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Original Article

Novel Nomogram for Prediction of Lymph Node Metastases from Buccal Mucosa Squamous Carcinoma Using Histological Parameters

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Abstract

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Objective The aim of the study was to construct a nomogram that is easily reproducible, accurate, and cost-effective in predicting cervical lymph nodal metastasis in buccal mucosa cancer.

Methodology Patients who underwent radical resection of a primary tumor of the buccal mucosa with neck dissection were enrolled. Clinical characteristics independently associated with lymph nodal metastasis in multivariate analyses were adopted to build the model.

Results Patients who underwent surgery (January 2021–December 2021) were included as the model development cohort ($n = 127$). Depth of invasion, perineural invasion, lymphovascular invasion, and the worst pattern of invasion were independent predictors of lymph nodal metastasis. The nomogram model based on these four predictors showed good discrimination accuracy in percentage prediction of lymph nodal metastasis.

Conclusion This study proposes a simple predictive model for the risk of nodal metastasis in buccal mucosa squamous cell cancer. The study has strength that, it is based on a large sample, proposed model being simple size, and based on parameters empirically supported as well as established in literature, easy to use in routine clinical practice, and cost-effective.

Keywords

- buccal mucosa squamous cell cancer
- oral cavity cancer
- nomogram in predicting nodal metastasis
- surgical outcomes
- cervical lymph node metastasis

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Introduction

At present, oral cancer is risk stratified based on the tumor, nodes, metastases (TNM) system of classification proposed by the American Joint Committee on Cancer 8th edition. Nodal metastasis is the single most important prognostic factor and decreases survival by 50%.[1,2] TNM system is being used to predict prognosis and the need for adjuvant treatment. The management of clinically negative neck nodes (N0) poses a significant challenge for surgeons, as there are no reliable parameters to predict occult metastasis. To identify patients who are likely to have occult nodal metastases, several parameters are evaluated, these are radiological in the form of computed tomography (CT) scan, ultrasound (USG), magnetic resonance imaging (MRI), whole-body positron emission tomography-CT, and image-guided fine-needle aspiration cytology (FNAC) from neck nodes, and histopathological like tumor differentiation, perineural invasion (PNI), lymphovascular invasion (LVI), the worst pattern of invasion (WPOI), and depth of invasion (DOI). These all have been previously studied but were not successful. Of late, studies are showing the use of sentinel lymph node biopsy in oral cavity cancer for predicting nodal metastasis which has a sensitivity of 86%.[3] On comparing elective versus therapeutic neck dissection, it was found that elective neck dissection was significantly better in overall survival and disease-free survival and supraomohyoid neck dissection has been accepted worldwide as a technique of prophylactic neck dissection for high-risk clinical N0.[4] There is a need for predicting the nodal and distal spread of disease, possibly changing the strategy of cancer treatment. This poses a clinical challenge in determining the extent of neck dissection as it is associated with functional side effects such as neck pain, fibrosis, and shoulder dysfunction.[5] There is no definite method to find nodal metastasis in carcinoma of buccal mucosa preoperatively. We used method to find nodal metastasis with routine pathological parameters. The objective of the study was to construct a nomogram that is an easily available, accurate, and cost-effective marker in predicting cervical lymph nodal metastasis in buccal mucosa squamous cell carcinoma.

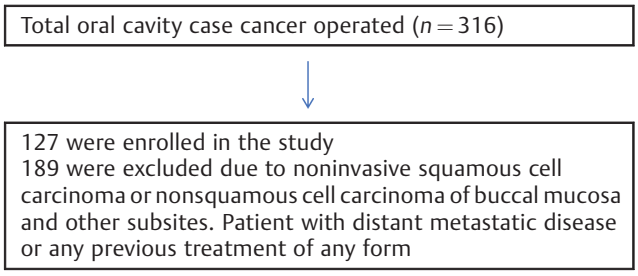
Material and Methods

This study was conducted in the department of surgical oncology at a tertiary care cancer hospital of northwest India after getting ethical committee clearance. It is a prospective observational study from January 2021 to December 2021.

