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Original Article

One Stop Destination for Diagnosis of Buccal Carcinoma on Contrast Enhanced Magnetic Resonance Imaging: A Three-Case Series with Clinico-Radiological Correlation

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ABSTRACT

Buccal mucosal squamous cell carcinoma is a common oral cavity malignancy in the Indian subcontinent, strongly associated with chronic tobacco and betel nut use. Accurate pre-treatment assessment is essential for staging and treatment planning. While computed tomography is useful for evaluating cortical bone destruction but has limitations whereas contrast enhanced magnetic resonance imaging (MRI) provides superior soft-tissue characterization and assessment of locoregional tumour spread. This case series included three histopathologically confirmed cases of buccal squamous cell carcinoma evaluated with contrast-enhanced MRI. All lesions demonstrated T1 iso-hypointensity, T2/STIR hyperintensity, restriction on diffusion, and heterogeneous post-contrast enhancement. MRI accurately delineates tumour extension into adjacent structures, including the gingivobuccal sulcus, tongue, retromolar trigone, buccal and masticator spaces, infratemporal fossa, maxillary sinus, and mandibular marrow, while also detecting cervical nodal metastases in all patients. These cases highlight the pivotal role of CE-MRI as the imaging modality of choice for comprehensive local staging of buccal carcinoma due to its superior soft tissue resolution, multiplanar capability, and ability to detect marrow invasion and deep-space extension.

Keywords*: Buccal mucosal squamous cell carcinoma, Buccal carcinoma, MRI, Diffusion-weighted imaging, Oral cavity cancer, Tumour staging.*

INTRODUCTION

Oral squamous cell carcinoma constitutes approximately 90–95% of all oral cavity malignancies and remains a major public health concern worldwide. India bears a disproportionate burden of disease, accounting for nearly one third of global oral cancer cases, largely owing to the widespread consumption of smokeless tobacco, betel quid, gutkha, and areca nut preparations. [1–3] Among oral cavity subsites, the buccal mucosa and gingivobuccal sulcus represent unique anatomical regions frequently affected in the Indian population. Unlike tongue cancers, buccal carcinomas often arise within the gingivobuccal complex and demonstrate a propensity for extensive submucosal spread before becoming clinically apparent. [4] The gingivobuccal complex comprises the buccal mucosa, upper and lower gingivobuccal sulci, alveolar ridges, retromolar trigone, and adjacent buccal space. Due to the absence of substantial anatomical barriers, tumours arising in this region can infiltrate the buccinator muscle, masticator space, infratemporal fossa, pterygomandibular raphe, mandible, and cervical lymphatic chains. [5] Clinical examination alone underestimates the true extent of disease, particularly in patients

presenting with trismus, ulceroproliferative lesions, or deep infiltrative tumours. Consequently, cross-sectional imaging plays a pivotal role in accurate staging. [6] Computed tomography is useful for evaluating cortical bone destruction but has its limitations; however, contrast enhanced MRI has emerged as the preferred modality for local staging because of its superior soft-tissue contrast resolution, multiplanar imaging capability, and enhanced detection of marrow infiltration, muscle invasion, perineural spread, and deep fascial extension. [7–9] Diffusion-weighted imaging (DWI) has further improved diagnostic confidence by enabling assessment of tumour cellularity and delineation of tumour margins against surrounding tissues. [10] The present case series demonstrates the spectrum of CE-MRI findings in three histopathologically confirmed cases of buccal squamous cell carcinoma and emphasizes the role of CE-MRI as the one stop destination imaging modality of choice for diagnosis and local staging.

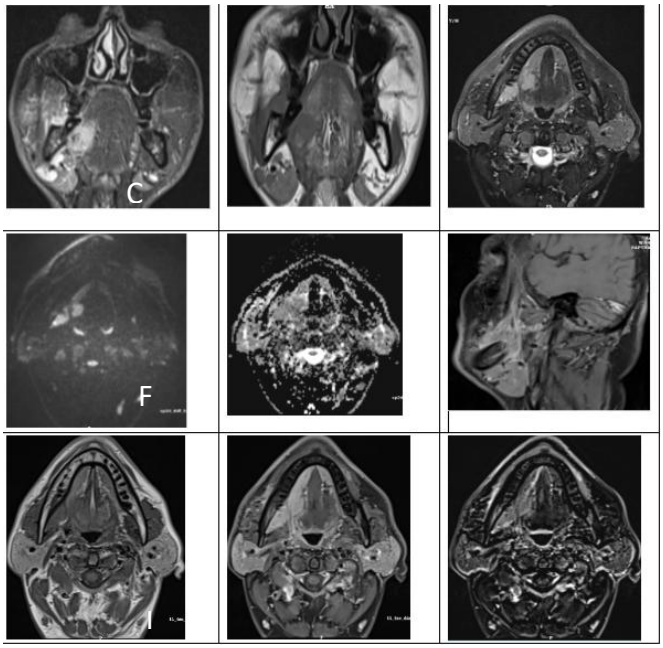
METHODS:

Three consecutive patients with histopathologically proven buccal squamous cell carcinoma who underwent MRI evaluation between March 2026, and May 2026 were included. MRI examinations were performed using a dedicated head and neck protocol consisting of: • Axial and coronal T1-weighted imaging • Axial and coronal T2-weighted imaging • Coronal STIR sequences • Diffusion-weighted imaging (b values 0 and 1000) • ADC mapping • Fat-suppressed pre and post-contrast T1-weighted imaging in axial, coronal, and sagittal planes

RESULTS

Case 1

A 44-year-old male with a history of tobacco chewing for nearly 20 years presented with pain, swelling in the right buccal region, progressive trismus, and significant weight loss. MRI demonstrated an ill-defined infiltrative lesion involving the right gingivobuccal sulcus, lateral aspect of the anterior two-thirds of the tongue, and right retromolar trigone. The tongue component measured 1.8 × 1.3 × 1.4 cm while the retromolar trigone component measured 2.2 × 1.3 × 2.0 cm. The lesion appeared hypointense on T1-weighted images and heterogeneously hyperintense on T2-weighted and STIR sequences. Diffusion-weighted imaging demonstrated marked restriction on diffusion with corresponding low ADC values. Post-contrast images revealed heterogeneous enhancement. CE-MRI accurately delineated extension into the superior and inferior gingivobuccal sulci and right buccal space without skin infiltration. The lesion involved the lateral tongue but did not cross the midline. Multiple enlarged bilateral cervical lymph nodes were identified, predominantly within levels IA, IB, and IIA. Excision of the mass lesion and biopsy revealed moderately differentiated squamous cell carcinoma.

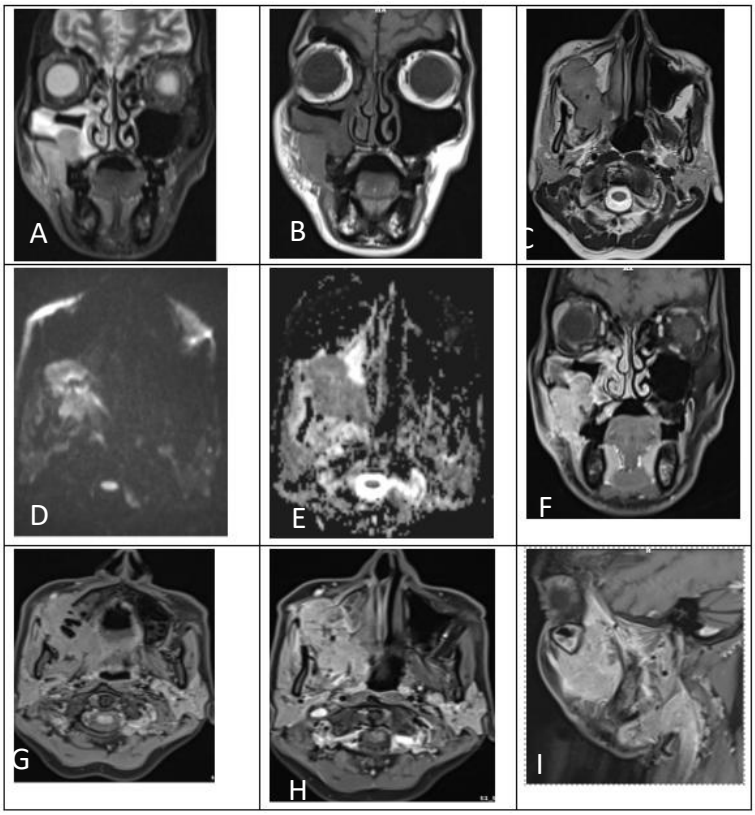


[Figure 1 A, B, C]. Coronal T2, T1 and axial STIR images shows ill-defined infiltrative lesion involving the right gingivobuccal sulcus, lateral aspect of the anterior two-thirds of the tongue, and right retromolar trigone.
[Figure 1 D, E, F]. Axial diffusion and ADC map shows restriction on diffusion and sagittal post contrast T1WI shows heterogeneous enhancement.
[Figure 1 G, H, I]. Axial T1FS Pre contrast, post contrast and subtraction images shows heterogeneous enhancement.

