



Evaluation of Depth of Invasion as a Histologic Predictor of Neck Node Metastasis in Squamous Cell Carcinoma of the Oral Tongue

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Abstract

The AJCC 8th edition has included depth of invasion as per the new CAP guidelines as an independent measure of T staging irrespective of tumour size. This aim of this study was to look at the correlation between depth of invasion measured by the new guidelines and neck nodal positivity rate in cases of carcinoma of the tongue. We performed a case series analysis of 131 cases of carcinoma tongue who underwent wide excision and neck dissection at a tertiary cancer care centre in North Kerala, India. Depth of invasion was reported as per the new CAP/AJCC guidelines and its correlation with lymph node positivity rate was assessed. We also looked at the upstaging caused by the addition of depth of invasion to T staging in the AJCC 8th edition. Lymph node positivity correlates well with depth of invasion, and the coefficient of correlation was 0.89 in our study. The lymph node positivity rate exceeded 15% when the depth of invasion exceeded 4 mm. 59.5% of T1 tumours and 28.5% of T2 tumours were upstaged when AJCC 8th edition TNM staging was used instead of 7th edition. Depth of invasion correlates well with lymph node positivity and the addition of depth of invasion in AJCC 8th edition results in upstaging compared to AJCC 7th.

Keywords Depth of invasion · AJCC 8th vs 7th · Carcinoma tongue · CAP guidelines

Introduction

Oral cancer is the most common malignancy in Indian men, and the oral tongue is frequently involved [1]. The most common site of metastasis from carcinoma of the tongue is to the cervical lymph nodes [2]. The chance of nodal metastasis correlates most strongly with the T (tumour) stage of the primary tumour with nodal involvement seen more in larger tumours. While advanced tumours present with clinically and radiologically obvious neck nodes, 15–30% of early tumours with no obvious nodal disease (N0) may also harbour micrometastasis [3]. For this reason, all patients who undergo surgery receive wide excision of the tongue lesion and ipsilateral cervical lymph node dissection [4]. The presence of even a single positive node reduced the survival by 50% compared to a patient with no positive

cervical nodes. Several other primary tumour characteristics like degree of differentiation, depth of invasion, perineural invasion, and lymphovascular emboli have been studied to predict the probability of occult metastasis. Of these factors the depth of invasion is perhaps the most important predictor of neck node metastasis [5, 6].

Depth of invasion (DOI) of a tumour measures its invasiveness irrespective of an exophytic component. The latest 8th edition of American Joint Committee on Cancer (AJCC) cancer staging manual for head and neck cancers acknowledges the importance of depth of invasion and recognizes it as a factor for T staging independent of tumour size which has so far been the only criteria to decide between T1, T2, and T3 stages. This is because a more deeply invasive tumour predicts a worse prognosis compared to a lesser invasive tumour which could be due to the higher incidence of lymph node metastasis in deeper tumours [7].

In literature, tumour thickness (TT) and depth of invasion have often been used interchangeably. Tumour thickness (TT) is measured from the surface of the invasive squamous cell carcinoma for an exophytic tumour and from the ulcer base for an ulcerated tumour to the deepest point of invasion [8]. DOI was traditionally defined as the measurement from

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Fig. 1 Tumour thickness vs depth of invasion

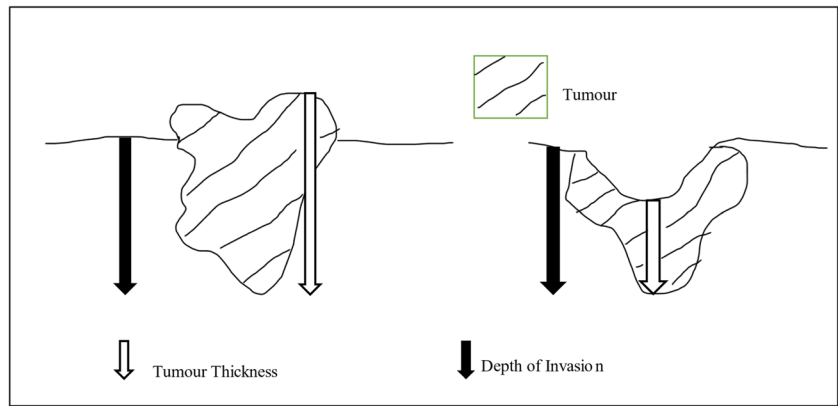
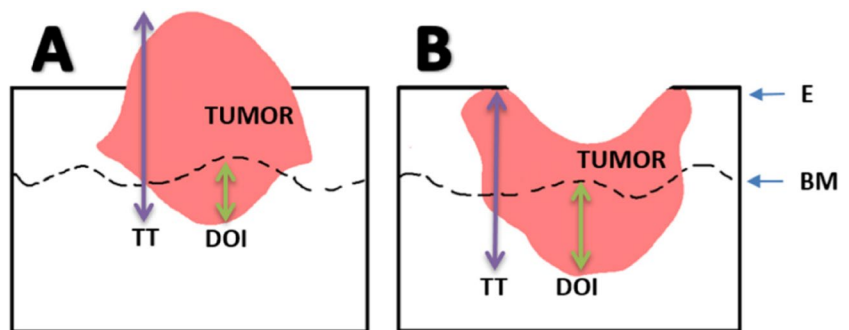


Fig. 2 Depth of invasion as per new CAP/AJCC guidelines



the surface of the adjacent uninvolved mucosa perpendicularly to the deepest point of invasion. See Fig. 1.

The current AJCC/CAP (College of American Pathologists) seeks to standardise the measurement of DOI. As per the new guidelines, depth of invasion is measured from the horizon of the basement membrane of the adjacent squamous mucosa to the deepest point of the tumour in a perpendicular direction [9] (Fig. 2).

