RESEARCH PAPER

ASSESSMENT OF LEVEL V LYMPH NODE METASTASIS IN CLINICALLY NODE POSITIVE ORAL CAVITY SQUAMOUS CELL CARCINOMA

[1]Mahesh Mohanty, [2]Samarendra Satpathy, [3]Mukti Prasaad Mishra,[4]Tathagat Sahoo, [5]Satyajit Swain

[1]Assistant Professor, Institute of medical science and SUM hospital II, Phulnakhara, Dept of Surgical oncology, Email: ms7mohanty@gmail.com

[2]Assistant Professor, Veer Surendra Sai Institute of Medical Sciences and Research, Dept of General Surgery, Email: raj.9438666688@gmail.com

[3]Assistant Professor , MJKMCH Jajpur, Dept of General Surgery, Email: mmuktiprasad@gmail.com

[4]Junior Resident, Veer Surendra Sai Institute of Medical Sciences and Research, Dept of General Surgery, Email:tathagat1401@gmail.com

[5]Junior Resident, Veer Surendra Sai Institute of Medical Sciences and Research, Dept of General Surgery, Email:satyajit.sony@gmail.com

Abstract

Aim & Objectives- To determine the role of level V lymph node dissection in clinico- radiologically cervical node positive oral cavity squamous cell carcinoma & To analyse the
potential risk factors (Clinico-radiological and histological) associated with level V lymph node metastasis.

Background- Head and neck malignancies represent a significant global health challenge, accounting for 10% of all cancer cases; in India, this burden is particularly severe,
reaching 40% of the total oncological landscape. Within this category, oral cavity cancer is the most prevalent, comprising 30% of cases, with squamous cell carcinoma (SCC) representing 95% of these tumors. In India, it is the leading cancer among men (35%) and the third most common in women (18%). While the typical diagnosis age is 60, there is a troubling trend of rising incidence among individuals under 40. The primary drivers of this disease are the combined use of alcohol and tobacco, including chewing tobacco and the traditional betel quid mixture, which is strongly linked to buccal mucosa malignancies. The presence of regional lymph node metastasis is the definitive prognostic indicator; its occurrence slashes survival rates by half and significantly increases the likelihood of recurrence and distant spread. Therapeutic management mandates addressing both the primary lesion and the neck's lymphatic drainage. While radiation and adjuvant chemoradiotherapy are standard, surgery remains central. Historically, modified radical neck dissection (MND) involved clearing lymph nodes from levels I through V while sparing vital
structures like the spinal accessory nerve (SAN), sternocleidomastoid muscle (SCM), and the internal jugular vein (IJV). However, clinical data suggests that metastasis to level V is rare in head and neck SCC unless level IIb nodes are already compromised.

Material & Methods- A prospective study was conducted in the department of Surgical Oncology, Bombay Hospital for 18 months between July 2023 to November 2024.
All patients with oral cavity squamous cell carcinomas having clinico-radiologically positive cervical lymph nodes and planned for upfront surgery with comprehensive neck dissection were included in the study After obtaining informed consent, a detailed history was obtained,
and clinical examination findings noted.

Results-In this series Men have a higher total incidence, but women over 50 show a higher frequency. For patients with node-positive disease, the level V metastasis rate was 4%. The buccal mucosa is the most common site of origin (linked to chewing tobacco), while the
tongue is most frequently associated with level V metastasis. Clinical nodal stage (cN), nodal burden (specifically cN1 or exceeding cN2b), and advancing clinical stage are strong predictors. Tumor size (cT stage) was not a significant predictor.

Conclusion- This prospective study on oral cavity squamous cell carcinoma (SCC) identified several key factors related to the spread of cancer to level V lymph nodes.
Although the overall incidence of this disease is higher in men, prevalence peaks among elderly women. While the buccal mucosa often linked to tobacco chewing is the most common primary site, tumors of the tongue are more likely to metastasize to level V.
Metastatic risk is significantly predicted by nodal factors, including clinical nodal stage (cN) and nodal burden (specifically cN1 or cases exceeding cN2b), as well as advancing overall clinical stage. Notably, tumor size (cT) does not serve as a significant predictor.
Both clinical and pathological ECS are significant markers for level V spread. Poorly differentiated tumors and those with perineural invasion (PNI) are more likely to involve level V nodes. Factors like WPOI and LVSI did not show a significant link.

*Author for Correspondence:raj.9438666688@gmail.com

Keywords: Modified radical neck dissection (MND), Spinal accessory nerve (SAN), Sternocleidomastoid muscle (SCM), Spinal accessory nerve (SAN)

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Introduction:

Head and neck malignancies represent a significant global health challenge, accounting for 10% of all cancer cases; in India1, this burden is particularly severe, reaching 40% of the total oncological landscape. Within this category, oral cavity cancer is the most prevalent,

comprising 30% of cases, with squamous cell carcinoma (SCC) representing 95% of these tumors. In India, it is the leading cancer among men (35%) and the third most common in women (18%).2 While the typical diagnosis age is 60, there is a troubling trend of rising

incidence among individuals under 403. The primary drivers of this disease are the combined use of alcohol and tobacco, including chewing tobacco and the traditional betel quid mixture, which is strongly linked to buccal mucosa malignancies4-7.

The presence of regional lymph node metastasis is the definitive prognostic indicator; its occurrence slashes survival rates by half and significantly increases the likelihood of recurrence and distant spread.8 Therapeutic management mandates addressing both the primary lesion and the neck's lymphatic drainage. While radiation and adjuvant chemoradiotherapy are standard, surgery remains central.

Historically, modified radical neck dissection (MND) involved clearing lymph nodes from levels I through V while sparing vital structures like the spinal accessory nerve (SAN), sternocleidomastoid muscle (SCM), and the internal jugular vein (IJV). However, clinical data suggests that metastasis to level V is rare in head and neck SCC unless level IIb nodes are already compromised.

The shift toward selective neck dissection (SND) is backed by three key findings:

Regional lymph node spread follows a predictable, sequential pattern.

Despite medical advancements, the five-year survival rate for oral cavity cancer has stagnated over the last three decades9.

Clearing level V nodes is frequently linked to shoulder dysfunction and injury to the spinal accessory nerve, even when the nerve is preserved, often due to traction or ischemia10,11.

While the efficacy of SND for clinically node-negative (cN0) patients is well-established12,13, many patients presenting with clinically palpable nodes (cN+) still undergo extensive, comprehensive neck dissections. Consequently, this study seeks to evaluate the necessity of level V lymph node removal in cN+ oral cavity cancer patients and identify the specific factors that might predict metastasis to this level.

