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Role Of Preoperative Ultrasonography and Magnetic Resonance Imaging for Assessing the Depth of Invasion in Oral Tongue Carcinoma with Postoperative Histopathological Correlation

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Abstract

Objectives: To evaluate the role of preoperative ultrasonography and magnetic resonance imaging for assessing the depth of invasion in oral tongue carcinoma with postoperative histopathological correlation

Methods: Prospective analysis was performed in 34 patients of early oral tongue carcinoma for a period of 2 years. After clinical assessment and histopathological examination, patient underwent radiological examination for proper preoperative depth of invasion measurement and nodal status assessment. Ultrasound examination was done by using 9-17 MHz conventional linear probe with sterile cover for the lesion and neck USG to assess suspicious nodes. MRI performed using Siemens Avanto 1.5 Tesla MRI Unit by surface coil. Axial, coronal and sagittal thin section of basic sequence of MRI like T1, T2 STIR, are performed including DWI and ADC sequence for proper assessment of soft tissue structure and nodal status. Depth of invasion was measured in T2W sequence and nodal status was assessed on MRI.

After histopathological confirmation of malignancy and radiological examination, all patients underwent primary lesion resection and elective neck dissection (ipsilateral) as per institutional protocol. . Macroscopic Tumor thickness measurements were obtained using hand held lens and Vernier caliper. Histological measurements were obtained using an ocular micrometer. Statistical analysis was done to present details in different parameters and assessment of associations.

Result: This study observed that there was strong correlation of depth of invasion among modalities. The correlation between depth of invasion on clinical examination and MRI was also significant ($r = 0.731$; $p < 0.001$). Relationship between MRI and histologic depth of invasion in oral tongue subsite was high with a correlation coefficient of 0. 949.In this study, the sensitivity and specificity of USG assessing the depth of invasion >5 mm was 100% and 88.2%, respectively. The sensitivity and specificity of MRI assessing the depth of invasion >5 mm was 88.2% and 94.1%, respectively.

Conclusion: Overall, the study convincingly suggests that tumor parameters assessed through MRI and Ultrasonography are concordant with the pathological findings and justify its use in pre-treatment evaluation of tongue carcinoma. It is possible to use intraoral ultrasonography as the preferred modality when circumstances do not allow for an MRI examination to determine depth invasion and nodal status. This will allow clinicians to

use a less expensive and faster tool in the preoperative diagnostic workup of selected oral tongue carcinoma, as well as giving adjunctive information in case of doubtful results after MRI.

Keywords: Tongue squamous cell carcinoma (TSCC), High frequency ultrasonography,Depth of invasion,MRI,Histopathological tumour thickness.

INTRODUCTION

Tongue is richly supplied with nerves and blood vessels (Maton et al, 1993)[1]. Tongue cancer is the most commonly diagnosed intraoral squamous cell carcinomas with incidence varying between 25-40%, (Regezi et al, 2008)[2].

Traditionally, tongue squamous cell carcinoma (TSCC) was considered to affect 60 years and above men who had risk factors like excess alcohol consumption and heavy smokers (Bachar et al, 2011; Majchrzak et al, 2014; Siegel et al, 2017)[3-5]. However, over the past 20 years, the incidence of tongue cancer has shifted to young adult populations, especially white women, (Ng et al, 2017)[6].

Tongue cancer is considered an aggressive form of squamous cell carcinoma. Tongue has well-structured musculature and rich vascular and lymphatic supply, which explains the increased tendency to invasion & metastasis in oral squamous cell carcinoma (Lim, 2006)[7]. Tongue carcinoma is most commonly associated with lymph nodes metastases (Sano and Myers, 2007)[8]. Prognostic factors of Tongue carcinoma include presence of occult metastases, the depth of invasion, perineural invasion, presence of lympho-vascular invasion, histological subtype and the degree of tumor differentiation (Neville et al, 2015; Bello et al, 2010)[9,10].

The management of the clinically negative neck in early oral cavity squamous cell carcinoma (OCSCC) is a controversial topic. Elective neck dissection (END) is performed if the risk of occult nodal metastasis is 20% or greater. The prognostic significance of tumor depth, or depth of invasion (DOI), has been well documented in OCSCC. DOI is an indicator of tumor aggressiveness and is an independent predictor of nodal metastasis, disease-specific survival (DSS), and overall survival in OCSCC (Kane et al, 2006; Balasubramanian et al, 2014; Tam et al, 2019)[11-13]

DOI has been found to be a strong predictor of regional metastasis in early-stage, clinically node negative OCSCC and determines the need for END in this group. DOI cutoff for treatment of the neck generally ranges between 2 and 5 mm (Shintani et al, 2001; Brockhoff et al, 2017)[14,15]. It is noted that there is significant difference between MRI determined depth of invasion and MRI determined tumor thickness, but whether MRI determined depth of invasion has the same effect as MRI-determined tumor thickness and whether it can be used as an indicator of END in cT1N0 tongue SCC remain unknown (Murakami et al, 2019; Hu et al, 2015)[16,17].

Magnetic resonance imaging (MRI) is the modality of choice in imaging of oral cavity tumors because of, providing wide details & nature of primary lesion, good tissue differentiation and excellent nodal mapping. A combination of ultrasound with CT, is an important one in investigating patients with oral cancers in areas where MRI machines are not available (Arya et al, 2014)[18].