Case 2

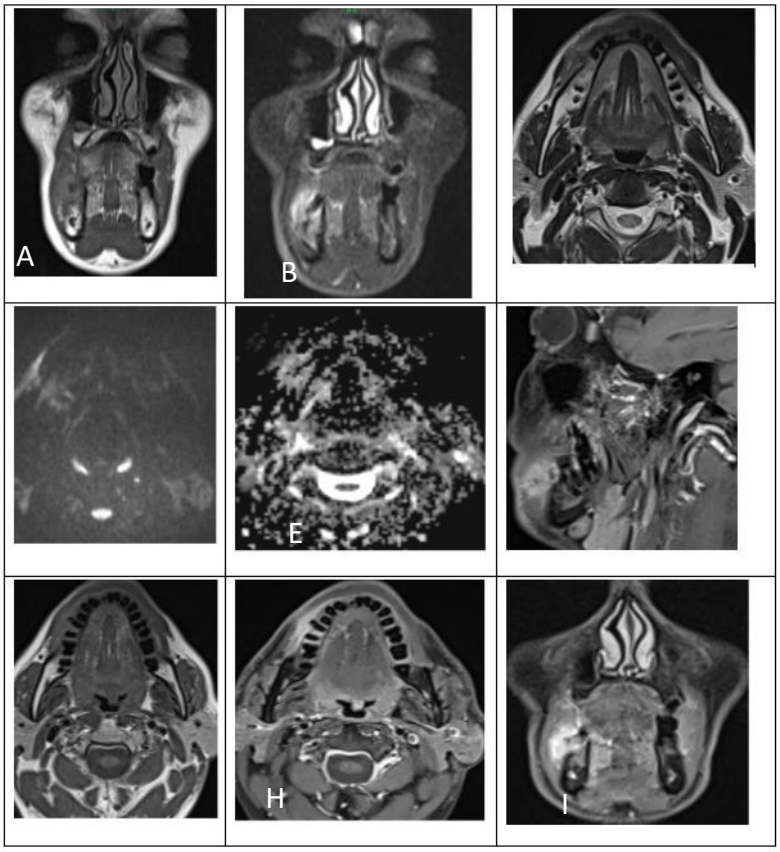
A 50-year-old male with a longstanding history of tobacco chewing and smoking presented with a progressively enlarging right buccal mucosal mass and trismus. MRI demonstrated a large infiltrative ulceroproliferative lesion measuring 5.3 × 4.1 × 4.7 cm involving the right upper gingivobuccal mucosa. The lesion exhibited isointense signal on T1-weighted images

and heterogeneous hyperintensity on T2-weighted and STIR sequences. The lesion showed restriction on diffusion and heterogeneous post contrast enhancement with internal non enhancing necrotic foci. The tumour extended into the retromolar trigone, masticator space, infratemporal fossa, and right maxillary sinus. MRI clearly demonstrated involvement of the buccinator, masseter, temporalis, and medial and lateral pterygoid muscles. Antero-superiorly the mass shows infiltration into the right maxillary sinus reaching upto the right premaxillary space. Superior extension toward the skull base was also evident. Multiple bilateral cervical lymph nodes were detected, with the largest node located in the right level IB station. This case exemplifies the ability of MRI to delineate deep-space extension and identify advanced locoregional disease.



[Figure 2 A, B, C]. Coronal STIR, T1 and axial T2 images shows large infiltrative ulcero-proliferative lesion involving the right upper gingivobuccal mucosa with invasion of the masticator space, infratemporal fossa, and right maxillary sinus.
[Figure2 D, E, F].Axial diffusion and ADC map shows restriction on diffusion and coronal post contrast T1WI shows heterogeneous enhancement with internal non enhancing necrotic foci.
[Figure 2 G, H, I]. Axial T1FS Pre contrast, post contrast and sagittal T1FS post contrast images shows heterogeneous enhancement with extensions as described.

