: Where available, imaging impressions were correlated with clinical findings and downstream histopathology or cytology (FNAC/biopsy/surgical specimen) as part of routine care. Cases without tissue diagnosis were followed clinically/radiologically as per treating team.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics (version 26.0). Raw data were curated in Microsoft Excel and imported for analysis. Continuous variables were inspected for distributional assumptions; those approximating normality are reported as mean $\pm$ standard deviation, whereas non-normal data are summarized as median (interquartile range). Categorical variables are presented as counts and percentages. Group differences for categorical data were assessed with the Chi-square test, and continuous

data were compared using the independent-samples t-test. Statistical significance was defined as two-tailed $p < 0.05$.

RESULTS

Thirty consecutive patients referred for suspected oral masses were evaluated with CECT during July–November 2024. Tongue (26.6%) and buccal mucosa (16.6%) were the most frequent subsites; other locations contributed smaller proportions ($\leq 10\%$ each). [Table 1]

Table 1. Spectrum of pathology (site-wise distribution)

Pathology	n	%
Tongue neoplasm	8	26.6
Buccal mucosa neoplasm	5	16.6
Infective etiology	4	13.6
Floor-of-mouth neoplasm	2	6.6
Hard-palate cancer	3	10.0
Soft-palate neoplasm	2	6.6
Gingival neoplasm	1	3.3
Tonsillar-region mass	1	3.3
Lymphadenopathy	1	3.3
Mandibular osteomyelitis	1	3.3
Maxillary neoplasm	2	6.6
Total	30	100

Malignant-prone locations (tongue, hard palate) clustered in older adults (≥ 60 yr). Infective conditions were confined to ≤ 60 yr. Sporadic lesions (gingiva, tonsil, isolated nodes) were seen mainly at 30–60 yr. [Table 2]

Table 2. Spectrum of pathology by age group

Pathology	1–30 yr	30–60 yr	60–90 yr
Tongue neoplasm	1 (12.5%)	2 (25%)	5 (62.5%)
Buccal mucosa neoplasm	1 (20%)	1 (20%)	3 (60%)
Infective etiology	2 (50%)	1 (25%)*	0
Floor-of-mouth neoplasm	0	1 (50%)	1 (50%)
Hard-palate cancer	0	0	3 (100%)
Soft-palate neoplasm	0	1 (50%)	1 (50%)
Gingival neoplasm	0	1 (100%)	0
Tonsillar-region mass	0	1 (100%)	0
Lymphadenopathy	1 (100%)	0	0
Mandible pathology	0	0	1 (100%)
Maxillary pathology	1 (50%)	0	1 (50%)

*One infective case could not be age-stratified in the source chart; totals reflect available data.

Overall distribution showed a slight male predominance (53% vs 47%). Tongue and buccal lesions were commoner in males, whereas several single-case entities occurred in females. [Table 3]

Table 3. Spectrum of pathology by gender

Pathology	Male, n	Female, n
Tongue neoplasm (n=8)	5	3
Buccal mucosa neoplasm (n=5)	3	2
Infective etiology (n=4)	1	3
Floor-of-mouth neoplasm (n=2)	1	1
Hard-palate cancer (n=3)	2	1
Soft-palate neoplasm (n=2)	2	0
Gingival neoplasm (n=1)	1	0
Tonsillar-region mass (n=1)	0	1
Lymphadenopathy (n=1)	0	1
Mandible pathology (n=1)	0	1
Maxillary pathology (n=2)	1	1
Total	16	14

Slight rural predominance (53.3% vs 46.7%). Tongue, buccal, and infective pathologies were more frequent among rural referrals; hard-palate cancer was relatively more urban. [Table 4]

Table 4. Spectrum of pathology by geographical background

Pathology	Rural, n	Urban, n
Tongue neoplasm	5	3
Buccal mucosa neoplasm	3	2
Infective etiology	3	1
Floor-of-mouth neoplasm	1	1
Hard-palate cancer	1	2
Soft-palate neoplasm	1	1
Gingival neoplasm	0	1
Tonsillar-region mass	0	1
Lymphadenopathy	0	1
Mandible pathology	1	0
Maxillary pathology	1	1
Total	16	14

Ill-defined margins were strongly associated with malignancy (85%), while smooth, well-defined margins favored benignity (77%). [Table 5]