Materials & Methods:

A prospective study was conducted in the department of Surgical Oncology, Bombay Hospital for 18 months between July 2023 to November 2024. All patients with oral cavity squamous cell carcinomas having clinico-radiologically positive cervical lymph nodes and planned for upfront surgery with comprehensive neck dissection were included in the study After obtaining informed consent, a detailed history was obtained and clinical examination findings noted. The essential work up included imaging contrast enhanced CT scan, Magnetic Resonance Imaging (MRI) and ultrasonography (USG) to evaluate clinical N staging. Round nodes on CT scan and MRI having heterogenous enhancing pattern with central necrotic content and size more than 1 cm on short axis was considered as positive nodes whereas round hypoechoic nodes with ill-defined capsular margin and loss of central hilum nodes was considered as positive nodes in USG. Also, this imaging helped to identify the exact size, extent of disease, depth of invasion, bone invasion, neck nodal status and local resectability of lesions in patients like large lesions with trismus, involvement of retromolar trigone and abutment of mandible. Contrast enhanced computed tomography (CECT) criteria for ECS include irregular nodal boundaries, streaky changes of adjacent fat planes and apparent infiltration of adjacent tissues.

So clinically evident ECS like palpably LN fixed with mandible, skin or adjacent structures, matted nodal mass and CECT scan criteria were considered in the study. Distant metastasis to lung was ruled out by chest x ray and if indicated by CT scan of chest in suspected cases. AJCC 8th edition TNM classification was followed and all patients was staged accordingly. Squamous cell carcinoma on biopsy was confirmed in all patients preoperatively. During neck dissection, contents of level V lymph nodes was dissected, labelled and sent separately for histopathological examination from comprehensive neck dissection specimen for final histopathological examination. Analysis of site of primary disease and the neck nodes with clinical stage, pathological stage and other variables like differentiation grade, depth of invasion (DOI), perineural invasion (PNI), lympho-vascular invasion (LVI), total number of lymph nodes, positive nodes, extra-nodal extension (ENE) was done. Review of the data and charting was done to evaluate potential risk factors for level V lymph node metastasis.

Results

Age distribution among study cases:

Table 1: Age distribution among study cases

Age	No of patients	% of patients
</= 40	9	18%
41-50	9	18%
51-60	15	30%
61-70	10	20%
71-80	7	14%
Total	50	100%

Above table shows that in the present study, most patients (15) of oral cavity carcinoma were in the age group 50-60 years (30%) and the mean age was 54.36 years.

Sex distribution among study cases:

The figure no.1 indicates that higher number of males were included in the present study as per our inclusion criteria, accounting for 74% of the participants, with a male-to-female ratio of 2.84.

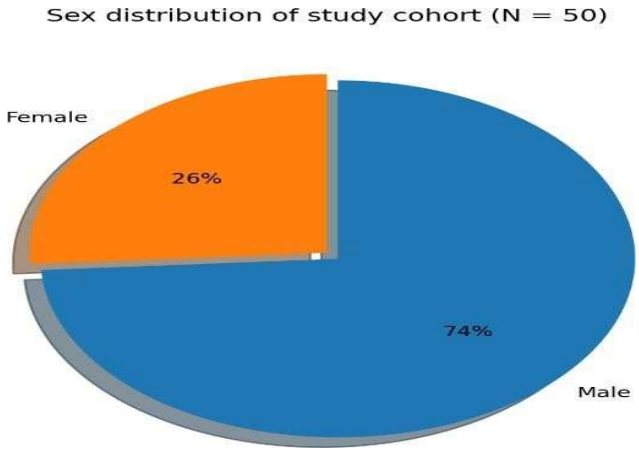

Figure 1: Sex distribution among study cases

Profile of primary site among study cases:

Below figure 2 shows that in the present study, most common primary site was buccal mucosa (38%) and least common site was lip (2%).

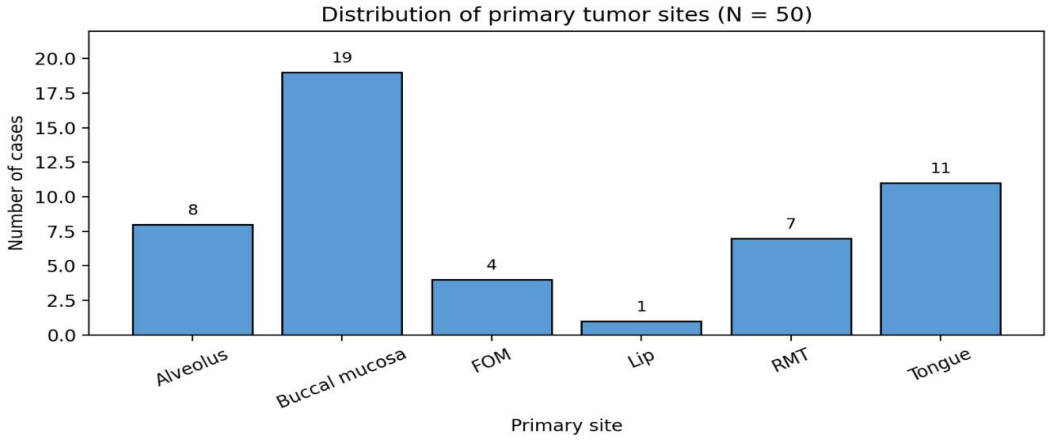

Figure 2: Profile of primary site among study cases

Profile of clinical stage group among study cases:

Table 2: Profile of clinical stage group among study cases

Stage	No of patients	% of patients
III	30	60%
IV A	15	30%
IV B	5	10%

Above table shows that in the present study, most patients were in stage III and no patients were in stage I//II.

Profile of LVSI & PNI among study groups:

Table 3: Profile of LVSI & PNI among study groups

	No.	Percentage (%)
LVSI positive	29	58%
PNI positive	8	16%

Above table shows that in the present study,58% of patients had lympho vascular stromal invasion (LVSI) and 16% had perineural invasion (PNI).

Profile of level V lymph node metastasis:

Table 4: Profile of level V lymph node metastasis

Level V lymph node	No.	%
Metastasis	2	4%
No Metastasis	48	96%

Above table shows that in the present study, 4% patients had level V lymph node metastasis.

Correlation between Age Distribution and level V metastasis

Table 5: Correlation between Age Distribution and level V metastasis

Age	Level V LN				Total	
	Absent		Present			
	No	%	No	%	No	%
</= 40	9	100 %	0	0	9	100 %
41-50	9	100 %	0	0	9	100 %
51-60	14	93.33 %	1	6.67 %	15	100 %
61-70	9	90 %	1	10 %	10	100 %
71-80	7	100 %	0	0	7	100 %
Total	48	96 %	2	4 %	50	100 %

Sample sizes: No metastasis = 48, Yes metastasis = 2

Mean age - No metastasis: 54.06 ± 13.11 Mean age – level V metastasis: 61.50 ± 6.36 T-test results: t-statistic: -0.792

value: 0.432

Individual ages with Level V metastasis: [66.0, 57.0]

The mean age for patients without Level V metastasis is about 54 years, while for those with metastasis, it is about 61.5 years. The t-test shows no statistically significant difference in age between the two groups (p = 0.432).

