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Original Article

Correlation of Radiological and Pathological Cervical Lymph Node Involvement in Oral Cavity Cancer

Asma Saleem Khan[1], Quratulain Badar[2], Asif Husain Osmani[3], Shoaib Hanif[4], Kaynat Siddiqui[5]

Abstract

Objective: This study aims to detect and correlate enlarged lymph nodes radiologically with their pathological status, specifically identifying reactive and positive nodes.

Methods: This retrospective observational study was performed at Dr. Ziauddin Hospital, Karachi, Pakistan. All patients with biopsy-proven surgically resectable oral cavity cancer from January 2021 to December 2021 were included in this study. Data were gathered, including radiological and histopathological reports. The diagnostic accuracy of the scans was calculated using final histopathology as the gold standard. Data was analysed using SPSS v.26.0.

Results: 222 patients' data were reviewed, and 89 patients satisfied the inclusion criteria. The sensitivity and specificity of the CT scan were 82.98% and 38.04%, respectively. The positive predictive value was 60%, whereas the negative predictive value was 66.67%. We found that the overall accuracy of the CT scan was 61.8%.

Conclusion: We conclude that contrast-enhanced CT scans in lower-middle-income countries remain a viable radiological approach for cervical lymph node assessment that can significantly influence decisions regarding neck dissection, impacting patient survival outcomes and improving quality of life.

Keywords: Oral cavity, Squamous cell carcinoma, Lymph node, Metastasis

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Introduction

According to the GLOBOCAN 2022 data, head and Neck cancers are the second most common malignancy in Pakistan.[1] The prognosis is generally worse for advanced disease. The most significant prognostic factor is the presence of cervical lymph node metastasis.[2,3] In oral cavity SCC, the incidence of neck metastasis ranges between 34% and 50%.[4] The survival rate drops to 50% with the increasing risk of cervical nodal involvement.[5]

Lymph node enlargement in many cases is reactive rather than metastatic, making it challenging for the treating physician to distinguish, as it influences treatment choice and prognosis.[6,7]

Different imaging modalities can be used to evaluate cervical lymphadenopathy. Each of these offers various advantages and limitations. An ultrasound scan is a useful tool to assess a lymph node 5mm or more in size and superficial. For nodes that are 2mm or smaller in size or present in deeper lymphatic chains, Computed Tomography (CT) scan offers better visualisation and has a high sensitivity.[8] Despite offering excellent soft-tissue detail, MRI is limited by cost and scan duration.[9] PET-CT combines metabolic imaging with anatomical localisation, making it valuable for detecting metastatic cervical lymphadenopathy. It relies on FDG uptake to distinguish reactive from metastatic lymph nodes. While effective for assessing metastases, PET-CT can yield false positives in inflammatory cases and is less accessible due to high cost and specialised facilities.[8,9]

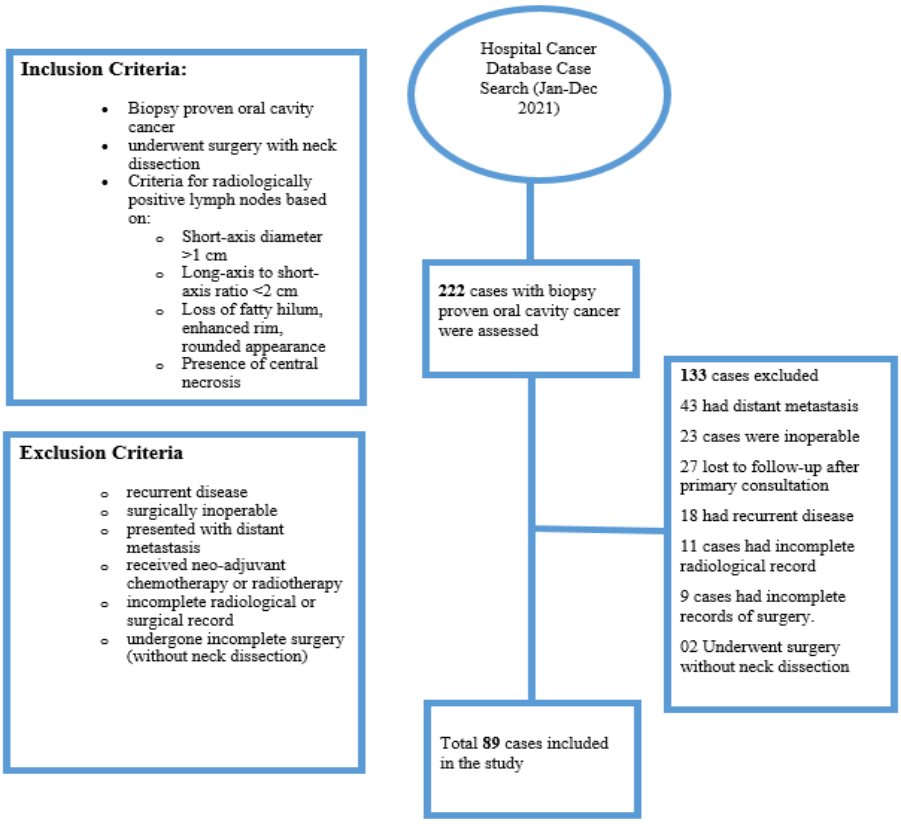
In the management of resectable, node-positive oral cavity cancers, the current standard treatment involves excision of the primary tumour and neck dissection, followed by adjuvant radiotherapy or concurrent chemoradiotherapy (CCRT).[10] For inoperable cases, definitive CCRT remains the preferred approach.[11]