Table 5. Lesion margins on CECT versus histology

Margins	n (%)	Histology malignant, n (%)	Histology benign, n (%)
Irregular/ill-defined	21 (70)	18 (85)	3 (15)
Smooth/well-defined	9 (30)	2 (22)	7 (77)

Heterogeneous enhancement predominated (73%) and corresponded to malignancy in 81% of such lesions; homogeneous enhancement more often indicated benign disease. [Table 6]

Table 6. Enhancement pattern on CECT versus histology

Enhancement pattern	n (%)	Histology malignant, n (%)	Histology benign, n (%)
Homogeneous	8 (26)	3 (37)	5 (63)
Heterogeneous	22 (73)	18 (81)	4 (19)

Clear feeder-vessel visualisation was uncommon and, in this cohort, was more often seen in benign lesions; absence of visible feeders co-occurred with malignancy in most cases.

Table 7. Vascularity/feeder-vessel identification versus histology

Feeder/vascularity on CECT	n (%)	Histology malignant, n (%)	Histology benign, n (%)
Identified	8 (26)	3 (37)	5 (63)
Not identified	22 (73)	18 (81)	4 (19)

Necrotic nodes were frequent and highly predictive of malignancy (94%). Non-necrotic nodes more often reflected benign disease. [Table 8]

Table 8. Cervical lymphadenopathy on CECT versus histology

Node characteristics	n (%)	Histology malignant, n (%)	Histology benign, n (%)
Necrotic nodes seen	18 (60)	17 (94)	1 (6)
Non-necrotic nodes seen	12 (40)	4 (33)	8 (66)

Extension to adjacent soft tissues/bone was common and was strongly associated with malignancy (95%). [Table 9]

Table 9. Involvement of adjacent structures (soft tissue/bone)

Adjacent involvement	n (%)	Histology malignant, n (%)	Histology benign, n (%)
Seen (incl. bone erosion)	23 (76)	22 (95)	1 (5)
Not seen	7 (24)	3 (42)	4 (57)

Necrosis/cystic change was present in 80% and tended to accompany malignancy. [Table 10]

Table 10. Intralesional necrosis/cystic change

Necrosis / cystic component	n (%)	Histology malignant, n (%)	Histology benign, n (%)
Seen	24 (80)	20 (83)	4 (17)
Not seen	6 (20)	4 (66)	2 (33)

Category-wise counts on CECT matched histopathology across all classes (overall categorical concordance 30/30, 100%). In this series, CECT provided a specific etiologic impression in every case (diagnostic yield 100%).

Table 11. Histopathology correlation by category

Pathology	CECT diagnosis (n)	Histopathology (n)
Tongue neoplasm	8	8
Buccal mucosa neoplasm	5	5
Infective etiology	4	4
Floor-of-mouth neoplasm	2	2
Hard-palate cancer	3	3
Soft-palate neoplasm	2	2
Gingival neoplasm	1	1
Tonsillar-region mass	1	1
Lymphadenopathy	1	1
Mandible pathology	1	1
Maxillary pathology	2	2
Total	30	30

Overall CECT accurately profiled the spectrum of oral masses in this cohort. Features most strongly associated with malignancy included ill-defined margins, heterogeneous enhancement, necrotic nodal disease, extension to adjacent soft tissues/bone, and intralesional necrosis/cystic change. Benignity was favored by smooth margins, homogeneous enhancement, and non-necrotic nodes. Geographically, cases were slightly more rural; age and sex distributions showed the expected clustering of malignant lesions in older males. Together, these findings support CECT as a high-yield first-line modality for detection, characterization, and staging of oral masses, with excellent category-level concordance with histopathology.