Methodology: Inclusion criteria—All biopsy-proven nonmetastatic invasive squamous cell carcinoma with epicenter in the buccal mucosa.

Patient with an ulcer over buccal mucosa but biopsy negative for malignancy, noninvasive squamous cell carcinoma or nonsquamous cell carcinoma of buccal mucosa, and other subsites, and patient with distant metastatic disease or any previous treatment of any form (surgery radiation or chemotherapy) and coexisting malignancy were excluded.

Patients of both sexes, all ages, presenting with carcinoma of oral cavity who were subsequently planned for surgical treatment were included in the study. Data were evaluated with respect to subsite, T stage of cancer, tumor grading, LVI and PNI by preoperative clinical findings, radiological findings, and histopathological evaluations of the resected specimen and correlated with nodal spread in the neck with respect to the number of nodes, level of spread, and size of nodes.



The surgical specimen was processed as per the College of American Pathologist protocol.

Size of tumor: The greatest dimension is taken into consideration.

The DOI is calculated as the distance between the basal membrane and the deepest point of the stromal invasion measured in millimeters (mm).

LVI was defined when a clear pattern of tumor cells within lymphatic, venous, or arterial vessels was identified.

The perineural spread was defined as a clear perineural or neural invasion by tumor cells.

WPOI: It is an important prognostic marker and has five types; for better statistical analysis, we have clubbed 1, 2, and 3 to one group and 4 and 5 to another group.

Grades of tumor: Divided into well-differentiated, moderately differentiated, and poorly differentiated according to border classification.

Statistical Analysis

The statistical analysis was performed using SPSS software (version 26, SPSS Inc., Chicago, Illinois, United States), STATA (version 14.0), and "R" (version 4.0.3). The descriptive statistics for categorical data were given by frequency with percentage and comparison was carried out by using the chi-square test/Fisher's exact test. The receiver operating characteristic (ROC) curves along with area under the curve (AUC) were used to assess the diagnostic ability of DOI for the presence of lymph node metastasis. Sensitivity, specificity, along with positive predictive value (PPV), negative predictive value (NPV), and misclassification rate were assessed. A simple univariate logistic regression was followed by multiple binary logistic regression using significant predictors. The Hosmer–Lemeshow goodness of fit test statistic was performed to test if the model fit of the model was good. An ROC probability curve for the predictive probability of the outcome (lymph node metastasis) based on the multivariable logistic regression model was plotted. Nomogram was constructed for the classification of lymph nodes metastasis based on the logistic

regression model. All the statistical tests were performed at 5% level of significance and a *p*-value of less than 0.05 was considered statistically significant.

Result

Out of 127 study population, 113 (89.0%) were males and 14 (11.0%) were females. Majority in these patients were of stage T2 41 (32.3%) and T4 44 (34.6%). LVI was seen in 15 (11.8%) patients, while PNI in 8 (6.3%). Patients with WPOI 1, 2, and 3 and 4 and 5 were 73 (57.5%) and 54 (42.5%), respectively. Out of 127 study population, metastatic lymph nodes were present in 54 (42.5%) patients and 75 (59.1%) of the patients had > 7.50 mm DOI.

Out of 127 study population, 73 (57.5%) had no lymph nodal metastasis while 54 (42.5%) had lymph nodal metastasis (►Table 1). Out of 73 who had no cervical nodal metastasis, 69 (94.5%) were males and 4 (5.5%) were females. Out of 54 who had cervical metastasis, 44 (81.5%) were males and 10 (18.5%) were females, *p*-value (0.020) is significant.

Out of 73 who had no cervical nodal metastasis LVI was seen in 3 (4.1%) and out of 54 who had cervical metastasis LVI was seen in 12 (22.2%). *p*-Value (0.002) is significant.