Early detection of oral carcinoma is key role for good outcomes, makes imaging a very important component in the management and prognosis of these patients. Tumor depth was very crucial role in prognosis and Patient's five-year survival was found to be dependent on it. Tumor invasion greater than 2 mm being predictive of poor outcomes and a 3.7-fold increase in the risk of regional recurrence. It is therefore importatnt to measure the tumor depth accurately (Ganly et al, 2012)[19]. Mucosal epithelium, lamina propria, and muscles involvement in tongue cancer are clearly depicted on MRI, which makes tumor thickness measurement in tongue carcinoma possible. However, the accuracy of such measurement is not well defined (Tetsumura et al, 2001)[20]. Magnetic resonance imaging (MRI) is preferred modality for evaluation of tongue carcinoma, however, there are some limitations like it is expensive, highcost

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maintenances, incompatibility with metallic implants, claustrophobia, and length of procedure. Although risk of contrast reactions in MRI is less than that in computed tomography, but they are known to occur also in MRI. Magnetic resonance imaging contrast agents are to be avoided in patients with renal insufficiency (Hasebroock and Serkova, 2009; Perazella, 2009)[21,22]. Ultrasonography (US) is easy to use for the detection of non-invasive and soft tissue-related diseases in oral and maxillofacial regions (Mashkevich et al, 2009)[23]. Ultrasonography plays an important role in analyzing normal and abnormal anatomical structures, particularly in oral and maxillofacial regions. (Morimoto et al, 2007)[24].

METHODOLOGY

Prospective analysis was performed in 34 patients of early oral tongue carcinoma, for a period of 2 year from June 2018 to May 2020. Selection of patients was done by following our inclusion and exclusion criteria. This study was approved by Institutional Ethical Committee.

Inclusion criteria

(1)- Biopsy proven T1 or T2 primary oral tongue carcinoma

(2)-Tumor located on oral tongue in anterior two-third.

Exclusion criteria

(1)- Base of tongue lesion.

(2)- Lesion with T3 or T4 staging.

(3)- Irradiated tumor of anterior two-third of tongue.

(4)- Tumor of other sub sites of oral cavity.

(5)- Loss of follow-up/defaulter cases.

Every selected patient underwent to our study protocol that was clinical assessment and histopathology confirmation of malignancy, radiological examination, resection of primary lesion and ipsilateral elective neck dissection with intraoperative depth of invasion measurement, postoperative histopathological examination and lastly follow up of patient. Detail descriptions of procedures were given and an informed consent was taken from all the patients who would be undergoing the study.

After the clinical assessment and histopathology examination, patient underwent radiological examination for proper preoperative depth of invasion measurement and nodal status assessment. In present study two radiological modalities- ultrasonography and MRI are used. Ultrasound examination was done by using 9-17 MHz conventional linear probe with sterile cover. After the procedure description to examining patient, tongue was protruded, held gently with gauze and probe placed directly on tumor surface such that deformation of tumor does not occur. For protruding lesions, depth of invasion measured from tumor surface to deepest point of invasion was and for ulcerative lesions an imaginary line was drawn over the ulcerated area joining the normal mucosa on both ends and the deepest point of invasion was measured. Other side of normal tissue also examined to look for any occult lesion. After completing the tongue examination, neck ultrasound screening was performed by using 9-17 MHz linear conventional probe in all patients to assess suspicious nodes. Further patient underwent to MRI examination and all the procedure description and precaution was informed to patient. MRI performed using Siemens Avanto 1.5 Tesla MRI Unit by surface coil. Axial, coronal and sagittal thin section of basic sequence of MRI like T1, T2 STIR, are performed including DWI and ADC sequence for proper assessment of soft tissue structure and nodal status. Depth of invasion was measured in T2W sequence and nodal status was assessed on MRI.

After histopathological confirmation of malignancy and radiological examination, all patients underwent primary lesion resection and elective neck dissection (ipsilateral) as per institutional protocol. After resection of tumor, glossectomy specimen was placed in saline solution for preservation and immediately shift to the Department of Pathology for sectioning. Before sectioning, measurements of specimen, tumor (except for thickness) and clear margins (except deep clear margins) were noted and after measurements it was cut into approximately 2–3 mm thick transverse slices and cut sections was examined for depth of invasion.

Tissue section in which mucosa adjacent to the tumor was observed, considered to have greatest infiltration into the underlying tissue. Macroscopic Tumor thickness measurements were obtained using hand held lens and Vernier caliper. This macroscopic Tumor thickness was verified and confirm by two other pathologists for intra-observer variation. Microscopically lesion was staged as per sixth edition

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of American Joint Committee on Cancer system (AJCC, 2010)[25].

Histological measurements were obtained using an ocular micrometer. For obtaining maximum thickness in both ulcerated and exophytic lesion, an imaginary line reconstructed showing intact mucosa, then measurement done from this line to deepest point of invasion into underlying tissue, disregarding any superficial keratin or inflammatory infiltrates. After DOI measurement, lymph node sections and lymphovascular invasion were examined to look for metastasis under ocular microscope. Hematoxylin-eosin (H and E) used for staining lymph node sections slides and further serial staining done by using immunohistochemical marker PAN CK by our institute pathologist and findings were noted.

