

SQUAMOUS CELL CARCINOMA (SCC) OF RETROMOLAR TRIGONE : COMPARATIVE EVALUATION OF MANDIBULAR INVASION AND T- STAGING BY MULTIDETECTOR ROW COMPUTED TOMOGRAPHY (MDCT) AND MAGNETIC RESONANCE IMAGING (MRI) AND CORRELATION WITH PATHOLOGICAL DATA

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ABSTRACT:

Purpose: Our purpose was to assess the diagnostic accuracy of CT and MRI in staging of squamous cell carcinoma (SCC) of the retromolar trigone , that can be associated with a potential of bone infiltration, by correlating prospectively with post-operative pathological data.

Method: Sixty patients, with histologically proven Squamous cell carcinoma (SCC) of the retromolar trigone were subjected to clinical and radiological examinations (MDCT & MRI) .Data on clinical findings, radiological findings and operative findings was collected prospectively on a preset proforma and the results were correlated with pathologic data. Histologic analysis and pathologic staging were considered the standard parameter to evaluate the presence of mandibular bone involvement and diagnostic accuracy of T- staging.

Results: For T- staging primary tumours, the accuracy of MR was 87% and that of CT was 79%. For detecting mandibular invasion , the accuracy of MR was 93% and that of CT was 82%. The sensitivity, specificity, PPV and NPV of MDCT and MRI in the assessment of mandibular invasion were 82%, 80%, 95% and 47% and 94%, 90% , 98% and 75% respectively. There wasn't any statistically significant difference in overall diagnostic accuracy between MRI and MDCT in the evaluation of mandibular tumour invasion ($p > .05$).

Conclusion:For T-staging and assessment of mandibular involvement from SCC arising in the retromolar trigone , MR scanning is overall more accurate than CT. If degraded images and T1 tumours are excluded, the techniques are comparable. Statistically also, no significant differences were noted. MRI was reliable enough to evaluate the relationships between the lesions and the surrounding structures but it was limited and in evaluating the infiltration of the alveolar ridge and cortical bone of the jaw in the early stage and in demonstrating superficial lesions.

Keywords: Retromolar trigone, Squamous Cell Carcinoma, Mandibular involvement, Magnetic Resonance Imaging, Multi-detector row computed tomography.

INTRODUCTION:

Malignant neoplasms of the oral cavity are mainly represented by squamous cell

carcinoma, which account for approximately 5% of all cases of this disease in the human body.^[1,2] They are responsible for considerable morbidity and mortality; therefore, an accurate tumour staging, which includes assessment of mandibular tumour invasion, is crucial for early diagnosis, appropriate treatment planning { surgical management (i.e. ablative, reconstructive) and for the chemo-radiation therapy } and for improving survival rates.^[2] They have a tendency to invade the surrounding bone structures in 12% to 88% of the cases.^[1-9] Oral malignancies are a challenging area for radiological diagnosis; however, imaging protocols can be tailored to the patient's specific presentation through a sound understanding of radiological anatomy, common pathways of disease spread and current complementary technical approaches to improve detection and characterisation of oral cavity pathology. From a treatment perspective, it is crucial to accurately define the tumour staging and the extension of the invasion of both the soft tissue and the bone adjacent to the lesion and, more importantly, the amplitude of bone involvement, since an underestimation may lead to a partial resection, resulting in local recurrence and potential metastasis.^[2] On the other hand, an overestimation of bone involvement can lead to an unnecessary bone resection, resulting in considerable functional and cosmetic defects.^[10,11]

Several imaging modalities such as conventional radiography, ultrasonography, computed tomography

[CT], bone scanning and magnetic resonance imaging [MRI] have been used to investigate and diagnose the oral malignancies.^[6,10,12] All these imaging modalities seem to have specific limitations; however, the use of magnetic resonance imaging [MRI] in the preoperative assessment of malignant tumors seems to be the most valuable technique, because it shows superiority in the evaluation of the T- staging and medullary involvement while MDCT is resulted more accurate as compared to MRI in the visualization of small cortical bone erosions^[13-14]. The aim of the present study was to assess the diagnostic accuracy of CT and MRI in staging of squamous cell carcinoma (SCC) of the retromolar trigone, that can be associated with a potential of bone infiltration, by correlating prospectively with post-operative pathological data.

MATERIALS AND METHODS:

Institutional review board approval with a waiver of informed patient consent was obtained. Sixty patients (45 men, 15 women; mean age, 57 years; range, 25-75 years) with histologically proven SCC of retromolar trigone, who performed both a preoperative MRI and MDCT, composed our final study population (Table 1). All the patients underwent surgical treatment (ablative or reconstructive), and their preoperative CT & MR imaging findings were correlated with postoperative pathologic findings. Surgical procedure, preoperative imaging examinations as well as histologic analysis were performed in our institution.

Exclusion criteria for histologically proven SCC cases of retromolar trigone, were the following: (i) patients who performed only MDCT or only MRI examinations; (ii) preoperative treatments with radiotherapy and/or chemotherapy (iii) a time greater than two weeks between the two examinations (iv) the presence of metallic artifacts or dental amalgam restorations in the images that could interfere with radiological interpretation.