Case 3
A 60-year-old male with biopsy-proven moderately differentiated squamous cell carcinoma of the right alveolar region underwent MRI for disease staging. MRI demonstrated an enhancing lesion measuring approximately 3.1 × 0.9 × 2.1 cm involving the right gingivobuccal sulcus. The lesion was hyperintense on T2-weighted images and demonstrated diffusion restriction. Heterogeneous enhancement was observed following intravenous contrast administration. A significant finding was altered marrow signal intensity within the mandible involving the canine and premolar regions, associated with post contrast enhancement and cortical breach with marrow infiltration, suggestive of mandibular invasion. MRI further demonstrated involvement of the buccinator, risorius, and levator anguli oris muscles. Ipsilateral cervical lymphadenopathy involving level IB and IIA nodal stations was present. The detection of early marrow infiltration significantly altered surgical planning and highlighted one of the most important advantages of MRI.



[Figure 3 A, B, C]. Coronal T1, STIR and axial T2 images shows ill-defined lesion involving the right gingivobuccal mucosa.
[Figure3 D, E, F]. Axial diffusion and ADC map shows restriction on diffusion and sagittal post contrast T1WI shows heterogeneous enhancement with infiltration of mandible.
[Figure 3 G, H, I]. Axial T1FS Pre contrast, post contrast and coronal T1FS post contrast images show heterogeneous enhancement with cortical breach and mandibular marrow infiltration.

DISCUSSION

Buccal carcinoma is characterized by a complex pattern of locoregional spread that often extends beyond clinically visible margins. The tendency for submucosal infiltration and extension into adjacent fascial planes makes accurate imaging evaluation indispensable. [11] MRI has become the cornerstone of local staging because of its superior soft-tissue contrast and multiplanar capabilities. In all three patients, MRI successfully identified the full extent of disease and accurately characterized the involvement of adjacent anatomical compartments. The characteristic MRI appearance observed in our series—T1 hypointensity, T2/STIR hyperintensity, restriction on diffusion, and heterogeneous enhancement—is consistent with previously described imaging features of oral squamous cell carcinoma. [8] [12] Restriction on diffusion weighted imaging was consistently observed across all cases. Recent studies have demonstrated that DWI improves lesion conspicuity and may aid in treatment response assessment. [13] Case 1 highlighted the importance of MRI in evaluating tongue involvement and retromolar trigone extension. Accurate assessment of the lesion not crossing the midline is essential because it significantly influences surgical approach and reconstructive planning. [14] Case 2 represented advanced disease with invasion of the masticator space, infratemporal fossa, and maxillary sinus. Masticator space involvement is considered an indicator of aggressive disease and is associated with increased local recurrence rates and poorer prognosis. MRI is particularly valuable in such cases because the intricate muscular anatomy of the masticator compartment is often inadequately evaluated by clinical examination or CT.[15] Case 3 - One of the most significant observations in our series was the identification of mandibular marrow infiltration in this case. Cortical erosion often represents a relatively late manifestation of bone involvement. MRI can detect early marrow replacement before gross cortical destruction becomes apparent, thereby improving staging accuracy. Previous studies have reported MRI sensitivity exceeding 90% for mandibular marrow invasion. [16] [17] Cervical nodal metastases were identified in all three patients. Nodal involvement remains one of the strongest prognostic indicators in oral cavity carcinoma. MRI facilitates evaluation of nodal morphology, necrosis, extracapsular extension, and diffusion characteristics, thereby providing comprehensive regional staging. [18] Compared with CT, CE-MRI offers superior evaluation of: • Tumour depth of invasion • Buccal space extension • Tongue infiltration • Masticator space involvement • Marrow infiltration • Perineural spread • Skull base extension While CT remains superior for assessing cortical bone destruction, CE-MRI provides a more comprehensive evaluation of overall tumour burden and local disease extent. [7] Our findings corroborate existing literature supporting CE-MRI as the imaging modality of choice for preoperative staging of buccal squamous cell carcinoma.

CONCLUSION

CE-MRI provides unparalleled assessment of buccal carcinoma owing to its superior soft-tissue contrast, multiplanar capability, and functional imaging through diffusion-weighted sequences. In this case series, MRI accurately delineated primary tumour extent, tongue involvement, retromolar trigone extension, masticator space invasion, mandibular marrow infiltration, and cervical nodal metastases. The ability of MRI to evaluate both superficial mucosal disease and deep anatomical compartment involvement makes it indispensable for TNM staging, treatment planning, surgical decision-making, and prognostication. Based on our experience and current evidence, MRI should be considered the one stop destination in imaging for local staging of buccal carcinoma.

CONFLICT OF INTEREST: None declared

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