Correlation between Sex Distribution and level V metastasis

Females showed higher Level V metastasis rate (7.7%) compared to males (2.7%), but this difference is not statistically significant.

No significant association between sex and Level V metastasis

Fisher's exact test p-value = 0.456 (not significant)

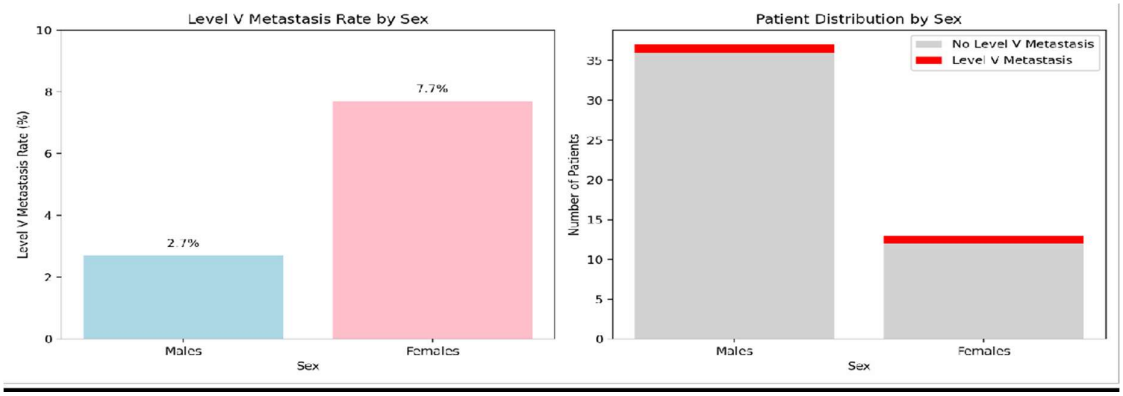

Figure 3: Correlation between Sex Distribution and level V metastasis

Correlation between Clinical T stage and level V metastasis

Table 6: Correlation between Clinical T stage and level V metastasis

cT Stage	No of cases	Level V Metastasis	%
cT1	1	0	0
cT2	26	0	0
cT3	8	1	12.5%
cT4	15	1	6.7%

Total patients analyzed: 50

Chi-square test: $\chi^2 = 2.9080$, p = 0.4060

Degree of freedom: 3

No significant correlation between cT stage and Level V metastasis. Level V metastasis occurred in T3 (12.5%) and T4a (6.7%) stages only.

Correlation between Clinical N stage and level V metastasis

Table 7: Correlation between Clinical N stage and level V metastasis

cN stage	No of cases	Level V Metastasis	%
cN1	41	0	0
cN2b	4	0	0

cN3b	5	2	40%

Clinical N Stage Analysis: Total patients analyzed: 50

Chi-square test: $\chi^2 = 18.7500$, $p = 0.0001$ Degree of freedom 2

Key finding: Only N3b patients developed Level V metastasis

The analysis reveals a significant positive correlation between clinical N stage and pathological Level V metastasis:

Chi-square test: $\chi 2=18.75$ with $p=0.0001$ (highly significant)

Clinical Pattern: There's a clear progression where only patients with N3b disease developed Level V metastasis (40% rate), while N1 and N2b patients had 0% incidence. This suggests that advanced nodal disease (N3b) is strongly associated with Level V involvement.

This finding indicates that clinical N staging, particularly N3b classification, may be an important predictor for Level V metastasis and could influence surgical planning decisions regarding Level V dissection.

Correlation between level II, III, IV nodes and level V metastasis

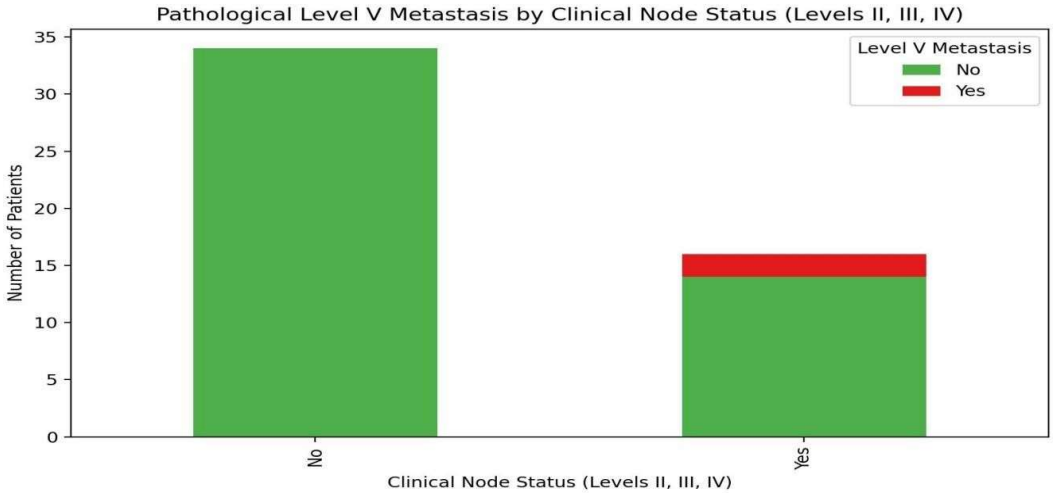

Figure 4: Correlation between level II, III, IV nodes and level V metastasis

- Among patients with no clinical involvement of Levels II/III/IV, none had pathological Level V metastasis (0/34) & Among patients with clinical involvement of Levels II/III/IV, 2 out of 16 (12.5%) had pathological Level V metastasis.

This finding indicates pathological Level V metastasis in this dataset only occurred in patients with clinical involvement of Levels II/III/IV, even though none had clinical evidence of Level V involvement. This suggests that patients with clinical node positivity in Levels II/III/IV may be at higher risk for occult Level V metastasis, highlighting the importance of careful pathological assessment in these cases.