MR images were acquired on a 1.5-T (Magnetom, Siemens, Iselin, NJ) superconductive system. MRI was performed using a neck coil, 5-mm thick sections, and a matrix of 256 X 256. In the study, spin-echo T1-weighted (550/15/2 [repetition time (TR)/echo time/excitations]) and T2-weighted sequences (2500/15-90/1) were performed in multiple planes (axial and coronal or sagittal) selected in relation to the site of the tumours into the oral cavity and short-tau-inversion-recovery (STIR) sequences T2 weighted (TR 1800 ms; TE 100 ms; TI 10 ms) acquired on the axial plane. The protocol also included a spinecho T1-weighted sequence on coronal or axial plane with 3-millimetre-thick slices, for the evaluation of the mandible. In addition, for the study of tumor extension to the mandible, gradient-echo sequences (190/20, 25° flip angle) in the axial planes were used.

MDCT examination was performed using a 64-MDCT scanner (Somatom sensation 64, Siemens Healthcare, Germany). The scans were performed with the patients supine with the neck hyper-extended. The

parameters used were: slice collimation 4 × 1; tube voltage, 120-140 kV; effective mAs, 150; slice thickness 1 mm. Reconstructed slices at 1.5-mm intervals; gantry rotation time 0.8 s; were secondarily obtained with a field of view of 35 cm focused on the oral cavity structures.

The post-operative histological analysis was considered the standard parameter in our study. Two experienced radiologists, unaware of the findings, independently reviewed, in consensus, all images to determine the pre-operative T-staging and mandibular tumour invasion. T-Stage assessment was made in concordance with the radiologic criteria of the TNM staging system established by the American Joint Committee on Cancer.^[15]

The statistical analysis was performed with SPSS 13.0 statistical package (SPSS, Chicago, IL, USA). Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of MRI and MDCT were assessed to evaluate the overall accuracy of both imaging techniques in the evaluation of the mandible involvement by the SCC. Wilcoxon non-parametric test was used to determine the difference between the post-operative pathological staging and pre-operative diagnostic T-staging by MDCT & MRI.

RESULTS:

Pathological examination showed evidence of mandibular invasion in 50 (83%) patients while no bone invasion was present in 10 (17%) patients. All of the

other 10 patients who underwent marginal or segmental mandibulectomy with negative MRI findings had no histopathologic evidence of mandibular involvement, except in 3 patients: on histopathologic examination, despite cortical integrity, neoplastic vascular embolization into the bony lacunae was detected. While MDCT reported 9 false negative cases. The sensitivity, the specificity, the accuracy, PPV and NPV of MDCT and MRI in the assessment of mandibular involvement are reported in Table 1. For T- staging primary tumours (See fig 1-2) , the accuracy of MR was 87% and that of CT was 79%. Wilcoxon non-parametric test didn-t show any significant difference in the diagnostic accuracy for the T- stage evaluation between the two modalities ($p > .05$).

DISCUSSION:

The RMT is a triangular region of mucosa posterior to the third mandibular molar .Squamous cell carcinomas (SCC) can arise primarily from, or spread secondarily into, the RMT from the tonsils or base of tongue. When assessing the RMT tumour, it is pertinent to understand the potential pathway of spread and assess the structures at risk. [19] There may be direct invasion into the mandible and inferior alveolar nerve, or extension posteriorly along the pterygomandibular raphe. Tumour invasion into the pterygomandibular raphe therefore potentiates the spread in multiple directions into the buccal space and oropharynx.

Several imaging techniques, such as conventional radiography, computed tomography, magnetic resonance and scintigraphy have been used to assess bone destruction by oral and maxillofacial lesions.[2,3,5,16,] The most accurate tumor staging, in tumors of the retromolar trigone region , comes when the clinical mucosal extent is matched with the radiographic evaluation of deep-tissue extent. The size , extent and mandible involvement of the primary tumor is critical in planning surgery and/or radiation therapy and predicting the prognosis. [17 ,18] The reported incidence of bone involvement by tumors in the oral region varies from 12% to 88%. [7,9,20] In our study, bone invasion was confirmed by MDCT in 41 cases (82%) and 47 cases (94%) by MRI. In a study , Marcello crecco et al reported that either CT or MR can be used to stage primary tumors.[21] The results of our study suggest the significance of careful preoperative staging and mandibular tumor invasion by MDCT & MRI. We propose that MRI is the technique of choice for treatment planning in advanced retromolar trigone squamous cell carcinoma because of its accuracy in depicting soft-tissue involvement and detecting bone invasion,however , MR imaging have still shown to have lower spatial resolution than 1-mm-thick CT. MRI was reliable enough to evaluate the relationships between the lesions and the surrounding structures but it was limited in evaluating the infiltration of the alveolar ridge and of the cortical bone of the jaw in the early stage and in demonstrating , neoplastic

vascular embolization into the bony lacunae in superficial lesions .

CONCLUSION:

In the present study, MRI was seen to be an adequate technique for the assessment of retromolar trigone malignancies, in the evaluation of accurate staging , depth invasion,

presence and extension of mandibular involvement. However statistically, no significant differences were noted between the two techniques. We propose that further studies with high resolution MRI and larger study population should be conducted because of the importance of the correct SCC staging at imaging for either surgical or treatment management.

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TABLES:

Table 1: Sensitivity, specificity, accuracy, PPV and NPV of MDCT and MRI in the assessment of mandibular invasion.

	MDCT	MRI
Sensitivity	82% [41/50]	94% [47/50]
Specificity	80% [8/10]	90% [9/10]
Accuracy	82% [49/60]	93% [56/60]
PPV	95% [41/43]	98% [47/48]
NPV	47% [8/17]	75% [9/12]