



Research Article

THE ROLE OF MRI AND CECT IN EVALUTAION OF ORAL CAVITY MALIGNANCY AND ITS STAGING

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ABSTRACT

Oral malignancies constitute over 30 % of malignancies in India. This study was conducted to determine and discuss in detail in the role played by Magnetic Resonance Imaging (MRI) and Contrast Enhanced Computed Tomography (CECT) in the staging of oral cavity malignancy. The study provides invaluable information on sensitivity, specificity and other important statistical data of MRI in diagnosing each of the criterion used for TNM staging of oral cavity malignancy. Comparing histopathological staging with imaging staging, MRI showed an astonishing equivalence and compliance with histopathological staging while CECT showed mild discordance with respect to histopathology.

Key words:

Oral cavity malignancy, MRI, CECT, staging.

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INTRODUCTION

The commonest malignancy in the oral cavity is Squamous cell carcinoma. The imaging of oral cavity and its subsites is considered complex. For each subsite, it is important to know the patterns of spread of the malignancy [1]. Radiological imaging plays an important role by providing accurate staging, in assessing respectability and thus in planning multimodality treatment [2].

Contrast Enhanced Contrast Tomography (CECT) is being widely used for evaluation, pretreatment assessment of oral cavity malignancies as it is more patient compliant and can be performed at much cheaper cost when compared with other modalities like Magnetic Resonance Imaging (MRI). The complexity of the anatomy of oral cavity and the need for increased soft tissue resolution to identify intrinsic details demands other imaging modalities for accurate pretreatment planning. MRI with its ability to produce excellent soft tissue resolution is considered an adjunct or potential replacement for CECT to assess oral cavity malignancy. This study has been performed to assess the role of CECT and MRI in evaluation of oral cavity malignancies. The role of CECT already being well established by extensive studies, our study primarily aims at comparing the MRI findings with those detected by CECT. In this study, we have obtained TNM staging for each causing MRI and CECT separately which we have compared with histopathological staging.

Thus, this study can provide immense details to the radiologist and clinician so that a well planned diagnostic approach can be employed towards similar disease in future.

Aim of the study

- To establish the significance of the role played by MRI in evaluation of oral cavity malignancy and its staging.

Objectives of the study

- To evaluate the role of MR imaging in staging of oral cavity tumours and to assess sensitivity and specificity of the same.
- To compare CT staging with histopathological staging.
- To compare MR imaging staging with histopathological staging.

MATERIALS AND METHODS

The study was conducted at Saveetha Medical College and Hospital after obtaining approval from the Institutional Ethical Committee.

Sample size and sampling technique

Sample size: 41

Sampling technique: Convenience sampling

Inclusion criteria

Patients with clinically diagnosed oral cavity malignancy, age of the patient over 18 years both male and female, patients who are able to sign an informed consent.

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Exclusion criteria

Patients with histopathologically proven benign oral cavity lesions, patients with recurrent or treated oral cavity malignancy, patients less than 18 years, patients contra-indicated for MRI, patients with previous history of intravenous contrast reactions.

Methodology and research design

Forty one clinically diagnosed new cases of oral cavity malignancy who have no treatment history for the same or similar disease referred from the oncology department for CECT of the oral cavity are the sample population.

- At first, using Siemens SomatomEmo 6 – slice CT scanner plain serial axial sections from scalp to thoracic inlet were obtained. Subsequently, intravenous contrast (Iohexol) was administered and serial axial sections were obtained. The obtained images and reconstructed images will be carefully evaluated and TNM staging of the oral cavity malignancy was performed.
- Subsequently, using Philips 1.5 TESLA MRI machine T2W axial, DWI axial and STIR axial sequences were obtained. After careful evaluation of the obtained images, TNM staging of the oral cavity malignancy was performed.
- The patients were followed up for obtaining the histopathological staging after incisional or excisional biopsy of the oral cavity lesion.
- The TNM staging results obtained by CECT and MR imaging were recorded and comparison was done with the histopathological staging during cumulative analysis of the data.

