COMPUTED TOMOGRAPHY VERSUS MAGNETIC RESONANCE IMAGING FOR DIAGNOSING OF ORAL CAVITY SQUAMOUS CELL CARCINOMA

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ABSTRACT:

Background: The sixth most common malignancy in the world is oral cancer. In India cancer of oral cavity is third most common cancer among both sexes out of them the most common variant is squamous cell carcinoma. In present scenario noninvasive staging techniques are being used frequently including clinical examination, CT scan and MRI. For staging the lymph nodes via CT and MRI Criteria used is based upon the size of the lymph nodes, the existence of central necrosis and presence of indistinct nodal margins. **Material & Methods**: A total of 100 patients were prospectively recruited into this study. Inclusion criteria comprised a clinical diagnosis of SCC in the oral cavity, no prior treatment to the head or neck region, and patients were scheduled for dissection. In these patients, the preoperative evaluation was accomplished using CT scan and MRI for all patients within 2 week before surgery. **Results:** Out of 100 patients the mandibular involvement present in 80 patients while no bone involvement was present in 20 patients**.** The accuracy of MR was 94% and that of CT was 84%. McNemar test didn't show any significant difference in the diagnostic accuracy for the T- stage evaluation between the two modalities (p value = 0.570).**Conclusion:** We concluded from the present study that MRI comes out to be most accurate, most sensitive and most specific technique for the evaluation of oral squamous cell malignancies.

Key words: Squamous Cell Carcinoma, Magnetic Resonance Imaging, Multi-detector row computed tomography.

INTRODUCTION:

The sixth most common malignancy in the world is oral cancer. In India cancer of oral cavity is third most common cancer among both sexes out of them the most common variant is squamous cell carcinoma.**(1)**The most important prognostic indicator for patients with squamous cell carcinoma of the head and neck is the presence or absence of malignant cervical adenopathy along with tumor size and site.**(2)** In present scenario noninvasive staging techniques are being used frequently including clinical examination, CT scan and MRI. For staging the lymph nodes via CT and MRI Criteria used is based upon the size of the lymph nodes, the

existence of central necrosis and presence of indistinct nodal margins.**(3)**

It is also possible to obtain the staging information by the help of ultrasound-guided biopsy of the lymph nodes, but this may be inappropriate because of the presence of numerous numbers of nodes. Hence there is a need for a noninvasive procedure that is easy and provides high-quality prognostic approaches.**(4)**

CT scan and MRI are imaging techniques that provide information about tissues and have been successfully applied to the evaluation of head and neck cancer. These ranged from 36% to 94% for sensitivity of CT and MRI for detecting lymph node metastases and the specificity ranges from 50% to 98% respectively for both of them.**(5)**

The methodology used for calculating sensitivity and specificity were also differed among many studies as they based on patient numbers, some based on neck sides and some based on the node numbers. Studies based on the lymph node numbers usually give a more accurate specificity because neck dissection display a large number of tumor free lymph nodes. Therefore neck dissection with its histologic findings are currently the most reliable staging procedure and the imaging techniques for recording of the cervical nodal location like CT scan or MRI used along ways. However, to our best knowledge there was no previous studies using the both above criterion have been reported and also it has been proven that the visual correlation CT scan or MRI with surgical diagnostic procedures have better diagnostic accuracy than alone in the evaluation of nasopharyngeal carcinoma and lung cancer.**(6)**

Therefore, we conducted a prospective study to find out the comparative results of CT and MRI and their sensivity and specificity in the detection of of SCC of the oral cavity.

MATERIALS AND METHODS

The present study was prospective study carried out in the department of radiodiagnosis, geetanjali medical college & hospital/ geetanjali university, Udaipur, and pacific medical college & hospital/ pacific university, Udaipur India during the period of January 2015 to August 2015. The ethical approval taken from institutional review board of our hospital, written informed consent obtained from all the enrolled subjects. A total of 100 patients were prospectively recruited into this study out of them 86patients were studied in the department of radiodiagnosis, geetanjali medical college and remaining 14 patients in the department of radiodiagnosis, pacific medical college. Inclusion criteria comprised a clinical diagnosis of SCC in the oral cavity, no prior treatment to the head or neck region, and patients were scheduled for dissection. The exclusion criterion was patients with diabetes mellitus.. In these patients, the preoperative evaluation was accomplished using CT scan and MRI for all patients within 2 week before surgery. CT was performed with contrast axial scans parallel to the line ramus of the mandible from the skull base to the supraclavicular fossa with contiguous sections of 5-mm-thickness with or without Contrast, then thin reconstruction at 1-mm-thickness in all axial coronal and seggital plane. Field of view range between 16 and 18 cm, variable is the size of the patient. All images with bone algorithms reconstructed in addition to the soft-tissue window settings. MRI with a 1.5-T unit (Vision; Siemens) used with spin-echo technique along with before and after injection of gadolinium di

ethylene tri amine penta acetic acid. To examine the region from the superior margin of the temporal we used a head coil. The supraclavicular fossa and the rest of the neck were examined by a neck coil. In the sagittal and axial planes unenhanced T1-weighted images were acquired in with a spin-echo of 500/20 ms (repetition time/echo time). T2-weighted fat-suppressed fast-spin-echo images were acquired in Axial and coronal sections with (3,000/85, 16–echo train length).