Statistical analysis

The results details are presented in different parameters like frequencies, percentages and mean±SD. For assessment of the associations, Chi-square test is used. Unpaired t-test is used for comparison of continuous variables. Receiving operating curve (ROC) analysis is carried out and area under the curve (AUC) with its 95% confidence interval (CI) is calculated. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) with its 95% confidence interval are calculated. The Pearson correlation coefficient is calculated. The p-value<0.05 is considered significant. All the analysis is carried out on SPSS 16.0 version (Chicago, Inc., USA).

RESULTS

- The present study was conducted in the Department of Radio-diagnosis, Rajiv Gandhi Cancer Institute and Research Centre, Rohini, New Delhi with the objective to study the role of preoperative ultrasonography and magnetic resonance imaging for assessing the depth of invasion in oral tongue carcinoma with postoperative histopathological correlation.
- The study group comprises of 34 patients.
- The observation is provided below in tabulated form and is classified as follows :-Table 1to 7
- About one third of patients were between 40-50 &>60 years (29.4%) followed by 51-60 (26.5%) and <40 (14.7%). The mean age of patients was 53.74±13.53 years ranging from 32 to 90 years.
- Majority of patients were males (70.6%). More than half of patients had mild site of lesion (52.9%). Most patients had addiction habit (82.4%).
- More than half of patients had <6 depth of invasion on USG (55.9%).
- The mean depth of invasion on USG was 5.78±2.10 mms with median depth of invasion on USG being 5.45 mms. Nodal metastasis on USG was present among more than one third of patients (44.1%). T2 tumor on USG was among more than half of patients (55.9%). Lymph node N0 on USG was among more than half of patients (55.9%) followed by N1 (26.5%) and N2 (17.6%).
- Depth invasion on MRI ≥6 was among more than half of patients (52.9%). The mean depth of invasion on MRI was 6.00±1.99. Lymph node metastasis on MRI was present among more than one third of patients (47.1%). T2 tumor stage on MRI was among more than half of patients (58.8%). Lymph node N0 on MRI was among more than half of patients (58.8%).
- The depth of invasion on HPE ≥6 mms was among 50% patients. The mean depth of invasion on HPE was 5.98±1.99 mms. The nodal status on HPE was present among 52.9% patients. Tumor stage T2 on HPE was among 67.6% patients. Lymph node N0 on HPE was among 47.1% patients.
- Concordance of lymph node on HPE with USG and MRI was among 88.2% and 79.4% respectively.
- T1 tumor staging was detected by both HPE and USG among 73.3%. There was significant (p=0.001) association between tumor staging on HPE with USG. There was high agreement between HPE and USG in detecting tumor stage (Kappa=0.75). N0 node staging was detected by both HPE and USG among 84.2% patients. There was high agreement between HPE and USG in detecting node stage (agreement=0.85).
- T1 tumor staging was detected by both HPE and MRI among 64.3% patients. There was significant (p=0.001) association between tumor staging on HPE with MRI. There was high agreement between HPE and MRI in detecting tumor stage (Kappa=0.56). N0 node staging was detected by both HPE and MRI among 80% patients. There was high agreement

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between HPE and MRI in detecting node stage (Kappa=0.79).

- The depth of invasion was significantly (p=0.001) higher among whom USG, MRI and HPE lymph node was present.
- Depth invasion >5 on USG correctly detected nodal metastasis among 38.2% patients with sensitivity and specificity of 72.2% (95%CI=51.5-92.9 and 62.5% (95%CI=38.8-86.2) respectively.

DISCUSSION

Moore et al (1986)[26] studied and reported tumor thickness significance in survival prediction, in their 151 patients' retrospective analysis, and the definition of depth of tumor invasion proposed by Moore has been widely accepted. Tumor thickness as obtained by the coronal T2W MRI was found to be significantly correlated to the cervical nodal metastases (P = 0.05) in the 43 patients studied by Okura et al (2008)[27] who suggested the need for actively addressing neck when the thickness of the tumor was >9.7 mm. A meta-analysis of 16 studies pooling data of 1136 patients of squamous cell carcinoma of the oral cavity published by Huang et al (2009)[28] from Princess Margaret Hospital in 2009 suggested tumor thickness of 4 mm as the cutoff for predicting lymphnodal involvement (P = 0.007). Bier-Laninget al (2009)[29] studied T1- andT2-tongue cancers with contralateral neck nodal metastasis and they concluded that contralateral neck nodes can be kept under close follow up if tumor thickness was ≤3.75 mm, while operative assessment is needed if the tumor thickness was ≥9.75 mm. Similar other studies & observations showing the significance of pathological tumor thickness were given by other authors as well (Jung etal, 2009; Lodderet al, 2011)[30,31]. Conclusions of these several studies have focused on correct tumor thickness determination before preoperative planning and surgical extent.

