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Original Research Article

Evaluation of Oral Cancer with CT Scan & MRI

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Abstract: The most common type of oral cancer is squamous cell carcinoma. In the tumours of the tongue, floor of the mouth & oropharayx, the imaging to localize the size & extent of primary tumor is very essential for planning of surgery & radiotherapy. Total 50 patients were subjected to contrast enhanced CT scans & were simultaneously subjected to MRI for the exact size & location of tumor as well as its spread to sorrounding structures. The staging was done with TNM classification. In our study CT scan has higher sensitivity in detecting the tumor whereas MRI has higher specificity.
Keywords: oral cancer, staging, CT scan & MRI.

INTRODUCTION:

Oral cavity squamous cell cancers form a significant percentage of the cancers seen in India, the age adjusted incidence in India being 20 per 100,000 population. While clinical examination allows direct visualization, it cannot evaluate deep extension of disease. Cross-sectional imaging has become the cornerstone in the pre treatment evaluation of these cancers and provides accurate information about the extent and depth of disease that can help decide the appropriate management strategy and indicate prognosis. Early cancers are treated with a single modality, either surgery or radiotherapy while advanced cancers are offered a combination of surgery, radiotherapy and chemotherapy. High incidence of squamous cell carcinoma in India is due to high incidence of tobacco chewing [1].

Anatomy of oral cavity:

The oral cavity is divided into a central part "the oral cavity proper" and a lateral part "the vestibule. The oral cavity proper consists of the central tongue, the roof formed by the hard palate, the lateral walls by the upper and lower alveolus covered by gingival mucosa, and the floor which is chiefly formed by the mylohyoid muscle. The vestibule is a cleft lined by the buccal mucosa laterally, superiorly and inferiorly by reflections of the buccal mucosa onto the mandible and maxilla, respectively, referred to as the upper and lower gingivobuccal sulci (GBS), the gingival mucosa medially, the lips anteriorly and leads to the retromolar trigone posteriorly.

The retromolar trigone (RMT) is a mucosal fold extending behind the mandibular last molar along the ascending ramus of the mandible upto the maxillary last molar on either side. It is triangular in shape with base behind the mandibular last molar and apex at the maxillary tuberose[2]. Beneath the mucosal fold lies the ptergyomandibular raphe that attaches superiorly to the pterygoid hamulus and inferiorly to the posterior end of the mylohyoid line. On CT images the RMT is seen in two or three consecutive axial sections, the upper limit behind the maxillary last molar and the lower limit behind the mandibular last molar. The RMT can be seen in its entirety in the oblique plane that can be reformatted with MDCT.

Lateral to the buccal mucosa is the buccomassteric region or buccal space which though not a part of the oral cavity needs mention. Squamous cancers arising from the buccal mucosa often spread to this region and beyond into the masticator space upstaging disease. The buccomasseteric region is bounded by the buccinator medially and the zygomaticus major laterally while the masseter is located posteriorly . It consists of the buccal fat, angular branch of the facial artery, facial vein, buccal artery,

nerves , the terminal part of the parotid duct and the facial node. Superiorly this space leads to the masticator space with often incomplete fascial boundaries between.

The oral tongue located in the central part of the oral cavity is composed of numerous muscles wrapped in mucous membrane. It is formed by the anterior two-thirds of the tongue upto the circumvallate papillae while the posterior one-third of the tongue, also called base tongue is a part of the oropharynx. The midline lingual septum divides the tongue into equal halves, consisting of the intrinsic and extrinsic muscles.

The four intrinsic muscles which form the bulk of the tongue are superior and inferior longitudinal, transverse and vertical. These interdigitate with each other in the upper portion of the tongue. They are difficult to appreciate on CT, but are well seen on MR imaging[3].The four extrinsic muscles of the tongue are genioglossus, hyoglossus, styloglossus and palatoglossus, best seen on T2W MR images. They provide attachment of the tongue to hyoid bone, mandible and styloid process. The largest is the fan-shaped genioglossus that originates from the superior genial tubercle, located on the inner aspect of midline mandible and fans out superiorly to interdigitate with the intrinsic muscles. Inferiorly it attaches to the body of hyoid bone. It is well seen on sagittal, coronal and axial MR images .The hyoglossus are thin flat quadrilateral muscles that course lateral to the genioglossus from the greater cornua of the hyoid bone to the sides of the tongue. The hyoglossus is best appreciated on axial and coronal MR imaging . The palatoglossus muscle covered by the mucosa forms the anterior tonsillar pillar. It arises from the oral surface of the soft palate and passes anterior to tonsil and downward to blend with the hyoglossus and may not always be appreciated on imaging . The styloglossus arises from the styloid process and stylomandibular ligament, passes forwards and interdigitates with the hyoglossus.