Purpose of the Study

This study seeks to assess whether the incidence of neck node metastasis in carcinoma tongue correlates with depth of invasion as per the new guidelines.

Patients and Methods

This is a case series analysis of records of 131 patients who presented with squamous cell carcinoma of the tongue and underwent primary surgery, i.e. wide excision of the tongue lesion and ipsilateral neck dissection in the department of surgical oncology at Medical College Kozhikode from March 2019 to July 2023. Histopathological analysis of both the tongue specimen and neck dissection specimen was done in the department of pathology at the same institute.

Table 1 Patient characteristics

	Number of patients
Age	
< 45	32
> 45	99
Sex	
Male	85
Female	46
Location of tumour on tongue	
Lateral	102
Involving midline	29
Clinical stage	
T1	47
T2	67
T3	17
T4	-

DOI was measured in all these patients as per the new CAP guidelines and is recorded in millimetres. Patient characteristics and clinical findings are summarized in Table 1, and pathologic characteristics are summarised in Table 2

Table 2 Pathologic characteristics

Differentiation	
Well differentiated	32
Moderately differentiated	75
Poorly differentiated	24
Lymphovascular emboli	
Present	23
Absent	108
Presence of perineural invasion	
Present	17
Absent	114

Table 3 Distribution of specimens according to depth of invasion

Depth of invasion in mm	Number of node positive	Number of specimens	Positivity
1		4	0
2		6	0
3		6	0
4	1	12	8.3
5	4	15	26.7
6	3	12	25
7	4	10	40
8	4	14	28.6
9	4	8	50
10	4	11	36.4
11	3	7	42.9
12	3	10	30
13	4	8	50
14	6	8	75

Results

The DOI of the specimens examined varied from 1 to 14 mm. The nodal positivity varied from 0 to 75%. Table 3 shows the distribution of specimens according to the DOI and nodal positivity.

The coefficient of correlation between depth of invasion and nodal positivity rate is 0.89. The same data when plotted as a graph enabled us to chart a trend line on it. From this line, we calculated that the lymph node positivity rate exceeds 15% when the DOI exceeds 4 mm (Fig. 3).

We also examined how addition of DOI to TNM staging in the AJCC 8th edition has changed the staging of the tumours from AJCC 7th edition. The new staging results in tumours getting upstaged compared to the 7th staging. 28 out of 47 T1 tumours (59.5%) and 19 out of 67 T2 (28.4%) tumours as per AJCC 7th have upstaged when AJCC 8th edition has been used for staging (Table 4).

Discussion

Since 1986 several studies have looked into tumour thickness as a predictor of lymph node metastasis in the clinically N0 neck. Weiss et al. used decision tree analysis to suggest that if the incidence of occult metastasis is more than 15% then it is worthwhile doing elective neck dissection in N0 neck [10]. Fukano et al. concluded that above 5 mm tumour thickness the incidence of occult metastasis in the N0 neck is high enough to warrant elective neck dissection in these cases [5]. A review of different definitions used for tumour thickness and depth of invasion was done by Pentenero et al. [12]. Moore et al. in 1986 defined tumour thickness from the level of the surface of adjacent uninvolved epithelium to deepest point of tumour [13]. Woolgar et al. recommended

Fig. 3 Trendline for lymph node positivity vs DOI

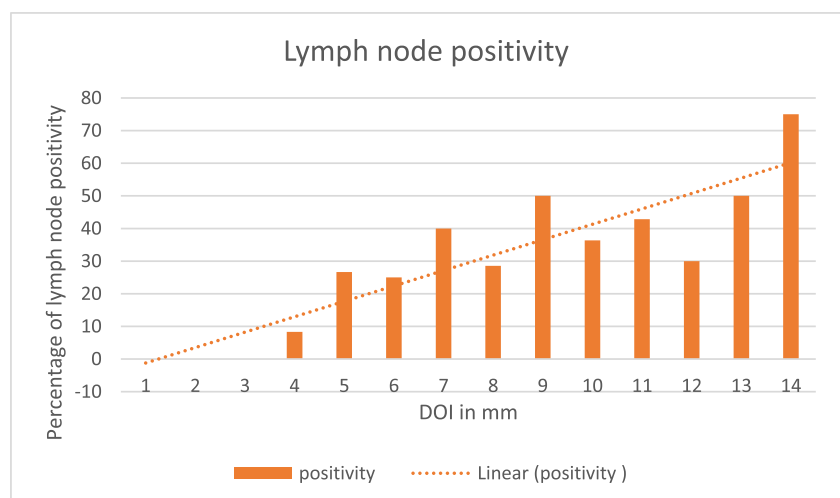


Table 4 T staging (AJCC 7th Vs 8th Editions)

AJCC 7 th Stage ↓	AJCC 8 th Stage			Grand Total
	T1	T2	T3	
T1	19	25	3	47
T2		48	19	67
T3			17	17
Grand Total	19	73	39	131

measuring depth from the surface of the epithelium of the adjacent non-ulcerated mucosal surface but termed it depth of invasion instead of tumour thickness. This increased DOI compared to TT in ulcerated tumours and decreased DOI compared to TT in polypoidal tumours [14].

DOI correlates strongly with nodal positivity as shown in our data. The addition of DOI to T staging in the 8th edition of AJCC has resulted in significant upstaging of tumours. This will result in larger number of patients receiving adjuvant treatment after surgery. We believe the addition of DOI to staging captures the aggressiveness of oral cancer better and is a better staging guideline.

Data Availability Data is available on request only due to ethical reasons.

Declarations

Conflict of Interest The authors declare no competing interests.

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