In the present study, about one third of patients were between 40-50 &>60 years (29.4%) followed by 51-60 (26.5%) and <40 (14.7%). The mean age of patients was 53.74±13.53 years ranging from 32 to 90 years. This study observed that the majority of patients were males (70.6%). In the study by Alsaffar et al (2016)[32], the mean age of patients was 64 years and the percentage of males was higher. Adel et al (2015)[33] reported that the age at diagnosis for the 571 patients with OSCC ranged from 21.9 to 86.8 years (median, 51.2 years). The study population consisted of 516 men and 55 women. Similar to the present study, Jaya Sankaran et al (2017)[34] reported that the mean age at presentation was 51.81 years (range: 18–74 years), with a male preponderance of 71.2%.

More than half of patients had mild site of lesion (52.9%) in the present study. Majority of patients had addiction habit (82.4%) in this study.

This showed that more than half of patients had <6 depth of invasion on USG (55.9%). The mean depth of invasion on USG was 5.78±2.10 mms with median depth of invasion on USG being 5.45 mms. In this study, depth invasion on MRI ≥6 was among more than half of patients (52.9%). The mean depth of invasion on MRI was 6.00±1.99. In the present study, the depth of invasion on HPE ≥6 mms was among 50% patients. The mean depth of invasion on HPE was 5.98±1.99 mms. Alsaffar et al (2016)[32] reported that the mean depth of invasion determined radiologically, clinically, and pathologically were 10.9 mm, 10.2 mm and 11.2 mm, respectively. In their study, on pathologic examination 10 patients had superficial tumours (<5 mm) and 43 had deep tumours (≥5 mm). Trehan et al (2015) found that depth of invasion was 5 mm or less in 39 patients, 5.1 to 10 mm in 59 patients, and more than 10 mm in 98 on HPE.

In this study, nodal metastasis on USG was present among more than one third of patients (44.1%). In the present study, T2 tumor on USG was among more than half of patients (55.9%). Lymph node N0 on USG was among more than half of patients (55.9%) followed by N1 (26.5%) and N2 (17.6%).

In this study, T2 tumor stage on MRI was among more than half of patients (58.8%). Lymph node N0 on MRI was among more than half of patients (58.8%). In the present study, Tumor stage T2 on HPE was among 67.6% patients. Lymph node N0 on HPE was among 47.1% patients. Lymph node metastasis on MRI was present among more than one third of patients (47.1%).

This study found that the nodal status on HPE was present among 52.9% patients.

The nodal dissection was done among majority of patients (82.4%) in this study. This finding is in agreement with the study by Alsaffar et al (2016)[32] in which all patients had surgical resection of the primary

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tumor with a partial glossectomy, 40 of which also had a selective neck dissection upon the surgeon discretion. Jayasankaranet al (2017)[34]found that all patients underwent ipsilateral neck dissection; selective neck dissection in 58 (98.3%) and modified radical dissection in one.

Concordance of lymph node on HPE with USG and MRI was among 88.2% and 79.4% respectively.

In the present study, T1 tumor staging was detected by both HPE and USG among 73.3%. There was significant (p=0.001) association between tumor staging on HPE with USG. There was high agreement between HPE and USG in detecting tumor stage (Kappa=0.75).

In this study, N0 node staging was detected by both HPE and USG among 84.2% patients. There was high agreement between HPE and USG in detecting node stage (agreement=0.85).

In the present study, T1 tumor staging was detected by both HPE and USG among 64.3% patients. There was significant (p=0.001) association between tumor staging on HPE with MRI. There was high agreement between HPE and MRI in detecting tumor stage (Kappa=0.56).

This study found that N0 node staging was detected by both HPE and MRI among 80% patients. There was high agreement between HPE and MRI in detecting node stage (Kappa=0.79).

The depth of invasion was significantly (p=0.001) higher among whom USG, MRI and HPE lymph node was present in this study. In the present study, depth invasion >5 on USG correctly detected nodal metastasis among 38.2% patients with sensitivity and specificity of 72.2% (95%CI=51.5-92.9 and 62.5% (95%CI=38.8-86.2) respectively.

In this study, Depth invasion >5 on MRI correctly detected nodal metastasis among 41.2% patients with sensitivity and specificity of 77.8% (95%CI=58.6-97.0) and 43.8% (95%CI=19.4-68.1) respectively.

This study found that the recurrence was occurred in 5.9% patients.

This study observed that there was strong correlation of depth of invasion among modalities. Alsaffar et al (2016)[32] also found similar correlation in which the correlation between clinical and pathologic depth of invasion was significant ($r = 0.78$; $p < 0.001$) as was the correlation between depth of invasion reported on MRI and pathologic depth of invasion ($r = 0.91$; $p < 0.001$). The correlation between depth of invasion on clinical examination and MRI was also significant ($r = 0.731$; $p < 0.001$). Preda et al (2006)[35] investigated 33 oral tongue SCC in a retrospective series. The authors demonstrated that MRI thicknesses correlated strongly with histological tumor thicknesses (correlation coefficient = 0.68, $p < 0.0001$). Park et al (2011)[36] evaluated 114 patients with oral cavity and oropharyngeal SCC of which 49 patients had oral tongue SCC. Relationship between MRI and histologic depth of invasion in oral tongue subsite was high with a correlation coefficient of 0.949.