In patients with no cervical nodal metastasis (73), PNI was seen in 1 (1.4%) and in patients with cervical metastasis (54), PNI was seen in 7 (13.0%). *p*-Value (0.008) is significant.

In patients with no cervical nodal metastasis (73), grade 4 and 5 WPOI was seen in 24 (32.9%) and in patients with cervical metastasis (54), grade 4 and 5 WPOI was seen in 30 (55.6%). *p*-Value (0.010) is significant.

Out of 73 who had no cervical nodal metastasis DOI > 7.5 mm was seen in 36 (49.3%) and out of 54 who had cervical metastasis DOI > 7.5 mm was seen in 39 (72.2%). *p*-Value (0.009) is significant.

The univariate logistic regression analysis was performed to ascertain the strength of association of each clinical parameter for the presence of lymph node metastasis (►Table 2). The risk of lymph node metastasis was almost fourfold (odds ratio [OR] = 3.92; 95% confidence interval [CI]: 1.16–13.17) among females relative to males.

Though the risk of lymph node metastasis to tumor size T1 was more than 1 for each tumor size T2, T3, and T4, but statistically these were insignificant ($p > 0.05$).

The risk of lymph node metastasis was 6.67 times (95% CI: 1.78–24.99) higher in patient with LVI in comparison with no LVI.

The risk of lymph nodal metastasis was 10 times (OR = 10.72; 95% CI: 1.28–89.99) higher in patient with PNI in comparison with no PNI.

The risk of lymph nodal metastasis was 2.5 times more (OR = 2.55; 95% CI: 1.24–5.27) higher in patient with WPOI 4 and 5 in comparison with WPOI 1, 2, and 3.

The risk of lymph node metastasis was more than 2.5 times (OR = 2.67; 95% CI: 1.26–5.67) higher in patients with DOI of > 7.50 mm relative to those of DOI < 7.50 mm.

Univariate analysis revealed female gender, LVI positivity, PNI positivity, 4 and 5 WPOI, and increased DOI were associated with significant *p*-value in the prediction of lymph nodal metastasis.

The sensitivity of LVI, PNI, DOI, and WPOI in predicting lymph nodal metastasis were 22.2, 13.0, 72.2, and 55.6%, while specificity of these were 95.5, 98.6, 50.7, and 67.1% with their misclassification rates as 35.5, 37.8, 40.2, and 37.8%, respectively.

Table 1 Association between clinical parameters and presence of metastatic lymph node

Variables		Metastatic Lymph node		*p*-Value
		Nonmetastatic lymph nodes ($n = 73$)	Metastatic lymph node ($n = 54$)	
		n (%)	*n* (%)	
Gender	Male	69 (94.5)	44 (81.5)	0.020
	Female	4 (5.5)	10 (18.5)	
Size of the tumor (T)	T1	12 (16.4)	4 (7.4)	0.139
	T2	27 (37.0)	14 (25.9)	
	T3	13 (17.8)	13 (24.1)	
	T4	21 (28.8)	23 (42.6)	
Lymphovascular invasion	Not seen	70 (95.9)	42 (77.8)	0.002
	Seen	3 (4.1)	12 (22.2)	
Perineural invasion	Not seen	72 (98.6)	47 (87.0)	0.008
	Seen	1 (1.4)	7 (13.0)	
Worst pattern of invasion	1, 2, 3	49 (67.1)	24 (44.4)	0.010
	4 and 5	24 (32.9)	30 (55.6)	
Depth of invasion	< 7.50 mm	37 (50.7)	15 (27.8)	0.009
	> 7.50 mm	36 (49.3)	39 (72.2)	

Table 2 Strength of univariate associations between each characteristic and presence of lymph node metastasis