Correlation between grade of tumour and level V metastasis

Total patients analysed: Fisher's exact test (PD vs others): OR = inf, $p = 0.0085$

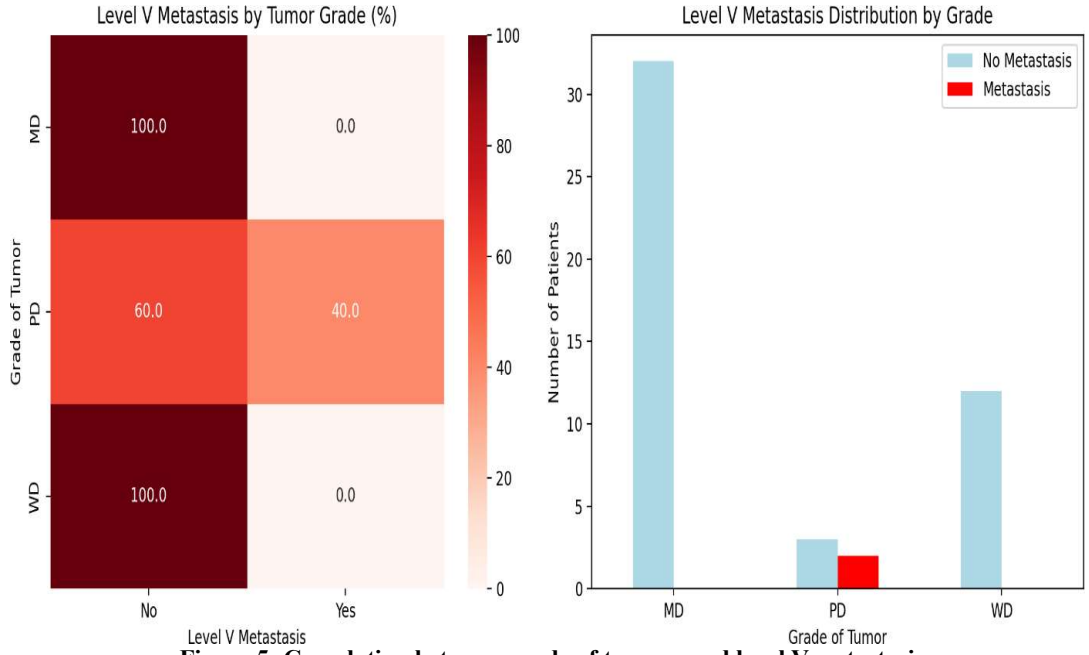

Figure 5: Correlation between grade of tumour and level V metastasis

Level V metastasis occurred ONLY in poorly differentiated (PD) tumours. PD tumours: 40% (2/5) had Level V metastasis. WD and MD tumours: 0% (0/45) had Level V metastasis.

Strong association between poor differentiation and Level V metastasis.

The analysis reveals a strong correlation (p=0.0085) between tumour grade and Level V metastasis. Level V metastasis occurred exclusively in poorly differentiated tumours, with 40% of PD cases showing metastasis compared to 0% in well/moderately differentiated tumours.

Correlation between Clinical ECS and level V metastasis

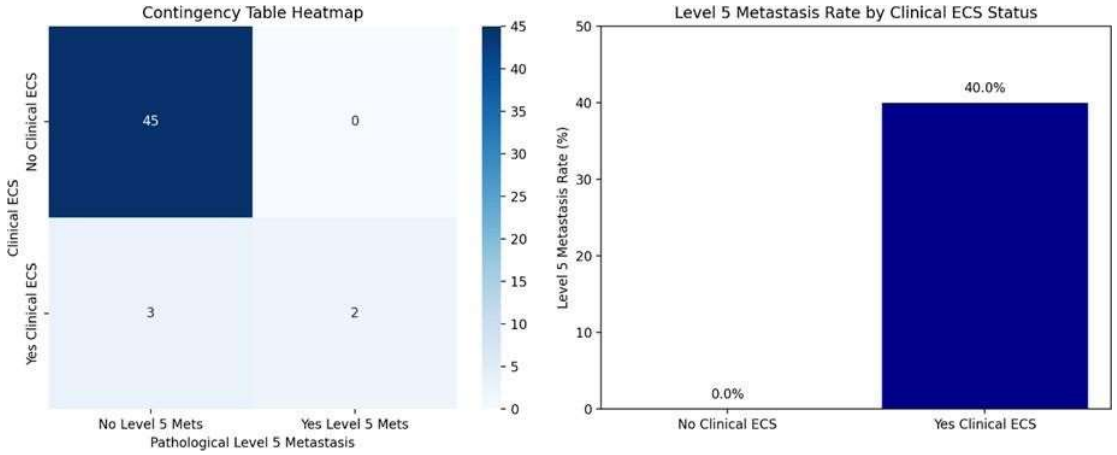

Figure 6: Correlation between Clinical ECS and level V metastasis

The analysis reveals a strong and statistically significant relationship between clinical ECS and pathological Level 5 metastasis: Statistical significance: p=0.0082 (highly significant). Clinical impact: Patients with clinical ECS have a 40% rate of Level 5 metastasis compared to 0% in patients without clinical ECS.

The infinite odds ratio occurs because no patients without clinical ECS developed Level 5 metastasis, creating a perfect predictive relationship in this dataset. This suggests that clinical ECS may be a strong predictor of pathological Level 5 metastasis.

Correlation between Clinical Stage group and level V metastasis

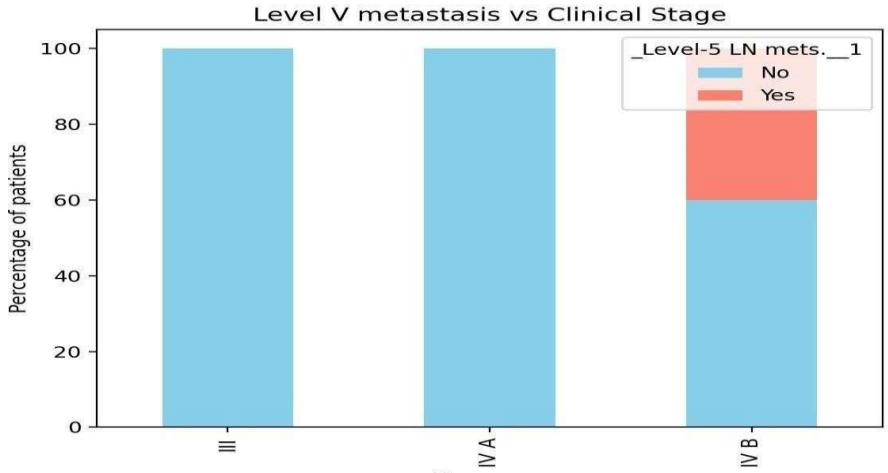

Figure 7: Correlation between Clinical Stage group and level V metastasis

Stage III and IV A patients in this cohort had no Level V lymph node positives, whereas Stage IV B patients showed 40 % positivity (2 of 5). The $\chi^2 = 18.75$, $P < 0.001$. Strong positive correlation ($r=0.60$, $p<0.001$) between cancer stage and level V lymph node metastasis. So, the analysis reveals that more advanced disease carries a greater risk of Level V lymph node metastasis.