Despite the importance of depth of invasion, other histopathological parameters have been found to correlate with nodal metastasis including size of the tumor in greatest dimension, and other pathologic features such as pattern of invasion, density of cancer-associated fibroblasts, perineural, and vascular invasion (Almangush et al, 2013)[37]. All these need to be taken in account to determine the risk of regional metastasis.

In this study, the sensitivity and specificity of USG assessing the depth of invasion >5 mm was 100% and 88.2%, respectively. The sensitivity and specificity of MRI assessing the depth of invasion >5 mm was 88.2% and 94.1%, respectively. Alsaffar et al (2016)[32] found that the sensitivity and specificity of MRI assessing the depth of invasion < 5 mm or ≥ 5 mm was 80 % and 97 %, respectively.

One of the limitations of this study was small sample size, the studies with larger sample size and long study period are required to have more robust findings.

CONCLUSION:

Overall, the study convincingly suggests that tumor parameters assessed through MRI and Ultrasonography are concordant with the pathological findings and justify its use in pre-treatment evaluation of tongue carcinoma. It is possible to use intraoral ultrasonography as the preferred modality when circumstances do not allow for an MRI examination to determine depth invasion and nodal status. This will allow clinicians to use a less expensive and faster tool in the preoperative diagnostic workup of selected oral tongue carcinoma, as well as giving adjunctive information in case of doubtful results after MRI.

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Primary tumor staging according to AJCC-2018

✓	T Category	T Criteria
	TX	Primary tumor cannot be assessed
	Tis	Carcinoma *in situ*
	T1	Tumor ≤ 2 cm with depth of invasion (DOI)* ≤ 5 mm
	T2	Tumor ≤ 2 cm with DOI* > 5 mm *or* tumor > 2 cm and ≤ 4 cm with DOI* ≤ 10 mm
	T3	Tumor > 2 cm and ≤ 4 cm with DOI* > 10 mm *or* tumor > 4 cm with DOI* ≤ 10 mm
	T4	Moderately advanced or very advanced local disease
	T4a	Moderately advanced local disease Tumor > 4 cm with DOI* > 10 mm **or** tumor invades adjacent structures only (e.g., through cortical bone of the mandible or maxilla or involves the maxillary sinus or skin of the face) Note: Superficial erosion of bone/tooth socket (alone) by a gingival primary is not sufficient to classify a tumor as T4.
	T4b	Very advanced local disease Tumor invades masticator space, pterygoid plates, or skull base and/or encases the internal carotid artery
*DOI is depth of invasion and **not** tumor thickness.		

✓	T Suffix	Definition
	(m)	Select if synchronous primary tumors are found in single organ.

Table-1: Distribution of patients according to age

Age in years	No. (n=34)	%
<40	5	14.7
40-50	10	29.4
51-60	9	26.5
>60	10	29.4
Mean±SD (Range)	53.74±13.53 (32-90)	

Table-1 shows the distribution of patients according to age. About one third of patients were between 40-50&>60 years (29.4%) followed by 51-60 (26.5%) and <40 (14.7%). The mean age of patients was 53.74±13.53 years ranging from 32 to 90 years.

Site of lesion	No. (n=34)	%
Anterior	16	47.1
Mild	18	52.9

Table-2 & Fig.2 shows the distribution of patients according to site of lesion. More than half of patients had mild site of lesion (52.9%).

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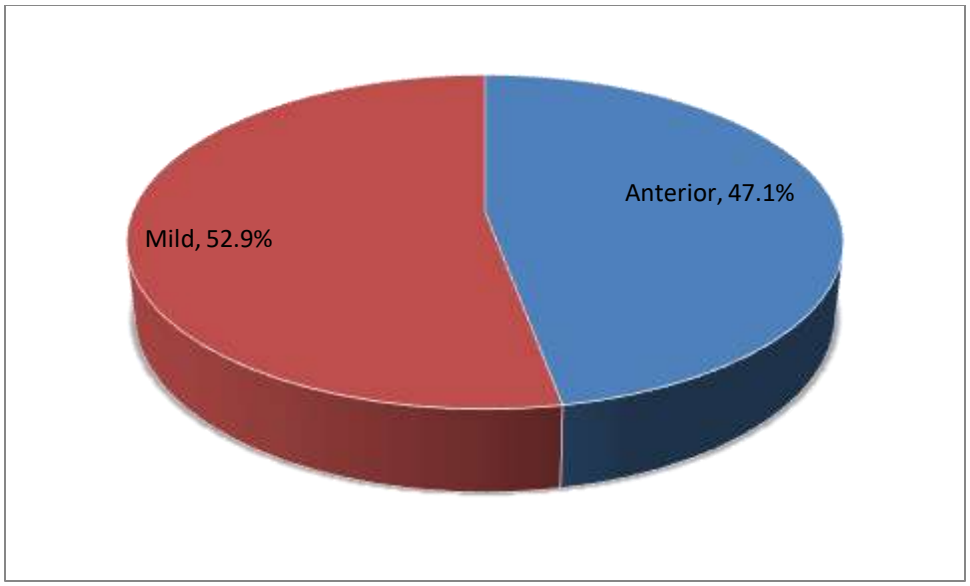

Fig. 3: Distribution of patients according to site of lesion

Table-3: Distribution of patients according to depth of invasion on USG

Depth of invasion on USG in mm	**No. (n=34)**	**%**
<6	19	55.9
≥6	15	44.1
Mean±SD (Median)	5.78±2.10 (5.45)	