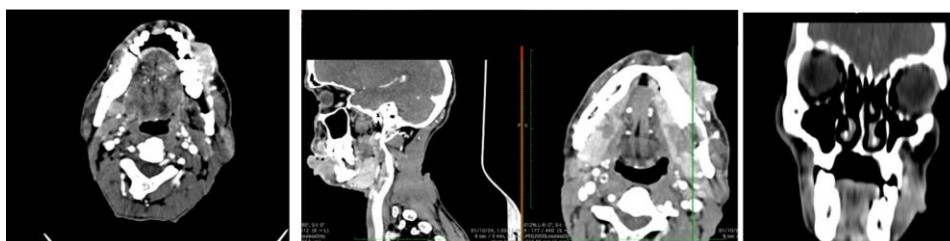


Figure 1. Buccal mucosa neoplasm: A 54-year-old man with 8-months history of progressive oral pain and a persistent left-sided lump. Contrast-enhanced CT reveals an ill-defined, infiltrative soft-tissue mass centered in the left buccal mucosa, measuring $3.6 \times 2.7 \times 3.2$ cm (AP $\times$ ML $\times$ CC) with mean attenuation ~ 60 HU. The lesion shows heterogeneous post-contrast enhancement, involves the buccinator and risorius muscles, extends laterally to the overlying skin and inferiorly into the masseteric space, and causes erosion/destruction of the left mandibular alveolus. Multiple cervical lymph nodes are noted at levels Ia, Ib, and bilateral IIa. Overall appearances are highly suggestive of an aggressive buccal-mucosal malignancy with mandibular alveolar involvement and regional nodal disease; histopathologic confirmation is advised.

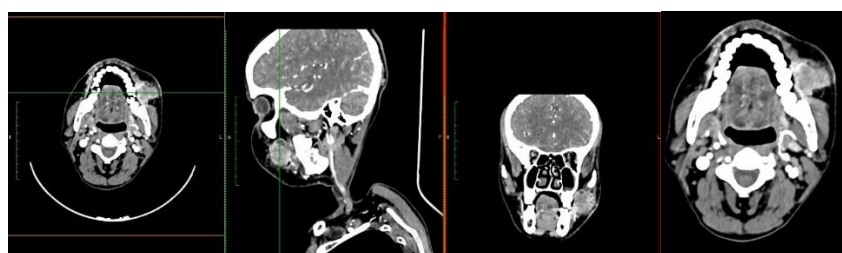


Figure 2. Gingivo-buccal sulcus neoplasm: A 46-year-old man with a 6-month history of an oral cavity lump and pain, difficulty with chewing, swallowing, and tongue movement, and non-healing oral ulcers. Contrast-enhanced CT shows a large, ill-defined soft-tissue lesion in the left gingivobuccal sulcus/mandibular region (mean attenuation ~ 56 HU), measuring approximately $2.9 \times 3.2 \times 3.0$ cm (AP $\times$ ML $\times$ CC). The lesion demonstrates heterogeneous enhancement on arterial and venous phases and extends medially into the left masticator space with involvement of the buccinator muscle and buccal mucosa; posteriorly it abuts the left masseter muscle; laterally it reaches the subcutaneous tissues of the cheek; and superiorly it approaches the left infratemporal fossa.

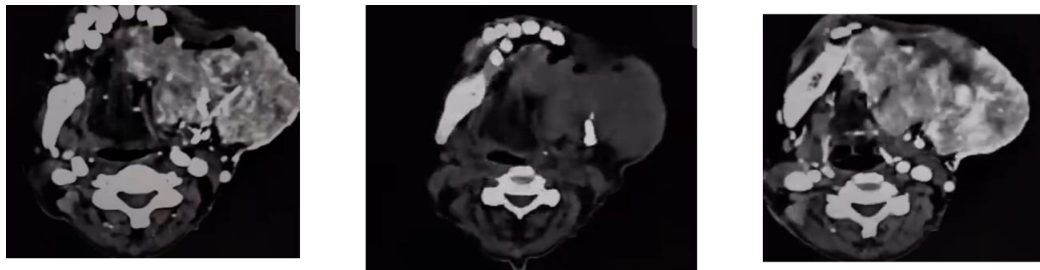


Figure 3. Buccal mucosa carcinoma: A 48-year-old man with several months of persistent buccal-mucosal pain and ulceration, progressive difficulty with mastication and swallowing, and unintentional weight loss; examination revealed a firm, indurated ulcer with regional lymphadenopathy. Contrast-enhanced CT demonstrates a heterogeneously enhancing soft-tissue mass centered in the buccal mucosa, containing intralesional necrotic areas and foci of air, with contiguous osseous destruction and infiltration of adjacent soft tissues. Findings are in keeping with histologically confirmed well-differentiated squamous cell carcinoma of the buccal mucosa with aggressive local invasion.