The floor of the mouth (FOM) is formed primarily by the mylohyoid which is a U-shaped sling extending from one mylohyoid ridge on the inner aspect of the mandible to the other ridge. Anteroposteriorly it extends from the symphysis menti to the last molar tooth. It inserts both into the midline fibrous raphe and the hyoid bone and is best seen on coronal planes on both CT and MR imaging. The submandibular gland is located inferior to the mylohyoid . The deep lobe of the submandibular gland wraps around the posterior free border of mylohyoid to lie on the superior surface of the mylohyoid. However, surgically the FOM is the space between the mucous membrane of the FOM and the mylohyoid.

Two other muscles, geniohyoid and anterior bellies of digastric support the FOM. The paired geniohyoid arising from the inferior genial tubercles run above the mylohyoid in a paramedian position to insert into the hyoid. They are seen best in the sagittal plane on MR images as darkly hypointense structures on T2W images . The anterior bellies of digastric are seen on the inferior surface of the mylohyoid, best seen on the coronal plane.

The sublingual space (SLS) is seen superomedial to the mylohyoid and lateral to the genioglossus. It is a fat-filled space and contains the sublingual gland, deep part of submandibular gland, Wharton′s duct, lingual neurovascular bundle and the anterior fibers of hyoglossus. On CT it appears as a low density plane while on MRI it is seen as a hyperintense area.

MATERIAL & METHODS:

Total 50 patients were subjected to CT scan & MRI study. The staging was done with TNM classification. Imaging was performed from paranasal sinuses & neck region with axial sections from skull base to clavicles after injection of intravenous contrast media for CT scan. Gadolinium contrast was used for MRI scans. Multiplannar sagital & coronal reformated images were obtained using multiplanar imaging. Puffed cheek manoeuvre[4] was performed to separate gingival & oral buccal mucosa for improved evaluation while doing CT scan. No puff cheek manoeuvre was done while performig MRI scans.

Both scans were evaluated for the size & extent of primary mass lesion. Disease was considered to be advanced in the presence of bone erosion, skin infiltration, sorrounding muscles involvement, involvement of retromolar trigone. Involvement of lymph node , its size, enhancement or areas of necrosis was also evaluated. Radiological findings were compared with histopathological study.

TNM staging for squamous cell carcinoma[5] in oral cancer:

TX - Primary tumor cannot be assessed.
T0 - no evidence of primary tumor
Tis - carcinoma in situ.
T1 - tumor size less than or equal to 2cm
T2 - tumor size 2-4cm
T3 - tumor size more than 4cm.
T4a- erosion of cortical bone , involvement of

muscles of tongue, maxillary sinus or skin of face.
T4b- tumor invovement of masticator space,pterygoid plates,skull base of encasement of internal carotid artery.
Nodal involvement:
Nx - regional lymph nodes cannot be assessed.
N0 - no regional lymph node metastasis.
N1 - metastasis in single ipsilateral lymph node,3cm or less in size.
N2 - metastasis in ipsilateral or contralateral node or node less than 6 cm in greatest dimension.
N2a - metastasis in single ipsilateral lymph node,3-6 cm in greatest dimension.
N2b - metastasis in multiple ipsilateral lymph nodes,none more than 6cm in dimension.
N2c - metastasis in bilateral or contralateral lymph nodes,none more than 6cm in greatest dimension.
N3 - metastasis in a lymph node more than 6cm in greatest dimension Metastases
Mx - distant metastasis cannot be assessed
M0 - no distant metastasis
M1- distant metastasis.

Staging criteria for oral cavity cancer

Stage	**TNM staging**	Criteria
I	T1N0M0	Tumour less than 2cm
II	T2N0M0	Tumour more than 2cm but less than 4cm
III	T3N0M0 or T1/T2/T3- N1 M0	Tumour > 4cm or ipsilateral node < 3cm
IV	T4N0M0 or T1/T2/T3 N2/N3 M0 or M1	Invasive lesions infiltrating skin & eroding bone. All N2,N3 lesions. Ipsilateral or bilateral lymph nodes. All M1 lesions(distant metastasis).

RESULT:

The incidence of oral cancer in male is twice as comapre to female population in the study done by R. shankarnarayan et al[6]. Highest incidence of buccal mucosa occurs in 4th decade in our study, followed by 3rd decade. Majority of patients were male as they have the habit of tobacco chewing.62% were having T4 stage.10 cases were classified as T4b stage with extension into masticator space. MRI is the best investigation of choice shows better anatomic detail, involvement of intrinisic & extrinsic muscles, involvemnet of floor of mouth, vacular bundles[7]. Contrast enhanced MR images shows intense enhancement of the tumour..CT scan can show the size of tumor & how far it has spread. However MRI is more accurate in delineation of the tumor & involvement of the muscular plane. Tumour thickness is also best seen with MRI. The tumour thickness especillay involving the tongue is measured from lateral to medial aspect. Okura et.al has found that tumour thickness of more than 9.7mm has a significant prediction of cervical metastases[8].