Variables		OR (95% CI)	*p*-Value
Gender	Female	3.92 (1.16–13.17)	0.028
	Male (Ref)		
Size of the tumor (T)	T2	1.56 (0.42–5.72)	0.506
	T3	3.00 (0.76–11.78)	0.115
	T4	3.29 (0.92–11.78)	0.068
	T1 (Ref)		
Lymphovascular invasion	Seen	6.67 (1.78–24.99)	0.005
	Not seen (Ref)		
Perineural invasion	Seen	10.72 (1.28–89.99)	0.029
	Not seen (Ref)	1 (1.4)	
Worst pattern of invasion	4 and 5	2.55 (1.24–5.27)	0.011
	3 (Ref)	24 (32.9)	
Depth of invasion	> 7.50 mm	2.67 (1.26–5.67)	0.010
	< 7.50 mm (Ref)		

Abbreviations: CI, confidence interval; OR, odds ratio.

Table 3 Diagnostic ability of lymphovascular invasion, perineural invasion, worst pattern of invasion, and depth of invasion to predict metastatic lymph node

Variables	Sensitivity	Specificity	Positive predictive value (PPV)	Negative predictive value (NPV)	Misclassification rate
Lymphovascular invasion	22.2%	95.5%	80.0%	62.5%	35.5%
Perineural invasion	13.0%	98.6%	87.5%	60.5%	37.8%
4 and 5 worst pattern of invasion (WPOI)	55.6%	67.1%	55.6%	67.1%	37.8%
Depth of invasion (DOI) 7.5 mm	72.2	50.7	52.0%	71.1%	40.2%

ROC curve was used and an optimal cutoff for DOI was calculated as 7.50 mm with AUC as 0.610 (95% CI: 0.512–0.708). The sensitivity at this cutoff for DOI was 72.2% and the specificity was 50.7%, respectively. The PPV and NPV were 52.0 and 71.1% with misclassification rate as 40.2% (►**Table 4**, ►**Fig. 1**).

Using multivariable logistic model, the predicted probabilities for the presence of metastatic lymph node using four clinical parameters, that is, LVI, PNI, WPOI, and DOI, were computed after testing the model fit. The Hosmer–Lemeshow goodness of fit test produced a *p*-value of 0.687 which suggests that the model had a good fit. The AUC of the predicted

Table 4 Predicted probability for metastasis lymph node with other risk factors

WPOI and DOI	Lymphovascular invasion and perineural invasion			
	Lymphovascular invasion and perineural invasion present	Lymphovascular invasion absent and perineural invasion present	Lymphovascular invasion present and perineural invasion absent	Lymphovascular invasion and perineural invasion absent
WPOI 4 and 5, DOI > 7.50 mm	0.97	0.86	0.83	0.50
WPOI 4 and 5, DOI < 7.50 mm	0.78	0.78	0.74	0.38
WPOI 1, 2, and 3, DOI > 7.50 mm	0.70	0.75	0.70	0.33
WPOI 1, 2, and 3, DOI < 7.50 mm	0.64	0.64	0.58	0.23

Abbreviations: DOI, depth of invasion; WPOI, worst pattern of invasion.
Note: Color codes: Yellow = probability < 0.50 (low risk of presence of metastatic lymph node), blue = probability between 0.50 and 0.70 (medium risk of presence of metastatic lymph node), orange = probability ≥ 0.75 (high risk of presence of metastatic lymph node).