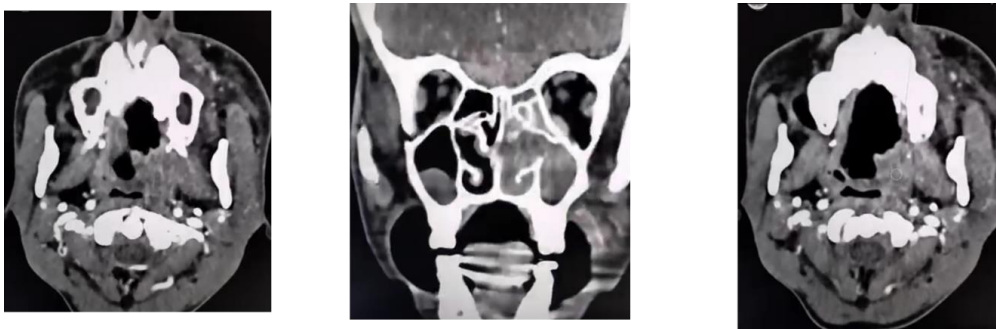


Figure 4. Tonsillar fossa mass: A 30-year-old man with persistent sore throat, dysphagia, referred otalgia, and a sensation of throat fullness; examination demonstrated left tonsillar asymmetry. Contrast-enhanced CT reveals an asymmetric, heterogeneously enhancing soft-tissue mass centered in the left palatine tonsillar fossa, with a contiguous component filling the left nasal cavity and opacifying all meatal compartments. There is associated osseous erosion of adjacent bony walls. Overall appearances are in keeping with an aggressive infiltrative neoplasm of the left tonsillar region with sinonasal extension; histopathologic correlation is recommended.

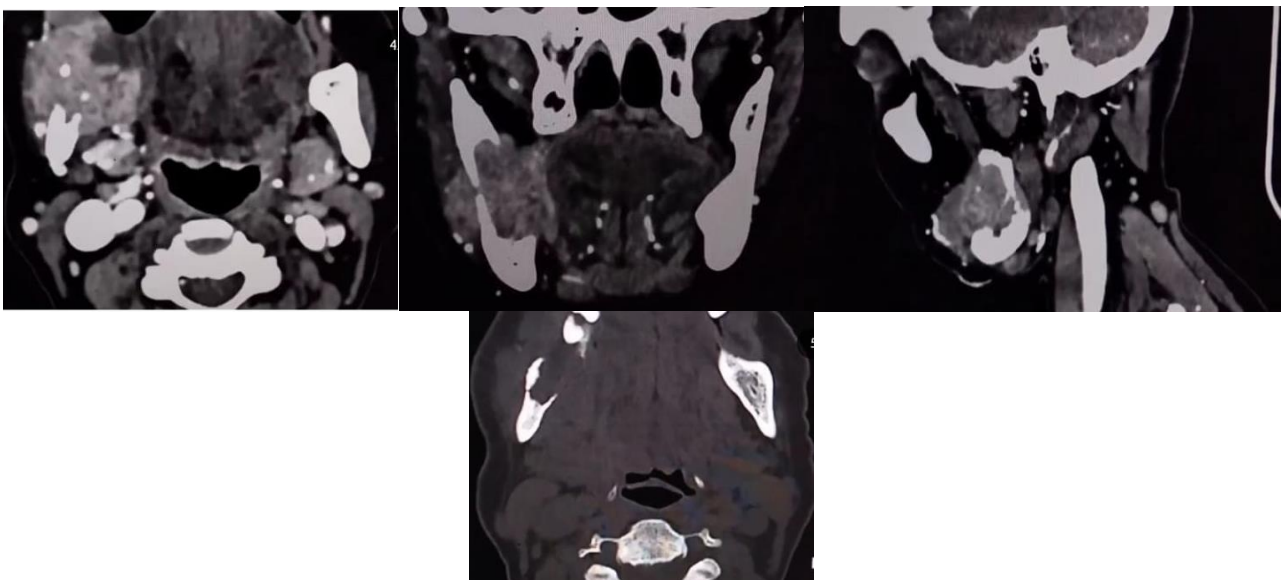


Figure 5 Sub mandibular region mass: A 45-year-old man with a 3-month history of a right submandibular swelling, pain/tenderness, and dysphagia with speech difficulty. Contrast-enhanced CT demonstrates an extensive, ill-defined soft-tissue mass centered in the right submandibular space. The lesion extends anteriorly to the right second molar with destruction of the mandibular alveolus, and posteriorly to the retromolar trigone. There is effacement of the lateral fat planes with the masseter muscle and loss of the medial fat plane with the tongue. Multiple necrotic level Ib (submandibular) lymph nodes are present. The overall appearances are in keeping with an aggressive infiltrative malignancy with mandibular alveolar involvement and regional nodal metastases; histopathologic confirmation is advised.