Correlation between pathological T Stage and level V metastasis

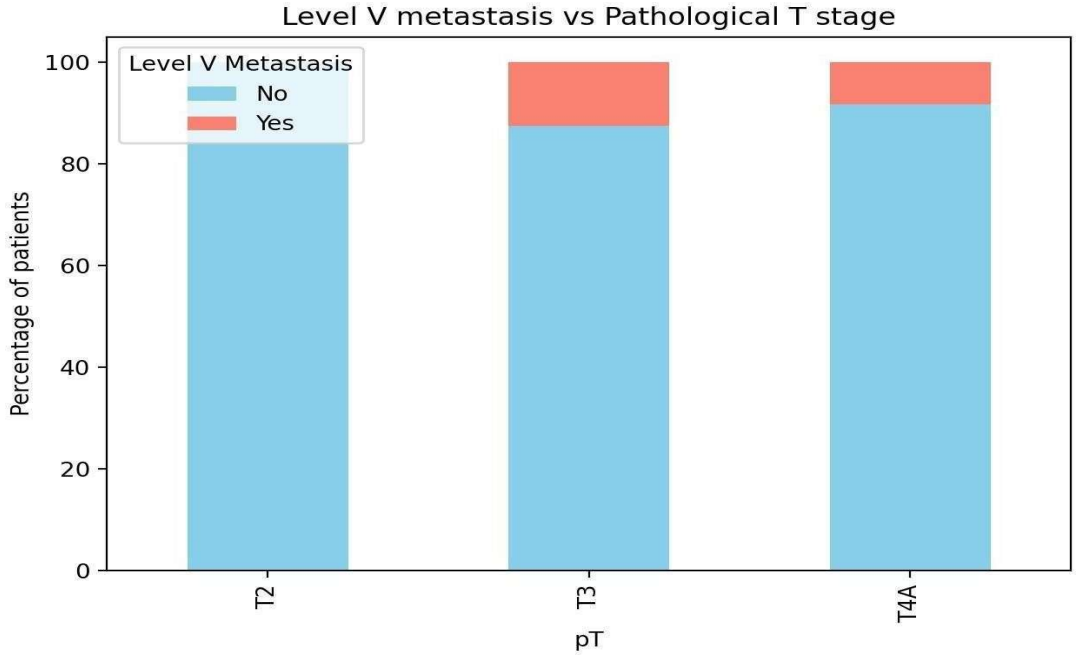

Figure 8: Correlation between pathological T Stage and level V metastasis

Most patients were pT2; none of those had Level-V disease.

pT3 and pT4A each had a small number of positives (1 in each group).

- The χ^2 statistic (≈ 3.34) with $p=0.19$ indicates no statistically significant association between pathological T-stage and presence of Level-V metastasis in this sample.
- Graphically, it can be seen that the red Level-V-positive segment appears only in the higher T-stages, but the association is not statistically significant.

On these data, pathological T-stage alone is not a reliable predictor for elective Level-V dissection. Combining T-stage with nodal factors (N-stage, ECS), or pooling pT3–pT4 together, may yield clearer signals.

Correlation between pathological N Stage and level V metastasis

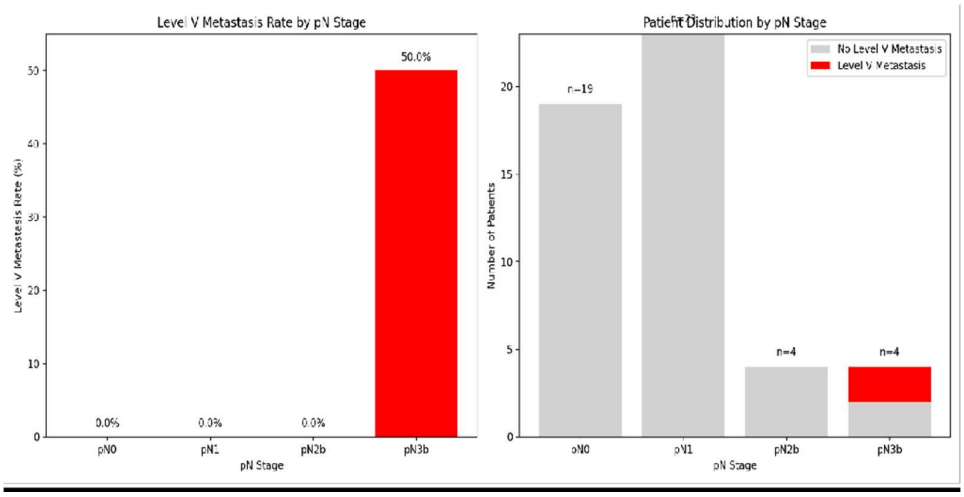

Figure 9: Correlation between pathological N Stage and level V metastasis pN Stage vs Level V Metastasis Analysis:

P-value: 0.005 (significant association)

Only pN3b stage shows Level V metastasis (50% rate: 2/4 cases)

pN0, pN1, and pN2b stages have 0% metastasis rates.

Strong significant correlation between advanced pN stage (pN3b) and Level V metastasis. Elective Level-V dissection may therefore be justified in pN3b cases, while pN0, pN1 patients could potentially avoid the added morbidity.

Correlation between LVSI and level V metastasis

LVSI vs Level V Metastasis Analysis: P-value: 0.503 (not significant)

LVSI present: 6.9% metastasis rate (2/29)

No significant association between LVSI and Level V metastasis despite the trend.