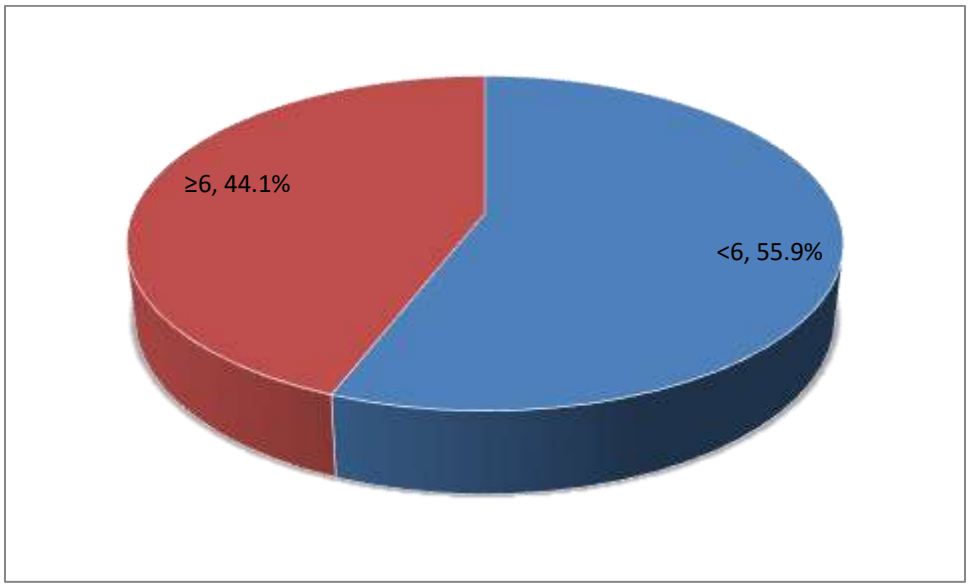

Fig. 3: Distribution of patients according to depth of invasion on USG

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Table-3& Fig.3shows the distribution of patients according to depth of invasion on USG. More than half of patients had <6 depth of invasion on USG (55.9%). The mean depth of invasion on USG was 5.78±2.10 mms with median depth of invasion on USG being 5.45 mms.

Table-4: Distribution of patients according to depth of invasion on MRI

Depth of invasion on MRIin mm	**No. (n=34)**	**%**
<6	16	47.1
≥6	18	52.9
Mean±SD (Median)	6.00±1.99 (6.00)	

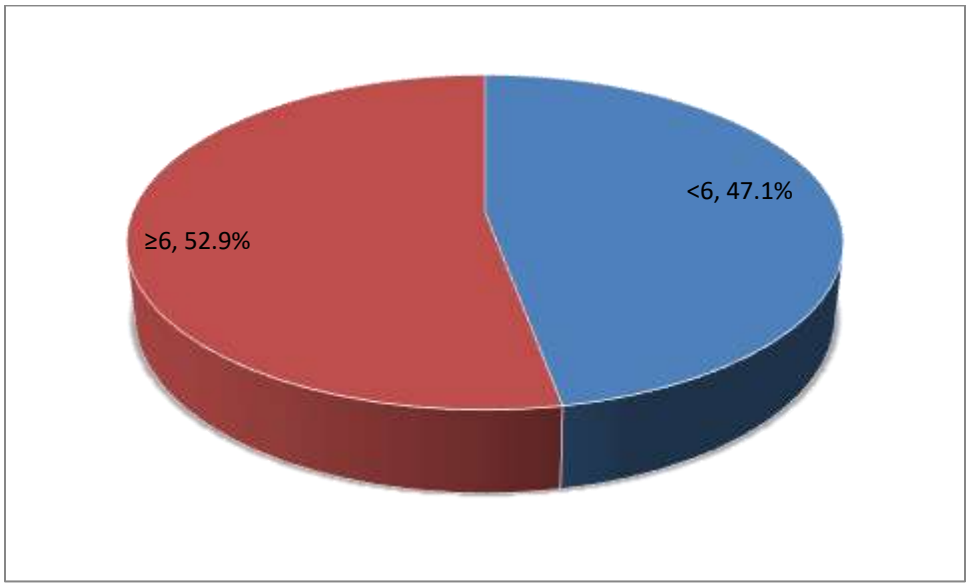

Fig. 4: Distribution of patients according to depth of invasion on MRI

Table-4& Fig.4 shows the distribution of patients according to depth of invasion on MRI. Depth invasion on MRI≥6 was among more than half of patients (52.9%). The mean depth of invasion on MRI was 6.00±1.99.