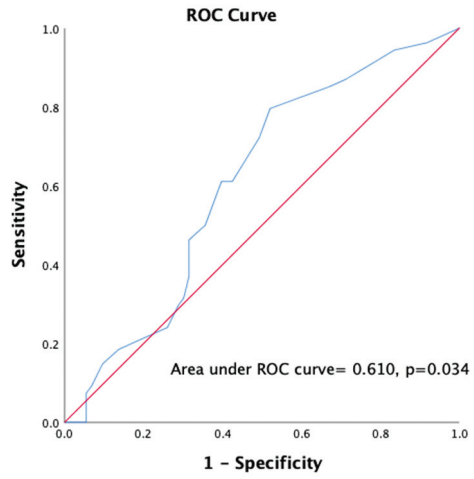


Fig. 1 Receiver operating characteristic curve (ROC) of depth of invasion to predict the likelihood of lymph node metastasis. Receiver operating characteristic (ROC) curve was used and an optimal cutoff for depth invasion was calculated as 7.50 mm with area under the curve as 0.610 (95% confidence interval [CI]: 0.512–0.708). The sensitivity at this cutoff for depth of invasion was 72.2% and the specificity was 50.7%, respectively. The positive predictive value (PPV) and negative predictive value (NPV) was 52.0 and 71.1% with misclassification rate as 40.2% (►**Table 4**, ►**Fig. 1**).

probabilities for the logistic regression model was 0.713 which was statistically significant ($p < 0.001$) as shown in ►**Fig. 2**.

The predicted probabilities for 16 possible combinations of LVI, PNI, WPOI, and DOI were obtained. The high, medium, and low risks for the presence of metastatic lymph node are shown in boxes with orange, blue, and yellow colors in ►**Table 4**. When LVI and PNI are present with DOI more than 7.5 mm and WPOI is 4 and 5, the predicted probability of lymph nodal metastasis is 0.97. When LVI and PNI are present with DOI less than 7.5 mm and WPOI is 4 and 5, the predicted probability of lymph nodal metastasis is 0.78. When LVI is absent and PNI is present with DOI more than 7.5 mm and WPOI is 1, 2, and 3, the predicted probability of lymph nodal metastasis is 0.75. When LVI is absent and PNI is present with DOI less than 7.5 mm and WPOI is 4 and 5, the predicted probability of lymph nodal metastasis is 0.78. When LVI is absent and PNI is present with DOI more than 7.5 mm and WPOI is 4 and 5, the predicted probability of lymph nodal metastasis is 0.86. When LVI is present and PNI is absent with DOI more than 7.5 mm and WPOI is 4 and 5, the predicted probability of lymph nodal metastasis is 0.83. These were high risk for cervical lymph nodal metastasis.

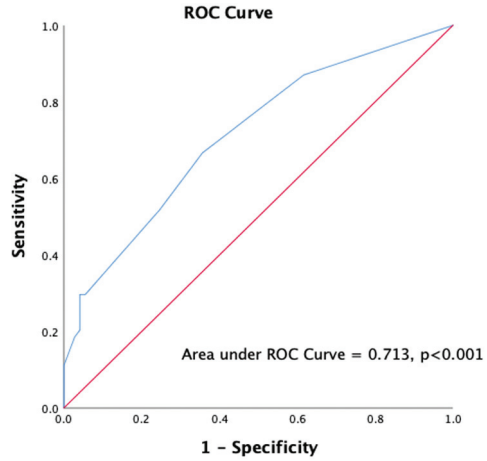


Fig. 2 Receiver operating characteristic (ROC) curve of the logistic regression model.

When LVI and PNI are present with DOI more than 7.5 mm and WPOI is 1, 2, and 3, the predicted probability of lymph nodal metastasis is 0.70. When LVI and PNI are present with DOI less than 7.5 mm and WPOI is 1, 2, and 3, the predicted probability of lymph nodal metastasis is 0.64. When LVI is absent and PNI is present with DOI less than 7.5 mm and WPOI is 1, 2, and 3, the predicted probability of lymph nodal metastasis is 0.64. When LVI is present and PNI is absent with DOI less than 7.5 mm and WPOI is 4 and 5, the predicted probability of lymph nodal metastasis is 0.74. When LVI is present and PNI is absent with DOI more than 7.5 mm and WPOI is 1, 2, and 3, the predicted probability of lymph nodal metastasis is 0.70. When LVI is present and PNI is absent with DOI less than 7.5 mm and WPOI is 1, 2, and 3, the predicted probability of lymph nodal metastasis is 0.58. When LVI and PNI are absent with DOI more than 7.5 mm and WPOI is 4 and 5, the predicted probability of lymph nodal metastasis is 0.50. These were medium-risk group.