Table-1: Age wise distribution of patients

Age group in years	No of patients(%)
20-30	2(4%)
31-40	11(22%)
41-50	22(44%)
51-60	9(18%)
61-70	6(12%0

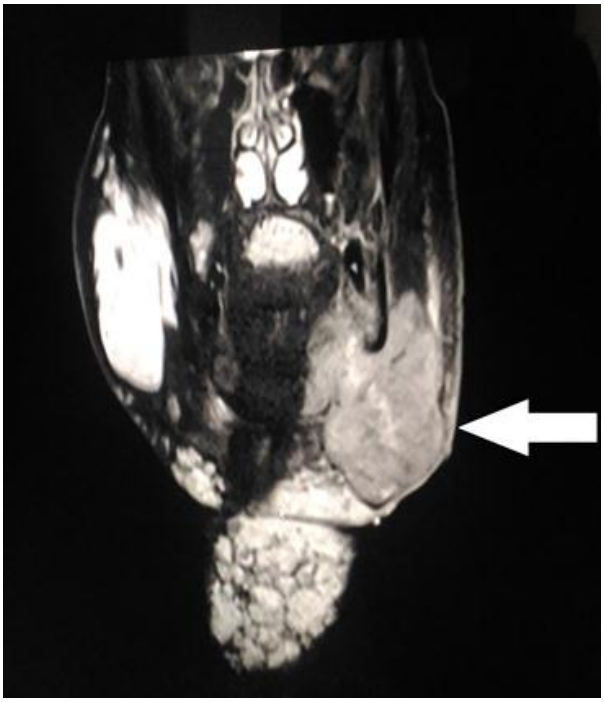

Fig-1: MRI Showing Large Infiltrating Soft Tissue Mass Lesion Involving Left Submandibular Region and Retro Mandibular Region Encasing Body of Mandible.

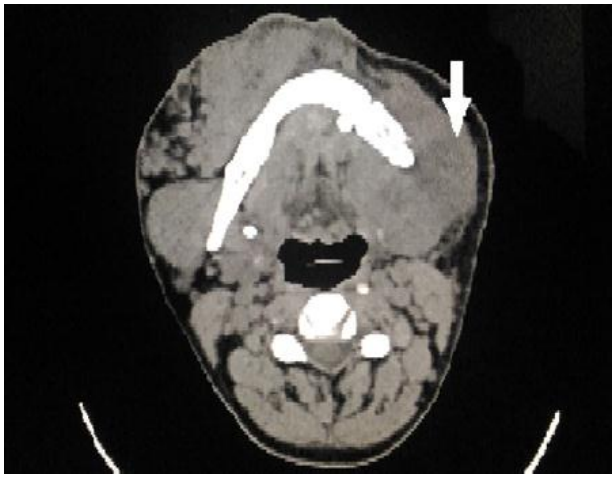

Fig-2 : CT Scan Showing Large Infiltrating Soft Tissue Mass Lesion Involving Left Submandibular Region and Retro Mandibular Region Encasing Body of Mandible.

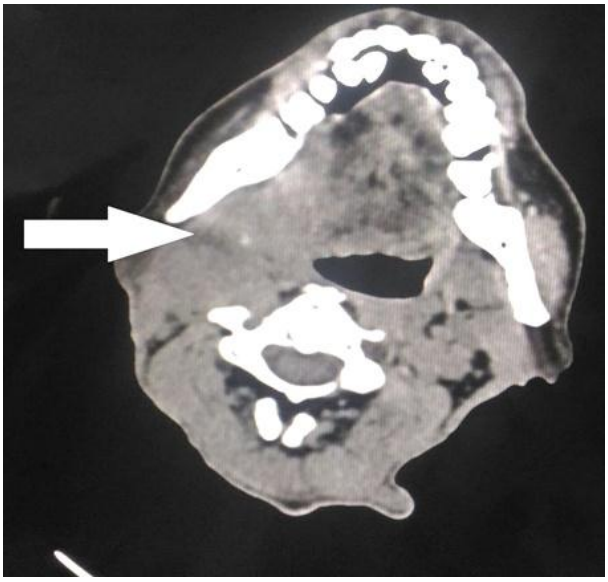

Fig-3: CT Scan Showing Large Infiltrating Soft Tissue Mass Lesion Involving Base of Tongue on Right Side.

Fig-4: MRI Showing Large Infiltrating Soft Tissue Mass Lesion Involving Base of Tongue on Right Side.