RESULTS

Predictive validity of MRI for each of the staging criteria used in TNM classification is described below

Criteria 1: Adjacent cortical bone involvement

Sensitivity - 100%, Specificity - 100%, False positive rate - 0%, False negative rate - 0%, Positive predictive value - 100%, Negative predictive value - 100% and the total diagnostic accuracy of MRI in determining adjacent cortical bone involvement was 100%.

Criteria 2: Deep muscle of tongue involvement

Sensitivity - 100%, Specificity - 87.5%, False positive rate - 12.5% , False negative rate - 0%, Positive predictive value - 16.7%, Negative predictive value - 100%, and the total diagnostic accuracy of MRI in determining deep muscle of tongue was 87.8%.

Criteria 3: Maxillary sinus involvement

Sensitivity - 100%, Specificity - 100%, False positive rate - 0% , False negative rate - 0%, Positive predictive value -100%, Negative predictive value - 100%, and the total diagnostic accuracy of MRI in determining maxillary sinus involvement was 100%.

Criteria 4: Skin of face involvement

Sensitivity - 100%, Specificity - 100%, False positive rate - 0% , False negative rate - 0%, Positive predictive value -100%, Negative predictive value - 100% and the total diagnostic accuracy of MRI in determining skin of face involvement was 100%.

Criteria 5: Masticator space involvement

Sensitivity - 100%, Specificity - 96.9%, False positive rate - 3.1% , False negative rate - 0%, Positive predictive value - 90%, Negative predictive value - 100%, and the total diagnostic accuracy of MRI in determining masticator space involvement was 97.6%.

Criteria 6: Lymph node detection

Sensitivity - 100%, Specificity - 100%, False positive rate - 0% , False negative rate - 0%, Positive predictive value - 100%, Negative predictive value - 100%, and the total diagnostic accuracy of MRI in detecting lymph nodes was 100%.

Comparing histopathological staging with imaging staging, MRI showed an astonishing equivalence and compliance with histopathological staging while CECT showed mild discordance with respect to histopathology. Among 1 patient with histopathological staging I, 1 had MR staging I. Among 10 people with histopathological staging III, 10 had MR staging III. Among 30 people with histopathological staging IV, 30 had MR staging IV.

DISCUSSION

In our study out of the 41 patients, adjacent cortical bone erosion was seen in 15 patients among the study population, of which MR showed the involvement in all the 15 patients with a sensitivity and specificity of 100%. A study by Imaizumi *et al* showed MRI sensitivity (96%) for cortical bone erosion similar to our study while the specificity was found to be higher in our study and the discrepancy may be attributed to relatively higher sample size of 51 patients in their study.

Deep muscle of tongue involvement was detected in MRI with a sensitivity of 100% and specificity of 87.5%. In a study by Nilu Malpani Dhoot *et al*, the sensitivity of MRI was found to be 94.4%.

Maxillary sinus involvement was seen in 4 patients in CECT, of which MRI showed the involvement in all the 4 patients with sensitivity and specificity of 100%.

Skin of face involvement was seen in 7 patients in CECT, of which MRI showed the involvement in all the 7 patients with a sensitivity and specificity of 100%.

Masticator space involvement was detected in MRI with a sensitivity of 100% and specificity of 96.9%.

Lymph nodes were detected by CECT in 35 patients, of which MRI detected all the 35 patients showing similarity in size criteria with a sensitivity and specificity of 100%. A similar study by de Bondt RB *et al* showed upper limits of their sensitivity and specificity to be 92% and 81% respectively.

The statistical equivalence of MRI with histopathological staging were in concordance with a similar study by Cherng-Gueih Shy *et al*.

Pterygoid plate invasion was found only in 1 of the 41 patients in CECT while MRI could not detect the invasion and hence statistically significant results could not be obtained for Pterygoid plate invasion. None of the patients in the study group showed ICA encasement or invasion of base of skull and hence these criteria could not be evaluated.

Arakawa A *et al* observed that tongue carcinoma show high signal intensity on T2WI which is seen in 11 out of 11 patients with oral tongue malignancy.