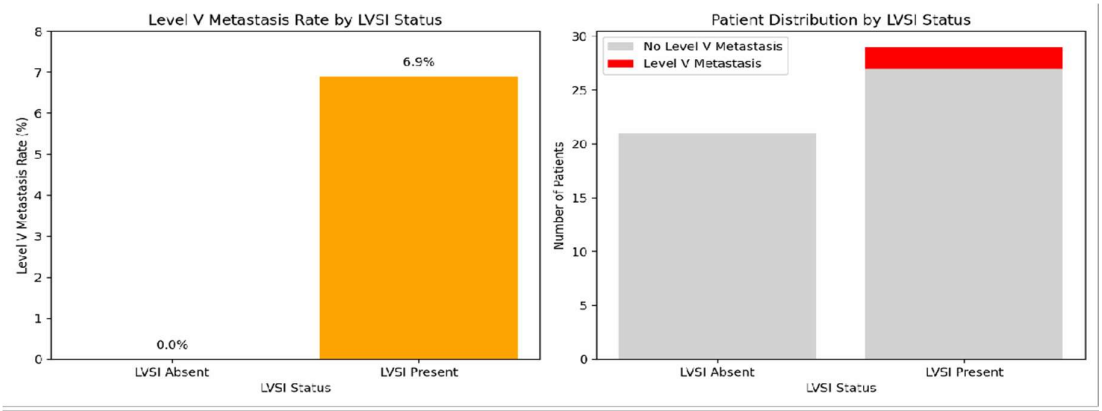

Figure 10: Correlation between LVSI and level V metastasis

Correlation between PNI and level V metastasis

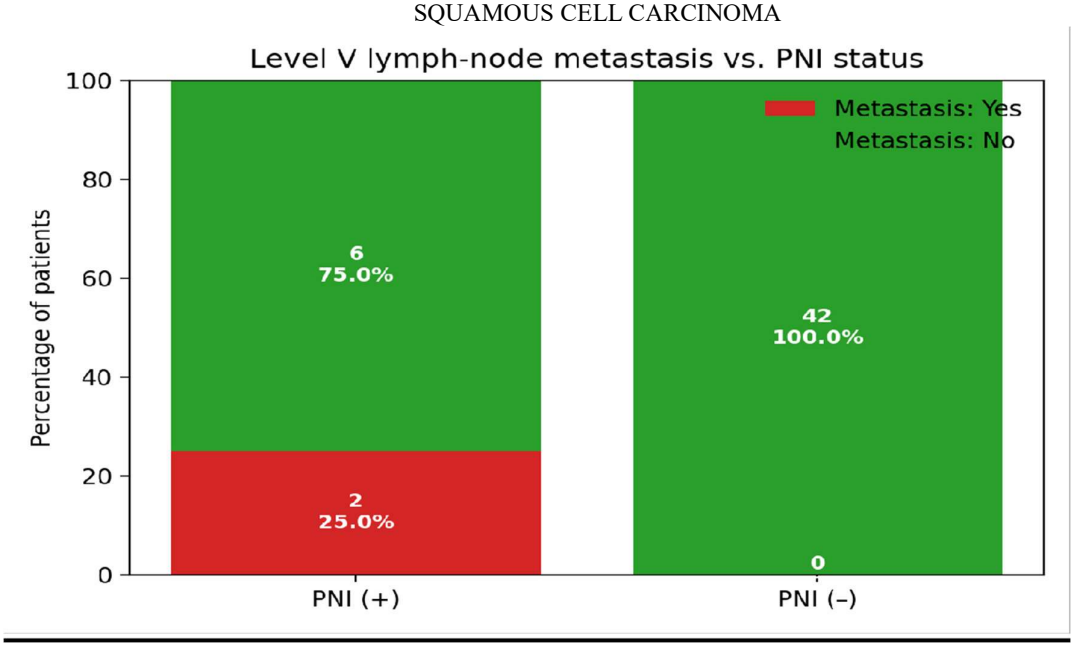

Figure 11: Correlation between PNI and level V metastasis

Incidence of level V metastasis in PNI (+) patients: 2 / 8 = 25 %

Statistical association (Fisher's exact test), P = 0.023

Level V nodal metastasis occurred exclusively in the PNI-positive group (25 % vs 0 %). Perineural invasion is strongly and significantly correlated with level V lymph-node involvement in this cohort. The finding suggests that patients with PNI should receive heightened scrutiny (e.g., imaging or prophylactic dissection) for level V disease.

Correlation between WPOI and level V metastasis

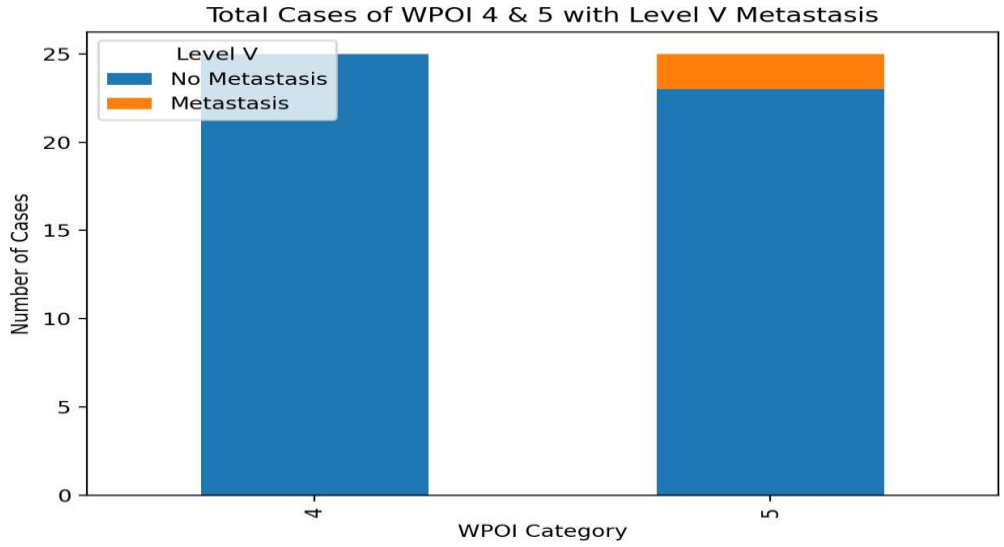

Figure 12: Correlation between WPOI and level V metastasis

Among the 25 patients with WPOI 5, two (8 %) had level V nodal metastasis.

Among the 25 patients with WPOI 4, none had level V metastasis (0 %).

So the correlation between WPOI and level V lymph node metastasis is not statistically significant.

Correlation between pathological ECS and level V metastasis

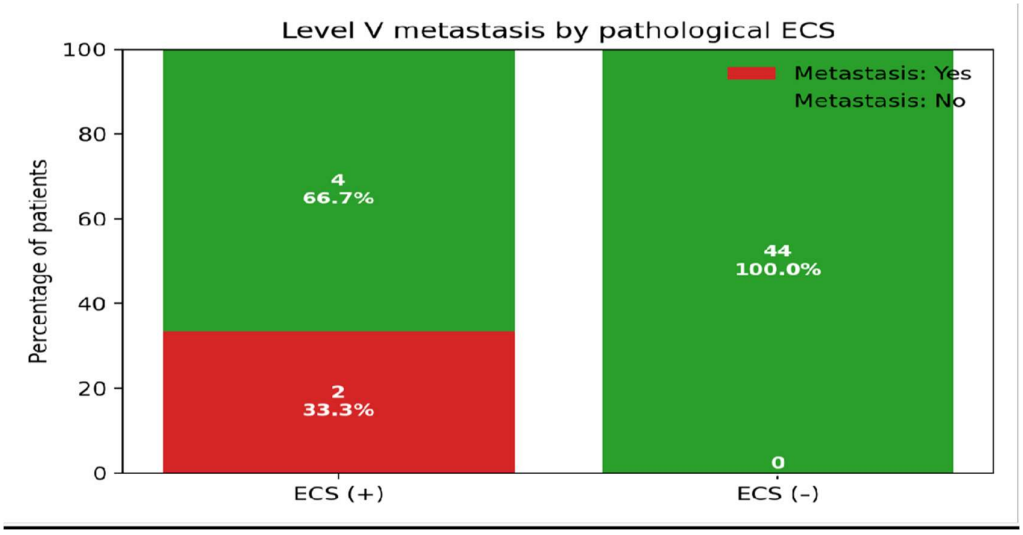

Figure 13: Correlation between pathological ECS and level V metastasis

All level V metastases occurred in the ECS-positive group (2 / 6 = 33 %), none in the ECS- negative group (0 / 44). Fisher's exact, P=0.012 indicates a statistically significant association. So pathological extra nodal extension (ECS) is a strong and significant predictor of level V lymph-node metastasis in this cohort.