Table-5: Distribution of patients according to depth of invasion on HPE

Depth of invasion on HPE in mm	**No. (n=34)**	**%**
<6	17	50.0
≥6	17	50.0
Mean±SD (Median)	5.98±1.99 (5.90)	

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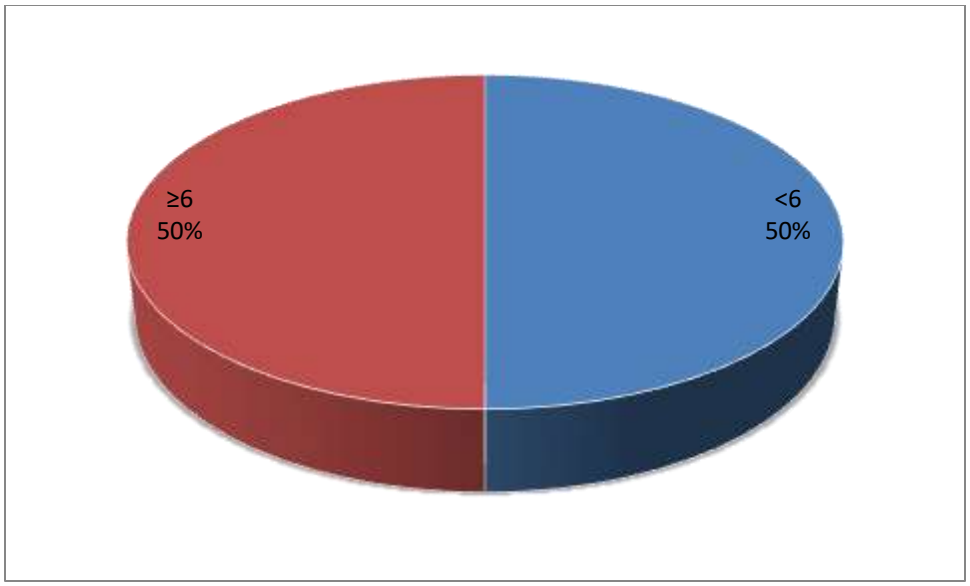

Fig. 5: Distribution of patients according to depth of invasion on HPE

Table-5& Fig.5 shows the distribution of patients according to depth of invasion on HPE. The depth of invasion on HPE ≥6 mms was among 50% patients. The mean depth of invasion on HPE was 5.98±1.99 mms.

Table-6: Predictive capacity of depth of invasion by USG in comparison to HPE

Depth of invasion by USG	**Depth of invasion on HPE**				**Total**	
	>5		**≤5**		**Present**	**Absent**
	No.	**%**	**No.**	**%**	**No.**	**%**
>5	17	50.0	2	5.9	19	55.9
≤5	0	0.0	15	44.1	15	44.1
Total	17	50.0	17	50.0	34	100.0
Predictive values, % (95%CI)						
Sensitivity	100.0 (100.0-100.0)					
Specificity	88.2 (72.9-103.6)					
PPV	89.5 (75.7-103.3)					
NPV	100.0 (100.0-100.0)					

%ages are from total no. of cases

Table-6 shows the predictive capacity of depth of invasion by USG in comparison to HPE. The sensitivity and specificity of USG assessing the depth of invasion>5 mm was 100% and 88.2%, respectively.

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Table-7: Predictive capacity of depth of invasion by MRI in comparison to HPE

Depth of invasion by MRI	**Depth of invasion on HPE**				**Total**	
	>5		**≤5**		**Present**	**Absent**
	No.	**%**	**No.**	**%**	**No.**	**%**
>5	15	44.1	1	2.9	16	47.1
≤5	2	5.9	16	47.1	18	52.9
Total	17	50.0	17	50.0	34	100.0
Predictive values, % (95%CI)						

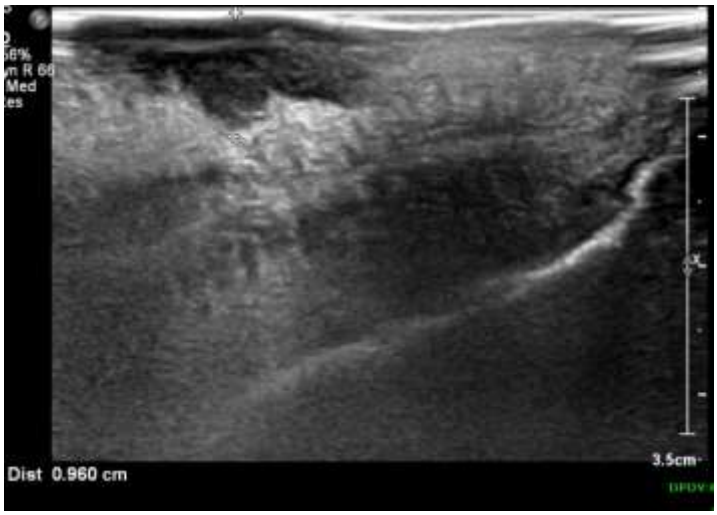
Sensitivity	88.2 (72.9-103.6)
Specificity	94.1 (82.9-105.3)
PPV	93.8 (81.9-105.6)
NPV	88.9 (74.4-103.4)

%ages are from total no. of cases

Table-7 shows the predictive capacity of depth of invasion by MRI in comparison to HPE. The sensitivity and specificity of MRI assessing the depth of invasion >5 mm was 88.2% and 94.1%, respectively.

Figure 1

Figure (a) USG images and Figure (b) MRI Axial T2W images of oral tongue taken and show ill defined infiltrative lesion in anterior region of left lateral boarder of tongue with depth of invasion measuring 9.6mm on USG and depth of invasion measuring 10mm on MRI. Later it correlated with depth of invasion on HPE which was 9.5mm.