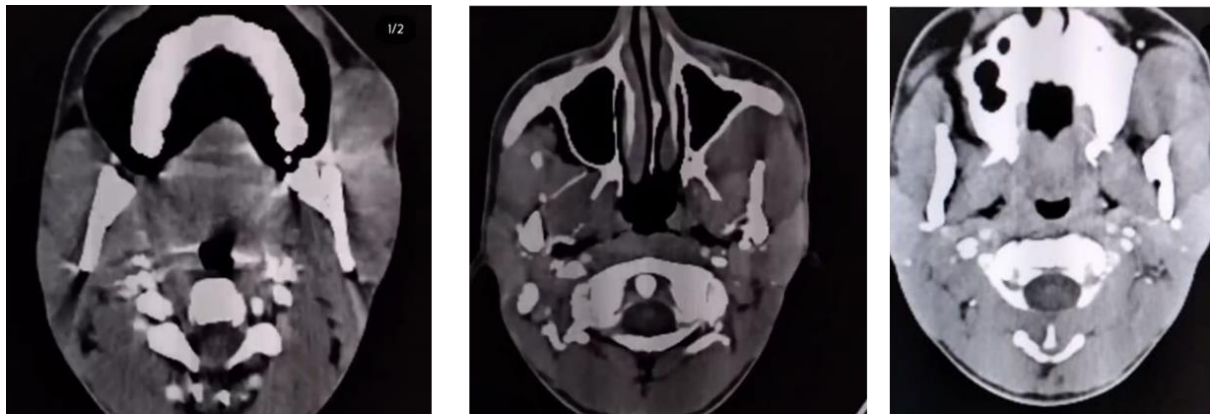


Figure 6. Maxillary region mass: A 30-year-old man with a localized, tender swelling over the left cheek. Contrast-enhanced CT demonstrates a well-circumscribed, non-enhancing soft-tissue lesion in the subcutaneous plane of the left maxillary (malar) region, measuring approximately 2.7×2.3 cm with mean attenuation 40–60 HU. The fat planes with the underlying facial muscles are preserved, with no deep extension or aggressive features. Imaging appearances favor a benign subcutaneous lesion; clinicopathologic correlation is recommended.



Figure 7. Mandibular osteomyelitis with neoplasm: A 30-year-old man with recent dental infection/tooth extraction and poor oral hygiene presented with localized mandibular pain, swelling, and fever. Contrast-enhanced CT demonstrates extensive cortical erosion and medullary destruction of the left mandibular body and ramus with alveolar involvement, accompanied by heterogeneously enhancing peri-mandibular soft-tissue thickening. There are enlarged necrotic lymph nodes along the submental, submandibular, and upper jugular chains. The constellation of osseous destruction with inflamed adjacent soft tissues is highly suggestive of mandibular osteomyelitis, although superadded/neoplastic etiology cannot be excluded; tissue sampling with microbiological culture and histopathology is recommended.