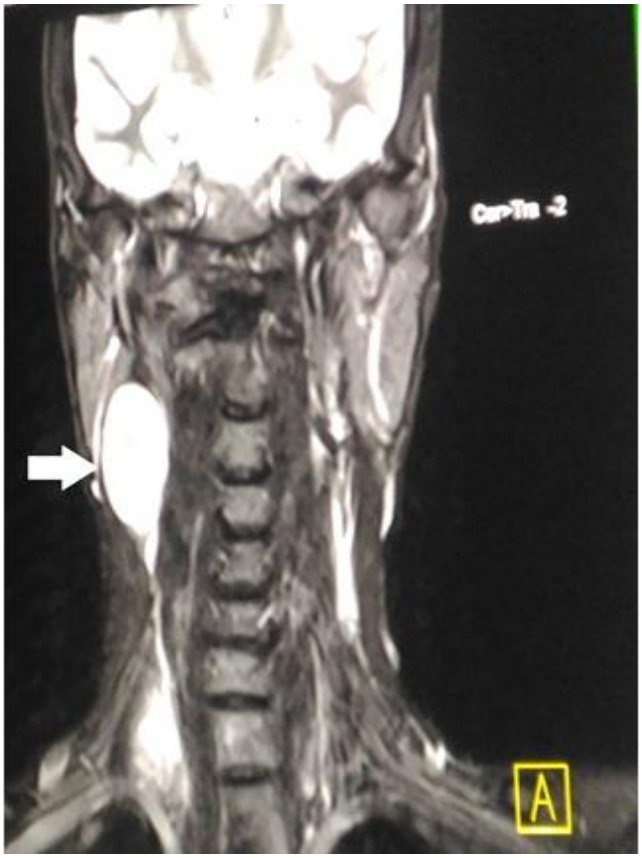

Fig-5 : MRI Showing Cervical Lymphadenopathy.

Fig-6: CT Scan Showing Bilateral Cervical Lymphadenopathy.

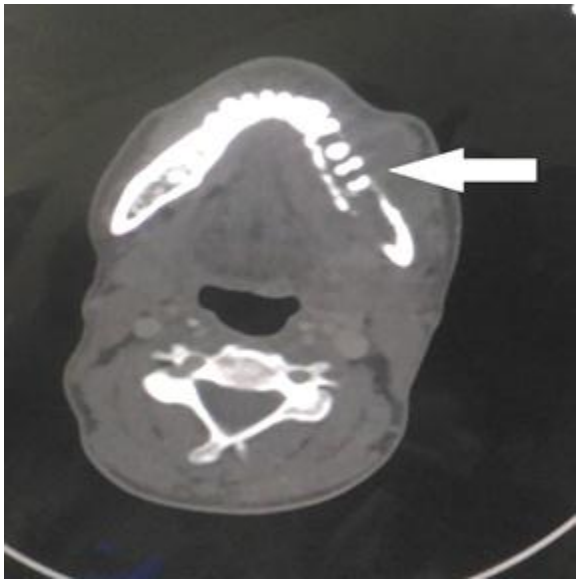

Fig-7: CT Scan Showing Erosion Of Left Mandible.

DISCUSSION:

Oral cavity tumors are the commenest tumor in indian population with tobacco chewing as the main cause. In our study we encountered 92% male population. CT & MRI are necessary to establish the staging of patients with oral cancer. They are the most important diagnostic tool in establishing pre therapeutic staging.

C T is essential in nodal involvement & bone erosions[9,10,11].Whereas MRI provides a better evaluation of neurovascular involvement. It also provides a good insight in smaller tumors. We have found that CT & MRI are complimentry to each other with advantange & disadvantage of each modality.

The advantage of CT is that it is easily available, relatively cheaper, takes less time, find out bony erosion in more precise way thus helping the operating surgeon to plan his treatment.
However CT scan involves radiation. The contrast media given intravenously has the potential to develop adverse reaction. Minor damage to nearby body parts may be missed on CT scan.

The advantage of MRI is that it delineates the tumor very sharply. MRI is relatively better in neural involvement & in involvement of muscular plane. MRI involves no radiation. However MRI is time consuming & patient might get claustrophobic.

Overall MRI has higher sensitivity whereas CT scan has higher specificity.

CONCLUSION:

Oral cancers cause significant proportion of cancers in young Indian population mainly because of increasing use of tobbaco chewing,alcohol .CT & MRI both plays a significant role in the management of oral cancers. It helps to plan appropriate therapy. When surgery is planned, it provides information about resectibility, extent of resection, helps in reconstruction. It also predicts the outcome of treatment. However CT scan is not that helpful in early stage of malignancy. MRI is better in delineation of the tumour & involvement of neurovascular bundle as well as muscular plane. CT scan is easily available as compared to MRI.

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