When LVI and PNI are absent with DOI less than 7.5 mm and WPOI is 4 and 5, the predicted probability of lymph nodal metastasis is 0.38. When LVI and PNI are absent with DOI more than 7.5 mm and WPOI is 1, 2, and 3, the predicted probability of lymph nodal metastasis is 0.33. When LVI and PNI are absent with DOI less than 7.5 mm and WPOI is 1, 2, and 3, the predicted probability of lymph nodal metastasis is 0.23. These were low-risk group.

A nomogram combining the significant risk factors was created to predict the likelihood of having a lymph node metastasis based on the results obtained from the logistic regression analysis (►**Fig. 3**). The nomogram had seven rows in total. The factors are listed in the first four rows, and each variable has a weighted point total that predicts lymph node metastasis. For instance, LVI was related with 0 points when it was not present but with 5.5 points when it was present. Row 5 displays the score for each variable, while row 7 displays the overall score. Each score may be added up to produce a total score, which would then be plotted on the scale axis for total scores. The probability of risk of lymph node metastasis for specific individuals may then be determined using this total score by drawing a straight line from the scale axis (row 6) at the bottom of ►**Fig. 3**. Out of 127 study population, 73 did not have cervical lymph nodal metastasis and 54 had cervical lymph nodal metastasis. With respect to our nomogram score, less than 10 were seen in 28 (80%) patients who did not have cervical lymph nodal metastasis and 7 (20%) who had cervical lymph nodal metastasis. Scores between 11 and 15, 42 (57.5%) with no cervical lymph nodal metastasis and 31 (42.5%) for those who had cervical lymph nodal metastasis. Between scores 16 and 20, 3 (18.8%) with no cervical lymph

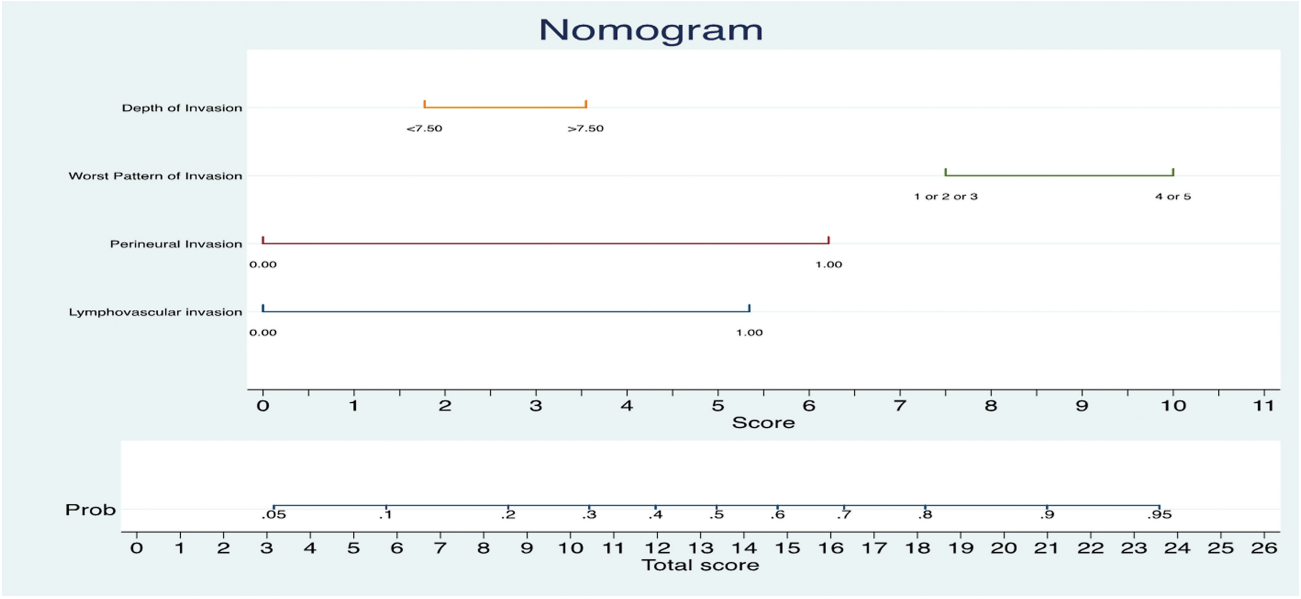


Fig. 3 Nomogram predicting the likelihood of lymph node metastasis.