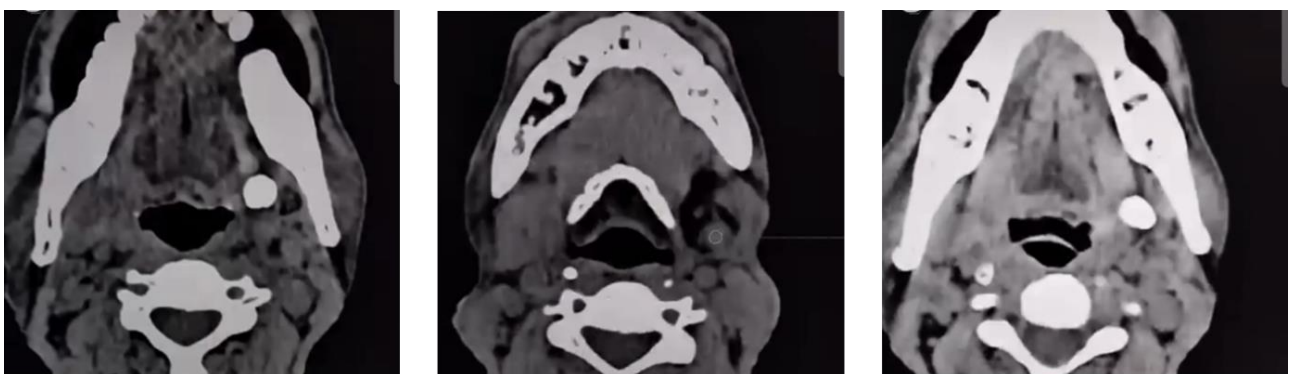


Figure 8. Sialoadenitis with sialolithiasis: A 58-year-old patient with intermittent, post-prandial pain and swelling localized to the left jaw and a palpable firm mass in the floor of mouth/cheek. Contrast-enhanced CT reveals a large calcified sialolith within the left submandibular (Wharton) duct, with fatty replacement/atrophy of the left submandibular gland and adjacent soft-tissue enhancement/stranding consistent with active inflammation. An enhancing sinus tract extends laterally from the obstructed duct region to the cutaneous surface. Overall appearances are diagnostic of chronic obstructive sialadenitis due to sialolithiasis with glandular fatty atrophy and a sialocutaneous fistula.



Figure 9. Tongue neoplasm: A 52-year-old man with persistent tongue pain and ulceration, dysphagia/dysarthria, and weight loss. Contrast-enhanced CT demonstrates an ill-defined, heterogeneously enhancing soft-tissue mass along the right lateral tongue, abutting the right genioglossus muscle with loss of the intervening fat plane. The appearances are highly suggestive of a primary tongue malignancy (likely squamous cell carcinoma); histopathologic confirmation and comprehensive cervical nodal staging are recommended.

DISCUSSION

In this prospective series, contrast-enhanced CT (CECT) delivered a high diagnostic yield for patients presenting with oral masses. Our most predictive malignant markers ill-defined margins, heterogeneous enhancement, intralesional necrosis/cystic change, invasion of adjacent soft tissue or bone, and necrotic cervical nodes mirror established CT correlates of aggressive biology in oral cavity squamous cell carcinoma (OCSCC) and related malignancies. Contemporary reviews and original studies emphasize that CECT rapidly delineates cross-sectional anatomy, depicts cortical breakthrough and mineralized tumor matrix, and characterizes nodal necrosis and extranodal spread surrogates capabilities that make it a practical first-line examination before problem-solving with MRI or metabolic staging with PET/CT. [1,8-10]

Margins and enhancement: In our cohort, irregular/ill-defined margins and heterogeneous enhancement were strongly associated with malignancy. This aligns with pattern-recognition frameworks in oral cavity imaging, where infiltrative growth produces indistinct interfaces and mixed enhancement from necrosis and stromal heterogeneity on CECT; smooth margins and homogeneous enhancement more often accompany benign entities. [8,9]

Intralesional necrosis/cystic change: The frequent association of necrosis/cystic areas with malignant histology in our study is consistent with CT descriptors used to flag high-grade disease burdens in OCSCC. These features, while not pathognomonic, raise pre-test probability for malignancy and should trigger expedited tissue diagnosis. [8,9]

Cervical nodes: Necrotic lymph nodes on CT in our series were highly predictive of malignant involvement, echoing the literature that central nodal necrosis on pre-operative CT is a sensitive marker and correlates with extranodal extension, adverse prognosis, and the need for intensified therapy.

Structured node assessment on CT (size/shape, internal architecture, necrosis, and perinodal stranding) improves staging accuracy and surgical planning. [11-13]

Adjacent invasion and bone involvement. The strongest single correlate of malignancy in our data was invasion of adjacent structures including bone erosion. Evidence shows CT is excellent for detecting cortical breakthrough and gross osseous destruction, while MRI is superior for early marrow infiltration; meta-analyses and comparative studies suggest that CT and MRI have broadly similar accuracy for mandibular invasion overall, with complementary strengths (CT for cortex; MRI for marrow and perineural spread). Emerging dual-energy/spectral CT techniques further improve conspicuity of tumor–bone interfaces and may approach MRI performance for bone invasion. [14-19]

Role relative to other modalities: Rapid availability and speed support CECT as the initial imaging test in many practices, with MRI reserved for deep soft-tissue mapping (e.g., tongue muscle invasion, perineural/perivascular spread) and PET/CT used for metabolic staging and response assessment. Prospective and cohort data indicate that PET/CT can improve nodal detection and risk stratification, particularly when combined with cross-sectional anatomic imaging. [8,18,20]

Implications for workflow: Our findings can be translated into a pragmatic CECT checklist for triage: (1) margins; (2) enhancement pattern; (3) necrosis/cystic change; (4) adjacent soft-tissue/bone invasion; and (5) nodal necrosis. Applied systematically, these features shorten time-to-diagnosis, guide biopsy targeting, and inform the extent of resection and neck management. The main limitations of our study are its single-centre design and modest sample size; we also did not quantify inter-reader agreement or incorporate radiomic/perfusion metrics that might further refine risk prediction. Future multicentre studies should validate weighted CECT scoring against histopathology and outcomes, and

examine the incremental value of spectral CT and hybrid PET/CT protocols in standardized care pathways.