Section thickness of 5 mm without inter slice gap used in the axial projection and 4 mm without inter slice gap used in the sagittal as well as coronal projections. Same parameters that were used before for gadolinium DTPA injection at a dose of 0.1 mmol/kg of body weight were used to obtained T1-weighted fat-suppressed axial, sagittal, and coronal sequences.

The standard parameter in our study was the post-operative histological analysis. Likewise CT or MRI was interpreted by 2 radiologists in a blinded fashion.

The sensitivity, specificity, accuracy, positive predictive value, and negative predictive value of CT and MRI were calculated. McNemar test used to find out any differences in sensitivity and specificity between the imaging modalities. The data were analyzed using MS Excel 2010, Epi Info v7 and SPSS v22.

RESULTS

In present study out of hundred patients pathological examination showed that the mandibular invasion in 80 patients while no bone invasion was present in 20 patients. All of the other 20 patients who underwent marginal or segmental mandibulectomy with negative MDCT findings had no histopathologic evidence of mandibular involvement, except in 12 patients: neoplastic vascular embolization into the bony lacunae was detected despite cortical integrity on histopathologic examination. This difference is highly statistically significant (p value< 0.01).

Out of all 20 patient who shows no bone invasion underwent marginal or segmental mandibulectomy with negative MRI findings, except of 4 patients rest had no histopathologic evidence of mandibular involvement. 76 patients were test positive by MRI out of total 80 disease positive patients and 18 patients were detected test negative out of 20 disease negative patients. This difference is highly statistically significant (p value< 0.01).[table 2]

Table 1: The assessment of mandibular invasion by MDCT

	Mandibular invasion +VE	Mandibular invasion -VE	TOTAL	P VALUE
TEST +VE	68	4	72	<0.01
TEST -VE	12	16	28	
TOTAL	80	20	100	

The sensitivity, the specificity, the accuracy, PPV and NPV of MDCT and MRI in the assessment of mandibular involvement are

reported in Table 3. For T- staging primary tumours (See fig 1-2) , the accuracy of MR was 94% and that of CT was 84%. McNemar test didn't show any significant difference in the diagnostic accuracy for the T- stage evaluation between the two modalities (p value = 0.570).

Table 2: The assessment of mandibular invasion by MRI

	Mandibular invasion +VE	Mandibular invasion -VE	TOATAL	P VALUE
TEST +VE	76	2	78	**<0.01**
TEST -VE	4	18	22	
TOTAL	80	20	100	

Table 3: The assessment of mandibular invasion by MDCT and MRI

	MDCT	MRI
Sensitivity	85%	95%
Specificity	80%	90%
Accuracy	84%	94%
PPV	94.4%	97.4%
NPV	57.1%	81.8%

Figure 1. CT axial image shows heterogeneously enhancing soft tissue density mass in left buccal mucosa and retromolar trigone.
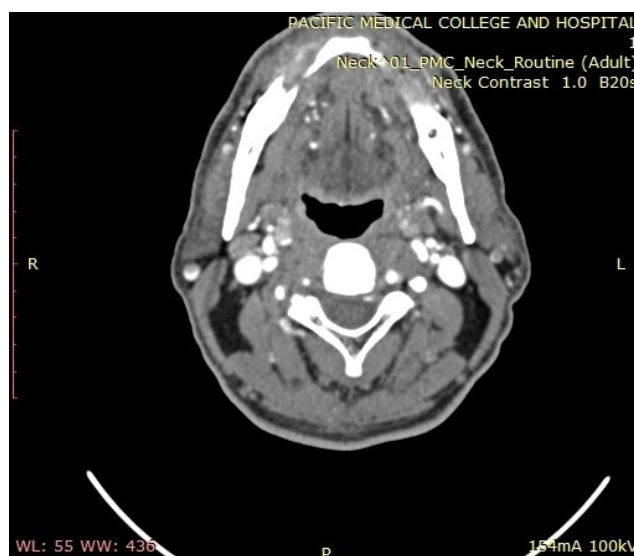