Table 5 Nomogram score distribution

Nomogram score distribution	Nonmetastatic lymph node	Metastatic lymph node	Total
< 10	28 (80.0%)	7 (20.0%)	35
11–15	42 (57.5%)	31 (42.5%)	73
16–20	3 (18.8%)	13 (81.2%)	16
> 20	0 (0.0%)	3 (100%)	3
Total	73 (57.5%)	54 (42.5%)	127

nodal metastasis and 13 (81.2%) people had cervical lymph nodal metastasis. When the score was over 20, our study population had only 3 patients. All had cervical lymph nodal metastasis. Also, the scoring system has been explored to find the optimal cutoff value (11.5) for predicting the metastasis lymph node based on the total scores got for each patient from a nomogram. The AUC with 95% CI was 0.713 (0.62–0.80) which was statistically significant ($p < 0.001$). The sensitivity and specificity were around 66.7 and 64.4%.

Discussion

Cervical nodal metastasis is the most important prognostic factor in oral squamous cell carcinoma (OSCC), and accurate prediction is required so that appropriate radical surgery can be done.

Even after doing preop CT scan ± MRI and supplemented with USG-guided FNAC in CN0 neck, sentinel lymph node biopsy was positive in 23% for malignancy according to the SENT trial.[6] Horváth et al did a study to find sensitivity of different imaging modalities for cervical lymph node metastasis in clinically N0 neck, none of these methods can definitively exclude the presence of regional tumor metastasis.[7]

In our study using the following parameters LVI, PNI, WPOI, and DOI we have created nomogram for prediction of lymph nodal metastasis.

Huang et al did a meta-analysis and found LVI positivity in OSCC was associated with lymph nodal metastasis and worse overall survival.[8]

Quintana et al did a systematic review and found PNI positivity in OSCC was associated increased lymph nodal metastasis, risk of recurrence, and reduced survival.[9]

Arora et al developed a model in predicting the lymph nodal metastasis in early oral cavity squamous cell carcinoma, using DOI, WPOI, PNI, grade of tumor, LVI, lymphoid response, and tumor budding with scores ranging from 7 to 11, 12 to 16, and ≥ 17 points showing lymph nodal metastasis in 6.4, 22.8, and 77.1% of cases, respectively,[10] but in our study, we have developed nomogram using DOI, WPOI, PNI, and LVI and scoring ranging less than 10, 11 to 15, 16 to 20, and more than 20, the predicted lymph nodal metastasis is 20, 42.5, 81.2, and 100%, respectively.

Chatterjee et al conducted a study that showed that the WPOI, tumor budding, PNI, and LVI are important markers in predicting lymph nodal metastasis in early buccal mucosa cancer,[11] on comparing to our study the *p*-value was significant in WPOI, LVI, and PNI in prediction of lymph nodal metastasis, but we did not study about tumor budding in our study.

Shah and Parikh showed that DOI was associated with the prediction of lymph nodal metastasis in the tongue above 8 mm is 75% and buccal mucosa above 10 mm is 66.66%,[12] in comparison with our studies it was > 7.5 mm with 72.2%.