‘Puffed cheek’ maneuver used during CECT in the study population provided for better delineation of the oral cavity malignancies than in those performed without the maneuver as observed by Jane L.Weissman *et al.* Patient compliance for evaluation of oral cavity malignancies was more with CECT than MRI.

CONCLUSION AND RECOMMENDATIONS

Oral cavity malignancy is among the commonest cancers in India. As the management is almost entirely dependent on stage of the disease, there is a need for reliable and accurate method for staging of the disease and thus for planning treatment. Radiological imaging serves as the ideal solution for staging of oral cavity malignancy.

The common imaging modalities used for assessing the extent of disease and its staging are CECT and MRI. CECT is being preferred by the referring clinicians for the staging of the disease because of its wider availability, higher patient compliance and cheaper cost. MRI in staging of oral cavity is less preferred by the clinician since it is relatively costlier. MRI with its excellent soft tissue resolution can accurately predict the extent of the disease with good sensitivity and specificity.

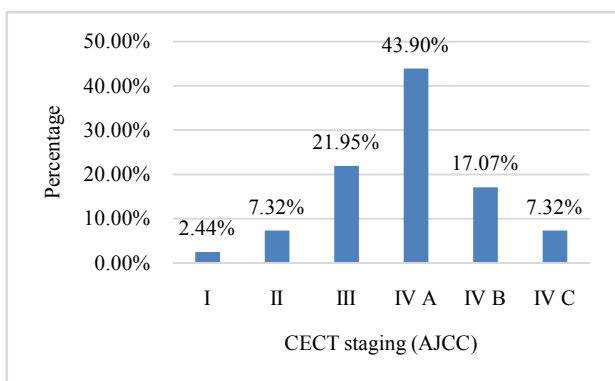
The analysis of our study showed good levels of sensitivity and specificity of MRI in assessment of the staging criteria used for staging oral cavity malignancy.

Our study was unique from other studies in that ours has assessed all the criteria used for staging oral cavity malignancy leaving none while others mostly have left out one or the other criterion and our study was exclusively performed for assessing oral cavity malignancy.

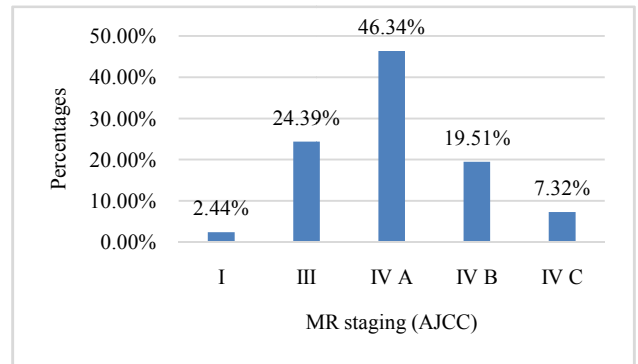
With availability of quality healthcare increasing by the day, the results recommend the clinician to use MRI for assessment of oral cavity malignancy with a major advantage of it being free of ionizing radiation.

Acknowledgment

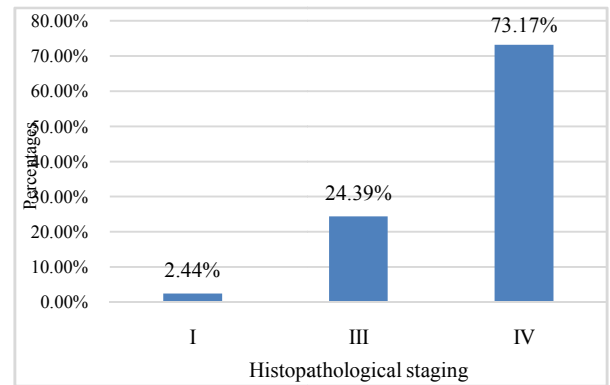
We are thankful to the patients who consented to this study. We are ever grateful to Professors Dr.Seena C.R and Dr.Saveetha.V who helped to conduct and publish this study.