Figure 2. CT axial image shows heterogeneously enhancing soft tissue density mass involving labio – gingival sulcus on right side with mandibular erosion.
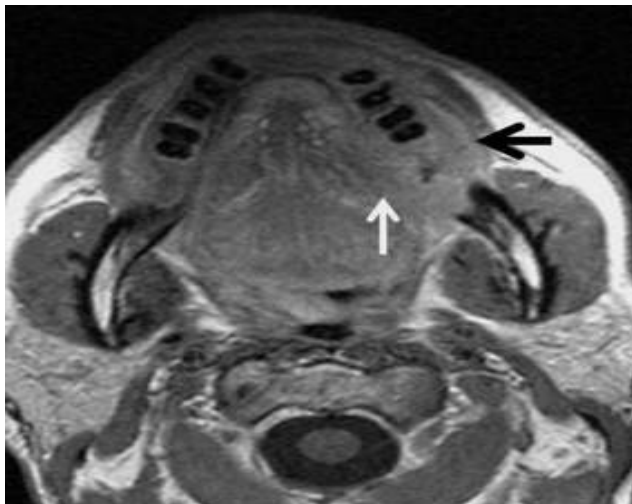
Figure 3: MRI axial image shows an abnormal signal intensity mass involving left buccal mucosa and retromolar trigone with erosion of alveolar surface of mandible.

DISCUSSION

Head and neck carcinomas constitute approximately 7% of all malignancies worldwide, and the incidence of tumors of the head and neck is constantly increasing. Majority of these tumors are SCC, which accounts for about 95% .**(7)** Squamous cell carcinomas may arise primarily from or spread secondarily into the retro molar trigon from the base of tongue or tonsils. It is a triangular area of mucosa posterior to the third mandibular molar and it is relevant to understand the potential pathway of metastasis and assess the structures at potential risk. **(8)** There is an proven evidenced of confounding results of smoking and in patients with a history of excessive alcohol use along with noted the association of SCC of the oral mucosa and the chewing of tobacco and betel quid.**(9)** In present study, there is strong association of tobacco and betel quid chewing in patients with oral cavity.

There may be direct metastasis into the mandible, extension posteriorly along the pterygo mandibular raphe and inferior alveolar nerve. Tumor invasion into the buccal space and oropharynx through the pterygo mandibular raphe potentiates the spread in multiple directions. Several imaging techniques, such as conventional radiography along with computed tomography with advanced magnetic resonance imaging and scintigraphy have been used to assess bone invasion, destruction by oral and maxillofacial lesions.**(10)**
Although a considerable number of studies of CT or MRI in the preoperative evaluation of head and neck cancer has been previously published **(11)**, but the majority of such publications had few number of patients. On the other hand our study enrolled 100 patients with newly diagnosed oral cavity SCC and. The present management of SCC mainly consists of resection which may be coupled with subsequent radiotherapy. It is evident from the previous literature **(12)** that MRI is very sensitive and specific for detecting primary tumors in the oral cavity, and present study further support these findings. Our data demonstrate an accuracy of 94% for MRI in the detection of known primary tumors and of 84% for MDCT.
The critical determinant of the mainstay of an imaging modality for SCC of oral cavity is its ability to detect the metastasis. This information is used to alter the treatment course and alter the patient morbidity. The neck dissection along with histologic examination is the most reliable staging procedure that provides overall prognostic picture, but it sometimes involve the resection of a large amount of healthy tissue. Previous studies **(13)** showed that the extent of the oral squamous cell carcinoma is a more

limiting determinate than the nodal size. Similar to present study MRI has been reported to have a higher specificity than CT in detecting cervical nodal disease **(14)**. The most canonical tumor staging pattern in tumors of the SCC of retromolar trigone region , comes when the histologic mucosal extent is matched with the radiographic evaluation of deep-tissue extent with pathologic evidence. The mandible involvement of the primary tumor with size and extent is critical in planning surgery and/or radiation therapy and predicting the prognosis **(15).** In a study conducted by Marcello crecco et al reported that either CT or MR can be used to stage primary tumors however MRI showed high accuracy in the study of tumors of the tongue and floor of the mouth which is similar to the present study results**(16)**.

In present study the bone invasion was confirmed by MRI in 76 cases and 68 cases by MDCT.

Almost similar result reported in a previous study conducted on incidence of bone involvement by tumors in the oral region and the results were up to 88% .(17)

The results of present study propose the significance of vigilant preoperative staging and mandibular tumor metastasis by MRI and MDCT. We recommend that MRI is the technique of choice for imaging and staging for treatment planning in advanced oral cavity squamous cell carcinoma because of its high sensitivity, specificity and accuracy in depicting soft-tissue involvement and detecting bone invasion. However, MRI still has lower spatial resolution than MDCT. MRI is reliable enough to assess the relationships between the lesions and the surrounding tissues and structures but it was limited in assessing neoplastic vascular

embolization into the bony lacunae in superficial lesions and also the imaging of the infiltration of the cortical bone of the jaw and alveolar ridge in the early stages.

CONCLUSION

We concluded from the present study that MRI comes out to be most accurate, most sensitive and most specific technique for the evaluation of oral squamous cell malignancies and also in the assessment of presence and extension of mandibular involvement along with depth invasion and as well as in accurate staging. Since the sample size was not up to generalize the result universally there is further need of more elaborative studies to enlighten new techniques as well as the most accurate technique in the field of diagnosis as well as the correct staging of oral squamous cell carcinoma.

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