(a)

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(b)

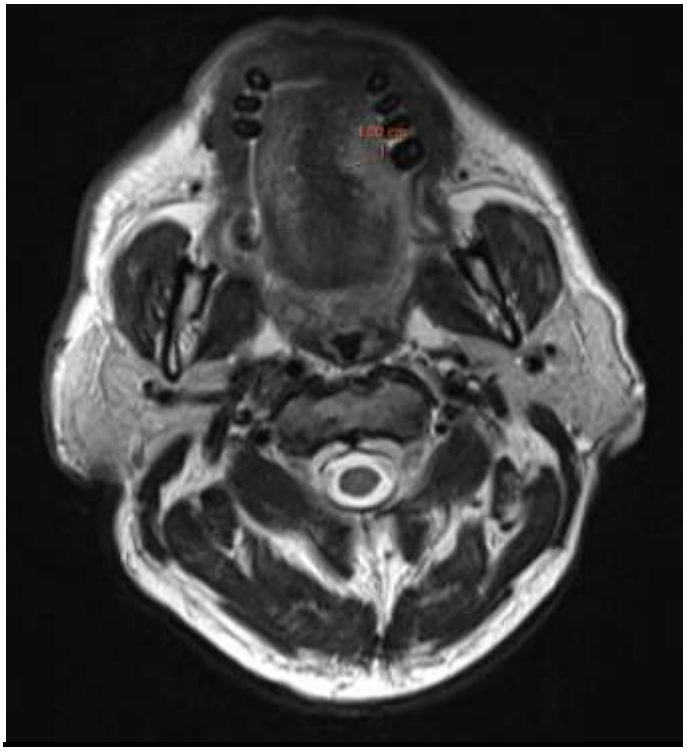
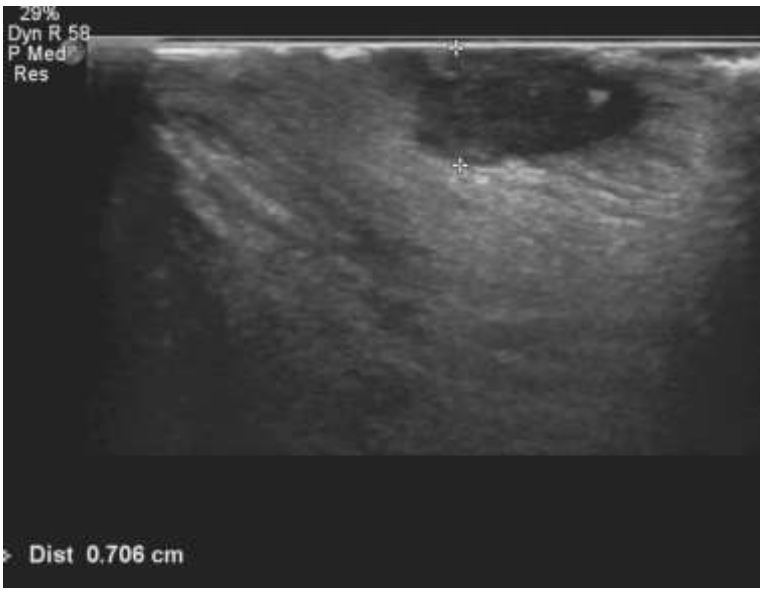


Figure 2

Figure (a) USG images and Figure (b) MRI Axial T2W images of oral tongue taken and show well defined hypoechoic lesion on right lateral boarder of tongue with depth of invasion measuring 7.0mm on USG (a) and depth of invasion measuring 6.5mm on MRI (b). Later it correlated with depth of invasion on HPE which was 7.0mm.

(a)



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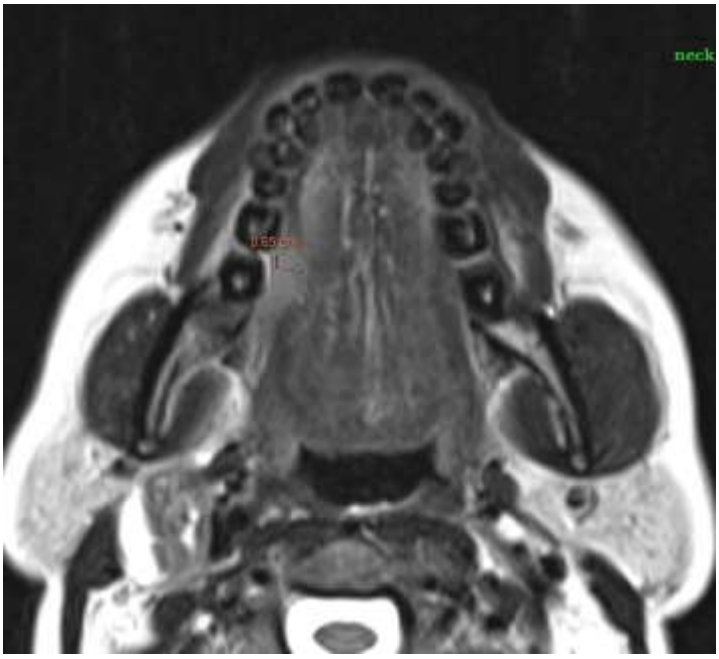
(b)



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