Table 6 Univariate analysis, sensitivity, and specificity of individual parameters with lymph node metastasis of different studies

Paper	Chen et al[13]	Arora et al[10]			De Silva et al[14]	Our study Only buccal mucosa		
Site	Buccal mucosa	All subsites			Tongue and buccal mucosa			
	Univariate	Univariate	Sensitivity	Specificity	Univariate	Univariate	Sensitivity	Specificity
Gender	0.454	ND	ND	ND	ND	0.028	ND	ND
Age	0.003	NA	ND	ND	0.50	ND	ND	ND
T stage	0.001	0.0371	ND	ND	< 0.1	0.139	ND	ND
Tumor thickness	0.001	0.9753	ND	ND	ND	ND	ND	ND
Tumor differentiation	0.004	0.0003	82%	81%	ND	ND	ND	ND
Tumor budding	ND	0.0089	69%	63%	ND	ND	ND	ND
DOI	ND	< 0.0001	92%	91%	< 0.1	0.010	72.2%	50.7%
Shape of nest	ND	0.0276			ND	ND	ND	ND
Lymphoid response	ND	0.0012	71%	68%	ND	ND	ND	ND
WPOI	ND	< 0.0001	87%	86%	< 0.1	0.011	55.6%	67.1%
Eosinophilic infiltration	ND	0.4446	ND	ND	ND	ND	ND	ND
LVI	ND	0.0008	80%	74%	ND	0.005	22.2%	95.2%
PNI	ND	0.0002	85%	83%	ND	0.029	13%	98.6%

Abbreviations: DOI, depth of invasion; LVI, lymphovascular invasion; ND, not done; PNI, perineural invasion; WPOI, worst pattern of invasion.

Chen et al constructed a nomogram by using age ($p = 0.004$), tumor thickness ($p = 0.002$), tumor differentiation ($p = 0.027$), and clinical nodal ($p = 0.001$) status and showed lymph nodal metastasis can be predicted preoperatively in buccal mucosa cancer.[13]

De Silva et al constructed a model that predicts lymph nodal metastasis using DOI, WPOI, and tumor stage in buccal mucosa cancer and the model revealed that T4 tumors in the buccal mucosa that have POI type 3 and has a DOI > 4 mm are more likely to metastasize. It also showed that T3 and T4 tumors in the buccal mucosa with POI type 4 tend to metastasize regardless of its DOI.[14]

Our nomogram has four parameters that show accuracy in the prediction of lymph nodal metastasis in buccal mucosa cancer, any score of more than 11.5 has high chance of lymph nodal metastasis. The main advantage of our study is to find predictor of lymph nodal metastasis in buccal mucosa cancer with routine histopathological parameters that can help us to guide for extent of neck dissection, adjuvant treatment, and prognostication of the patient. When edge wedge biopsy is done preoperatively it helps us determine accurately LVI, PNI, and WPOI. DOI can be found radiologically. Using the histological and radiological parameter we can predict the lymph nodal metastasis in buccal mucosa cancer preoperatively. Mukherjee et al showed that they were able to find LVI and PNI radiologically using a radiomics-based CT scan.[15] Wang et al showed DOI can be preoperatively measured radiologically.[16] The future study plan can be incorporating radiological and small biopsy parameters in predicting the lymph nodal metastasis using our nomogram.

Conclusion

This study proposes a simple predictive model for the risk of lymph nodal metastasis in buccal mucosa squamous cell cancer. However, the study has strength that, it is based on a large sample size, proposed model being simple, and based on parameters empirically supported as well as established in literature. It is easy to use in routine clinical practice and cost-effective. Although findings of this retrospective study need further validation in a prospective study, it provides a useful model that is practical to use in developing countries of South and Southeast Asia where OSCC etiology is similar and advanced facilities are not available.

Recommendation

(1) In patient where nomogram score is more than 10 we recommend for modified neck dissection as predicting probability of cervical lymph nodal metastasis is 42.5%.
(2) In patient where nomogram score is less than 10 we recommend for selective neck dissection as predicting probability of cervical lymph nodal metastasis is 20%.
(3) A large cohort prospective study is warranted.

Conflict of Interest
None declared.

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