Discussion

This study was conducted at the Bombay Hospital in Mumbai, a premier tertiary care facility. The research cohort consisted of 50 patients suffering from primary oral cavity squamous cell carcinoma (OCSCC) who met specific inclusion criteria. All subjects underwent primary tumor excision and neck dissection, supplemented by necessary reconstructive surgery. These procedures were strictly performed following established clinical guidelines and current medical literature.

Age and Gender Demographics-The study population displayed a male-to-female ratio of :1, consisting of 37 men and 13 women. The age range spanned 30 to 78 years, with the highest prevalence (30%, or 15 patients) found in the 50–60 age bracket. When assessing for level V lymph node metastasis, the mean age for patients without such involvement was roughly 54 years, whereas those with level V metastasis were older, averaging 61.5 years.

Our findings reflect broader trends observed in existing research. For instance, Jayasuriya et al. noted a 72% male majority with a mean age of 57.4167. Wh14ile Parikh D.G. et al.19 found a younger mean age of 44.96, their male-to-female ratio (2.8:1) closely mirrors our own.

Other studies, such as those by Jatin P. et al., Shin Y.S. et al.18, and Masahiro Umeda et al.,19 generally confirm a pattern of middle-aged to older male dominance in OCSCC. Our coho mean age was approximately 5–6 years lower than many of these studies, a discrepancy likely explained by the earlier onset of tobacco consumption in our local male population. Primary tumor Subsite Distribution-In our analysis, the buccal mucosa was the

predominant primary site (38%), followed by the tongue (22%). This contrasts with Western research, where the tongue and floor of the mouth are typically the primary sites of origin.

While Jayasuriya et al. and Shin Y.S. et al. 13also identified the tongue as a highly frequent

primary site, the Indian context—our study included—shows a strong predilection for the buccal mucosa. This is likely driven by regional habits involving the placement of chewable

tobacco in the lower gingivobuccal sulcus.

Cervical Lymph Node Metastasis Incidence-Among our 50 patients, 62% exhibited cervical lymph node metastasis. Of the 50 clinically node-positive cases, 41 were staged cN1, resulting in 22 pathologically

confirmed (pN1) cases. In more advanced stages (cN2 and cN3), pathological examination confirmed significant nodal involvement. Overall, our

findings align with the 45–60% metastasis rate often cited in global literature, such as in the studies by Kainuma K. et al15. and Woolgar et al.

Level V Lymph Node Involvement-We identified level V lymph node metastasis in 4% of our patients (2 individuals). None of these cases were preoperatively suspected, and we

observed no instances of "skip" metastasis (where level V is affected without concurrent involvement of other levels).

Comparison of Level V Metastasis Rates:

Study/Source	Level V Metastasis Rate
Our Study	4%
Jayasuriya et al.	6.4%
Shin Y.S. et al.	6.94%
Parikh D.G. et al.	4.3%
Lim Y.C. et al.	5%
Pantvaidya et al.	3.3%
Kainuma K. et al.	7.4%
Davidson J. et al.20	1%
Shah et al.	4%

International data, such as that from Lim Y.C. et al. and Parikh D.G. et al., supports the rarity of skip metastasis in this region. Overall, the evidence suggests that while level V nodal metastasis occurs, it is generally associated with advanced disease and concurrent involvement of other nodal groups. In three instances, isolated level V involvement was identified, one of which included bilateral metastases; however, these findings were likely influenced by the inclusion of various head and neck sites, such as the larynx, hypopharynx, and oropharynx. Research by Davidson et al., analyzing over 1,200 neck dissections across diverse upper aerodigestive tract malignancies, placed the overall incidence of level V metastasis at 3%, dropping to just 1% for oral cavity squamous cell carcinoma (OCSCC). Consistent with these figures, our research documented a 4% rate of level V involvement in OCSCC patients.

Association Between Histological Grade and Level V Metastasis -All patients with level V metastasis in our cohort had poorly differentiated tumors, while those with well or moderately differentiated tumors showed no such involvement (p=0.007). Similarly, Jayasuriya et al. and Kainuma et al. observed a significant link between higher-grade, poorly differentiated tumors and increased risk of level V spread. Conversely, Shin et al. found no statistically significant correlation between tumor differentiation and level V metastasis, suggesting that while grade is a notable factor, it remains an inconsistent predictor. Correlation with T-Stage- In our study, level V metastasis was absent in cT1 and cT2 cases but present in isolated cT3 and cT4 cases. Although these results mirrored both clinical and pathological staging trends, the correlation was not statistically significant ($p = 0.4060$). Similar patterns appear in the work of Parikh et al. and Shin et al., where higher T-stages show a propensity for level V involvement, yet the statistical significance remains elusive across the broader literature.

Correlation with N-Stage Both cases of level V metastasis- in our study occurred in patients with cN3b disease ($p = 0.0001$), characterized by multiple nodes exhibiting extra nodal extension. Notably, no patients lacking involvement in the jugular chain (levels II-IV) showed level V spread, whereas 12.5% of those with jugular involvement did. This supports a strong body of evidence, including findings from Jayasuriya, McDuffie, and others, indicating that level V metastasis is strongly associated with advanced nodal disease (N2b or higher) and the presence of malignancy in levels II through IV.

Extracapsular Spread (ECS) and Level V Involvement- Our data revealed that both patients with level V metastasis exhibited extracapsular spread, a finding that reached statistical significance (p=0.0018). This aligns with Parikh et al., who reported that every patient in their study with level V involvement also displayed ECS, suggesting it is a critical risk factor for this pattern of spread.

LVSI, PNI, and WPOI in Relation to Level V Metastasis- While lympho-vascular space invasion (LVSI) was present in both patients with level V involvement, the overall correlation was not statistically significant (p = 0.503). Perineural invasion (PNI) showed a significant association with level V metastasis (p = 0.023), whereas the relationship with the worst pattern of invasion (WPOI-5) did not reach significance (p = 0.489). While Parikh et al. documented a high rate of LVSI in patients with level V metastasis, the impact of PNI and WPOI remains under-researched in existing literature, marking an area for further investigation.