CONCLUSION

In this prospective, cross-sectional series of 30 patients with suspected oral masses, contrast-enhanced CT (CECT) reliably detected, localized, and characterised lesions across the oral cavity with category-level concordance of 100% against histopathology. Imaging markers most strongly associated with malignancy were adjacent soft-tissue/bone involvement, necrotic cervical nodes, ill-defined margins, heterogeneous enhancement, and intralesional necrosis/cystic change, whereas smooth, well-defined margins, homogeneous enhancement, and non-necrotic nodes tended to favour benignity. Site distribution was led by tongue and buccal mucosa lesions, with malignant-prone entities clustering in older adults and a slight rural predominance among referrals.

Taken together, these findings support CECT as an effective first-line modality for the detection, characterization, and initial staging of oral masses, providing a pragmatic checklist that can streamline biopsy targeting, nodal assessment, and surgical planning. While our single-centre sample is modest, the high diagnostic yield underscores the clinical value of CECT; complementary MRI/US/¹⁸F-FDG PET/CT should be reserved for problem-solving, perineural mapping, or metabolic staging as indicated. Larger multicentre studies are warranted to validate predictive CECT features and refine standardized reporting pathways for oral cavity tumors.

DECLARATIONS

Ethics Approval and Consent to Participate

The study was conducted in accordance with the ethical standards of the institutional research committee and the principles of the Declaration of Helsinki. Approval was obtained from the Institutional Ethics Committee of AIIMS, Bhopal, prior to commencement of the study. Written informed consent was obtained from all participants before enrolment and imaging.

Consent for Publication

Written informed consent was obtained from the participants for publication of relevant clinical and radiological findings. All identifying information has been removed to maintain participant confidentiality.

Availability of Data and Materials

The datasets generated and/or analysed during the present study are available from the corresponding author on reasonable request, subject to institutional policies and applicable ethical and confidentiality requirements.

Competing Interests

The authors declare that they have no competing interests.

Funding

The authors received no specific financial support or funding for this study.

Authors' Contributions

Dr. Rohit Solanki: Study conception and design, patient recruitment, radiological evaluation, data collection, data interpretation, manuscript preparation, and critical revision of the manuscript.

Dr. Benazeer Khan: Data analysis and interpretation, literature review, manuscript drafting, critical revision, and final approval of the manuscript.

Both authors read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Acknowledgements

The authors acknowledge the support of the Department of Radiodiagnosis, AIIMS, Bhopal, and all patients who participated in the study.

AI Use Disclosure

The authors declare that no generative artificial intelligence tools were used to generate or substantially modify the scientific content of this manuscript.

REFERENCES

1. Lahiri AK, Daultrey CR. Imaging evaluation of the benign and malignant lesions of the floor of the mouth: Pictorial review. *SA J Radiol.* 2023 Aug 31;27(1):2677.
2. Kasat PR, Parihar P, Kashikar SV, Sachani P, Shrivastava P, Pradeep U, Mapari SA, Bedi GN. A Comprehensive Review of Advancements in Diagnostic Imaging: Unveiling Oral Cavity Malignancies Using Computed Tomography. *Cureus.* 2024 Jul 7;16(7):e64045.
3. Law CP, Chandra RV, Hoang JK, Phal PM. Imaging the oral cavity: Key concepts for the radiologist. *Br J Radiol.* 2011;84(1006):944–957.
4. Patel S, Bhatt AA. Imaging of the sublingual and submandibular spaces. *Insights Imaging.* 2018;9(3):391–401.
5. Agarwal AK, Kanekar SG. Submandibular and sublingual spaces: diagnostic imaging and evaluation. *Otolaryngol Clin North Am.* 2012;45(6):1311–1323.
6. Varghese J, Kirsch C. Magnetic resonance imaging of the oral cavity and oropharynx. *Top Magn Reson Imaging.* 2021;30(2):79–83.