1 Bar chart of CECT staging (AJCC) in study population (N=41)



2 Bar chart of MR staging (AJCC) in study population (N=41)



3 Bar chart of histopathological staging distribution in study population (N=41)

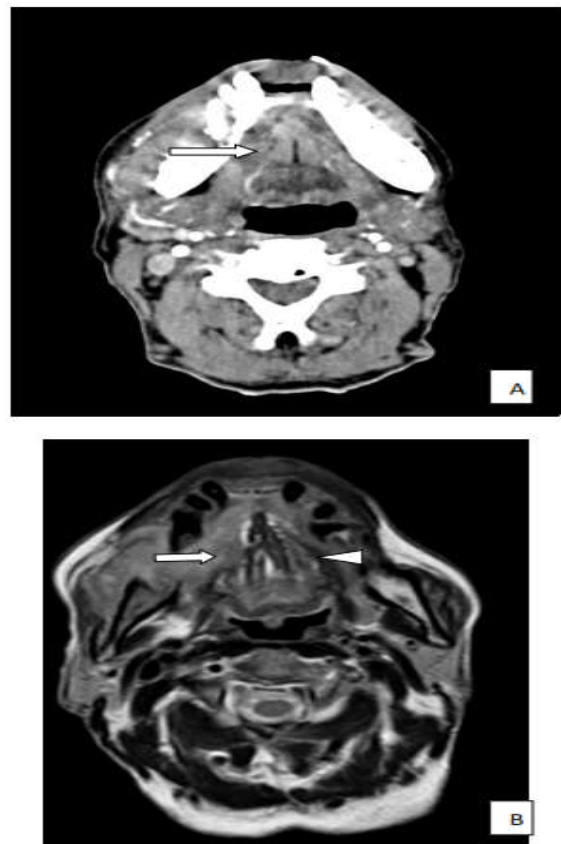


Figure 1 A) CECT axial section shows extension of right lower gingivobuccal tumor invading the tongue (arrow). B) T2 Axial image shows the tumor margin causing signal changes and partial non-visualisation of right styloglossus (arrow), suggestive of invasion which was not detected on CECT. Normal left styloglossus (arrowhead)

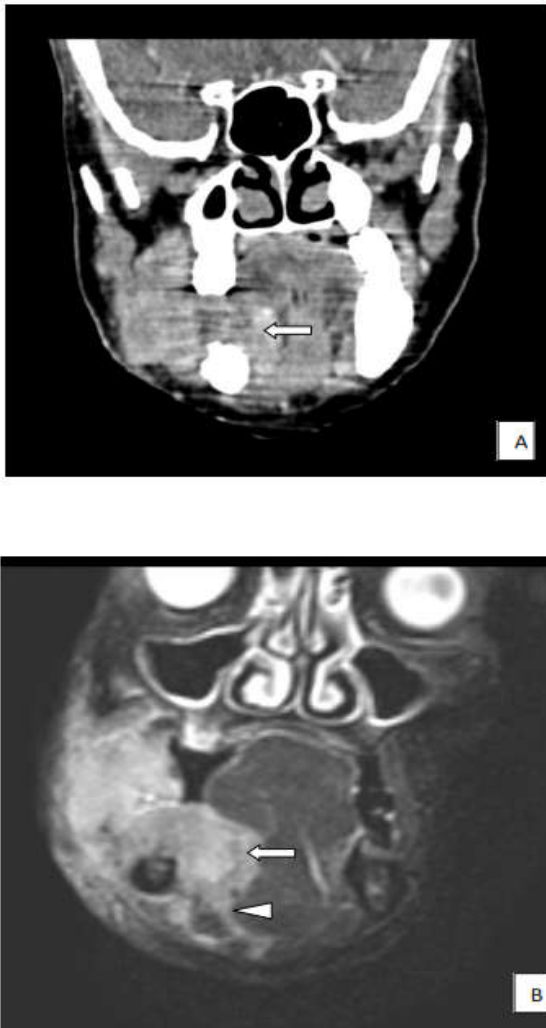


Figure 2 A) Coronal reformation of CECT shows tumor in right lower gingivobuccal mucosa extending into sublingual space (arrow), adherent to tongue. B) Corresponding STIR coronal image shows similar findings (arrow) found in CECT with an additional information on signal changes in the right mylohyoid (arrowhead) suggesting involvement of floor of mouth

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