Conclusion

This prospective investigation, carried out at a tertiary referral centre, yielded the following key findings regarding oral cavity squamous cell carcinoma (SCC):

- **Demographic Trends**: While men account for a higher total incidence of oral SCC, women over the age of 50 displayed a higher frequency of the disease.
- **Level V Involvement:** Neither age nor gender showed a statistically significant link to metastasis in level V lymph nodes.
- **Anatomical Distribution**: The buccal mucosa was the most common site of origin, a finding likely linked to the widespread habit of chewing tobacco in India. Conversely, the tongue was the primary site most frequently associated with the spread of cancer to level V nodes.
- **Predictors of Metastasis:**
  - Staging: While the primary tumor (cT) stage did not significantly predict level V involvement, the nodal (cN) stage did. This suggests that the current nodal status is a more reliable indicator for surgical planning and risk assessment than the size of the tumor.
  - Disease Progression: As the clinical stage of the disease advances, the probability of level V nodal metastasis rises accordingly.
  - Nodal Burden: Patients presenting with cN1 disease (metastasis within levels II–IV) showed a heightened risk of level V involvement. Furthermore, advanced nodal disease (exceeding stage cN2b) was strongly linked to positive level V nodes.
  - Extracapsular Spread: Both clinical and pathological extracapsular spread (ECS) were identified as potent, statistically significant markers for predicting metastasis to level V.
- **Incidence Rates:** For patients with clinically or radiologically evident node-positive disease, the rate of level V metastasis was 4%, aligning with established medical literature.
- **Histopathological Factors**:
  - Differentiation: Poorly differentiated SCCs showed a higher propensity for level V involvement than those that were well or moderately differentiated.
  - Invasion Patterns: Perineural invasion (PNI) demonstrated a significant correlation with level V metastasis. In contrast, neither the worst pattern of invasion (WPOI) nor lympho-vascular space invasion (LVSI) showed a statistically significant relationship with the spread of cancer to level V nodes.

Ethical Approval -For this retrospective analysis, it was waived of informed consent. The analysis looked retrospectively at outcomes for a large cohort of patients treated. All data analysed were collected as part of routine diagnosis and treatment.

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References

1. Parkin DM, Pisani P, Ferlay J. Global cancer statistics. CA Cancer J Clin. 1999;49(1):33– 64. doi:10.3322/canjclin.49.1.33
2. Sankaranarayanan R. Head and Neck cancer: a global perspective on epidemiology and prognosis. Anticancer Res. 1998;18: 4779–86.
3. Myers JN, Elkins T, Roberts D, Byers RM. Squamous cell carcinoma of the tongue in young adults: increasing incidence and factors that predict treatment outcomes. Otolaryngol Head Neck Surg. 2000;122(1):44–51.
4. Jussawalla DJ, Deshpande VA. Evaluation of cancer risk in tobacco chewers and smokers: an epidemiologic assessment. Cancer. 1971;28(1):244–52.
5. World Health Organization. Global data on incidence of oral cancer [Internet]. Geneva: WHO; [cited 2021 Dec 11]. Available from: http://who.int/oral_health/publications/oral_cancer_brochure.pdf

6. Lin WJ, Jiang RS, Wu SH, Chen FJ, Liu SA. Smoking, alcohol, and betel quid and oral cancer: a prospective cohort study. J Oncol. 2011;2011: 525976.

7. Baden E. Prevention of cancer of the oral cavity and pharynx. CA Cancer J Clin. 1987;37(1):49–62.

8. Johnson JT. Cervical lymph node metastases. Arch Otolaryngol Head Neck Surg. 1995;111: 534–7.

9. Shah JP, Candela FC, Poddar AK. The patterns of cervical lymph node metastases from squamous carcinoma of the oral cavity. Cancer. 1990;66(1):109–13.

10. Moore S, Johnson A, Pierce A. The epidemiology of mouth cancer. Oral Dis. 2000;6: 65–74. doi:10.1111/j.1601-0825. 2000. tb00104.x

11. Cheng PT, Hao SP, Lin YH, Yeh AR. Objective comparison of shoulder dysfunction after three neck dissection techniques. Ann Otol Rhinol Laryngol. 2000;109(8):761–6.

12. Pieter UD, Paul CV. Incidence of shoulder pain after neck dissection: a clinical explorative study for risk factors. Head Neck. 2001;23(11):947–53. doi:10.1002/hed.1137

13. Khunteta N, Makkar A, Badwal JS, Katta P, Choudhary D, Viswanath M, et al. Patterns of neck nodal metastasis from oral cavity carcinoma. South Asian J Cancer. 2023 Feb 6;11(4):326–331. doi:10.1055/s-0041-1733348. PMID: 36756101; PMCID: PMC9902093.

14. Giresh A, Parida PK, Chappity P, Adhya AK, Nayak A, Pradhan P, et al. Prevalence of skip metastases to cervical lymph-nodes in oral cavity cancer in Eastern India—an observational study. Indian J Otolaryngol Head Neck Surg. 2022 Apr 25;74(Suppl 3):6374–6383. doi:10.1007/s12070-021-03048-z. PMID: 36742498; PMCID: PMC9895623.

15. Ludwig R, Werlen S, Barbatei D, Widmer L, Pouymayou B, Balermpas P, et al. Patterns of lymph node involvement for oral cavity squamous cell carcinoma. Radiother Oncol. 2024 Nov;200: 110474. doi:10. 1016/j.radonc.2024.110474.

16. Jena A, Sundaram R, Manilal B, Patnayak R. Oral Cavity Cancers – Level V Metastasis. Indian J Surg Oncol. 2014 Jun;5(2): [page numbers if available]. doi:10.1007/s13193-014-0319-2.

17. Pantvaidya GH, Pal P, Vaidya AD, Pai PS, D'Cruz AK. Prospective study of 583 neck dissections in oral cancers: implications for clinical practice. Head Neck. 2014 Oct;36(10):1503-7. doi:10.1002/hed.23494. Epub 2014 Jan 13. PMID: 23996343.

18. Gutiontov S, et al. The clinical target volume delineation based on the correlation analysis of neck node levels in oral cavity squamous cell carcinoma (OCSCC). BMC Cancer. 2024;24(1):1–8.

19. Obermeier A, et al. Lymph nodal recurrence in levels IV and V in oral squamous cell carcinoma after neck dissection. ANZ Journal of Surgery. 2023;93(1–2):1–6.

20. Wiegand S, Zimmermann AP, Sesterhenn AM, Werner JA. Prevalence of Level V metastases in node-positive head and neck squamous cell carcinoma. Anticancer Res. 2011 Nov;31(11):3959–61.

21. Umeda M, Yokoo S, Take Y, Omori A, Nakanishi K, Shimada K. Lymph node metastasis in squamous cell carcinoma of the oral cavity: correlation between histologic features and the prevalence of metastasis. Head Neck. 1992 Jul-Aug;14(4):263–72. doi:10.1002/hed.2880140402.