7. Tantiwongkosi B, Yu F, Kanard A, et al. Role of 18F-FDG PET/CT in pre and post treatment evaluation in head and neck carcinoma. *World J Radiol.* 2014;6(5): 177–191.
8. Elbadawy WM, Mohamed EA, Elghamry A, et al. Imaging of oral cavity and oropharyngeal masses: a comprehensive review. *Egypt J Radiol Nucl Med.* 2024;55:132.
9. Zoumalan RA, Kleinberger AJ, Morris LG, Ranade A, Yee H, DeLacure MD, Myssiorek D. Lymph node central necrosis on computed tomography as predictor of extracapsular spread in metastatic head and neck squamous cell carcinoma: pilot study. *J Laryngol Otol.* 2010 Dec;124(12):1284-8.
10. Kasat PR, Parihar P, Kashikar SV, Sachani P, Shrivastava P, Pradeep U, Mapari SA, Bedi GN. A Comprehensive Review of Advancements in Diagnostic Imaging: Unveiling Oral Cavity Malignancies Using Computed Tomography. *Cureus.* 2024 Jul 7;16(7):e64045.
11. Sharma A, Jaiswal AA, Umredkar G, Barle R, Sharma N, Banerjee PK, Garg AK, Membally R. Lymph Node Central Necrosis on the Computed Tomography as the Predictor of the Extra Capsular Spread in Metastatic Head and Neck Squamous Cell Carcinoma. *Indian J Otolaryngol Head Neck Surg.* 2017 Sep;69(3):323-332.
12. Hoang JK, Vanka J, Ludwig BJ, Glastonbury CM. Evaluation of cervical lymph nodes in head and neck cancer with CT and MRI: tips, traps, and a systematic approach. *AJR Am J Roentgenol.* 2013 Jan;200(1):W17-25.
13. Baik SH, Seo JW, Kim JH, Lee SK, Choi EC, Kim J. Prognostic Value of Cervical Nodal Necrosis Observed in Preoperative CT and MRI of Patients With Tongue Squamous Cell Carcinoma and Cervical Node Metastases: A Retrospective Study. *AJR Am J Roentgenol.* 2019 Aug;213(2):437-443.
14. Brandão Neto JS, Aires FT, Dedivitis RA, Matos LL, Cernea CR. Comparison between magnetic resonance and computed tomography in detecting mandibular invasion in oral cancer: A systematic review and diagnostic meta-analysis: MRI x CT in mandibular invasion. *Oral Oncol.* 2018 Mar;78:114-118.
15. Nae A, O'Leary G, Feeley L, Fives C, Fitzgerald B, Chiriac E, Sheahan P. Utility of CT and MRI in assessment of mandibular involvement in oral cavity cancer. *World J Otorhinolaryngol Head Neck Surg.* 2019 Mar 22;5(2):71-75.
16. Vidiri A, Guerrisi A, Pellini R, Manciooco V, Covello R, Mattioni O, Guerrisi I, Di Giovanni S, Spriano G, Crecco M. Multi-detector row computed tomography (MDCT) and magnetic resonance imaging (MRI) in the evaluation of the mandibular invasion by squamous cell carcinomas (SCC) of the oral cavity. Correlation with pathological data. *J Exp Clin Cancer Res.* 2010 Jun 17;29(1):73.
17. Mukherji SK, Isaacs DL, Creager A, Shockley W, Weissler M, Armao D. CT detection of mandibular invasion by squamous cell carcinoma of the oral cavity. *AJR Am J Roentgenol.* 2001 Jul;177(1):237-43.
18. Pasha MA, Marcus C, Fakhry C, Kang H, Kiess AP, Subramaniam RM. FDG PET/CT for Management and Assessing Outcomes of Squamous Cell Cancer of the Oral Cavity. *AJR Am J Roentgenol.* 2015 Aug;205(2):W150-61.
19. Hsu CC, Jeavon C, Fomin I, Du L, Buchan C, Watkins TW, Nae Y, Parry NM, Aviv RI. Dual-Layer Spectral CT Imaging of Upper Aerodigestive Tract Cancer: Analysis of Spectral Imaging Parameters and Impact on Tumor Staging. *AJNR Am J Neuroradiol.* 2021 Sep;42(9):1683-1689
20. Madsen CB, Rohde M, Gerke O, Godballe C, Sørensen JA. Diagnostic Accuracy of Up-Front PET/CT and MRI for Detecting Cervical Lymph Node Metastases in T1–T2 Oral Cavity Cancer—A Prospective Cohort Study. *Diagnostics.* 2023; 13(22):3414;1-12.