We aim to correlate radiologically and pathologically positive cervical lymph nodes in patients with resectable oral cavity squamous cell carcinoma (SCC) in this study.

Materials And Methods

This retrospective observational study was conducted at Dr. Ziauddin Hospital, Karachi, Pakistan. Ethical approval was obtained with a waiver from the Ethics Review Committee (ERC) under reference code 8690524ASRAD.

We included data from patients with biopsy-confirmed, surgically resectable oral cavity cancer treated between January 2021 and December 2021. A flowchart illustrating the inclusion and exclusion criteria was developed to provide a clear overview of the patient selection process (Figure 1). We reviewed patient files, including radiological and histopathological reports. Radiological assessment primarily uses contrast-enhanced computed tomography (CT) scans. Lymph nodes were classified as radiologically positive (cN+) if they measured greater than 10mm in short-axis diameter, exhibited enhancement similar to the primary tumour,



or showed central necrosis. Data analysis was performed using IBM SPSS version 26. Descriptive statistics were calculated for patient demographics and tumour characteristics. To examine the correlation between radiologically and pathologically positive lymph nodes, we used the Pearson chi-square test. Statistical significance was defined as a p-value of <0.05.

Figure 1: Flow chart of patients who met the inclusion and exclusion criteria for the study.

Results

Of the 222 patient records reviewed, 89 met the inclusion criteria. Table 1 summarises patient and tumour characteristics. Among these, 83.1% (n=74) were male, and 16.9% (n=15) were female, with a mean age of 49.2 ± 12.06 years (range: 20–76 years). Primary tumour sites included the tongue in 49.6% (n=44) of cases and the buccal mucosa in 50.4% (n=45). Radiological staging showed that 37.1% (n=33) of patients had T2 disease and 29.2% (n=26) had T3 disease. Most patients (91%, n=81) underwent unilateral neck dissection, while 9% (n=8) had bilateral neck dissection. Radiological nodal staging identified 27% (n=24) with cN0 disease, 27% (n=24) with cN1 disease, and 46.1% (n=42) with cN2 disease, with no cases of cN3 disease. The majority (53.9%, n=48) were classified as stage IVA. (Table 1). Pathological examination after neck dissection revealed that 47.2% (n=42) of patients were node-negative (pN0), while 52.8% (n=47) were node-positive (pN+). Among the pN+ cases, 59.6% (n=28) had primary tongue cancer, and 40.4% (n=19) had primary buccal mucosa cancer (Table 2).

Table 1: Patient and tumour characteristics

		Count (n)	Column (n% %)	Mean±SD
Gender	Male	74	83.1%	
	Female	15	16.9%	
Age				49.21±12.06
Primary site	Tongue	44	49.4%	
	Buccal mucosa	45	50.6%	
Radiological T stage (cT)	T1	13	14.6%	
	T2	33	37.1%	
	T3	26	29.2%	
	T4a	17	19.1%	
Radiological N stage (cN)	N0	24	27.0%	
	N1	24	27.0%	
	N2	41	46.1%	
	N3	0	0.0%	
Radiological Stage	Stage I	8	9.0%	
	Stage II	15	16.9%	
	Stage III	18	20.2%	
	Stage IVa	48	53.9%	
	Stage IV b	0	0.0%	
Neck Dissection	Unilateral	81	91%	
	Bilateral	8	9%	

n represents the number of patients, % represents the percentage, and ±SD represents the standard deviation. (cT) represents the radiological tumour stage, and (cN) represents the radiological nodal stage

Table 2: Correlation between primary site and pathological nodal status

			Pathological nodal status (pN)		Total
			Positive	Negative	
Primary site	Tongue	Count (n)	28	16	44
		% within Pathological Positive	59.6%	38.1%	49.4%
	Buccal mucosa	Count (n)	19	26	45
		% within Pathological Positive	40.4%	61.9%	50.6%
Total		Count (n)	47	42	89
		% within Pathological Positive	100.0%	100.0%	100.0%

pN represents the pathological nodal status, n represents the number, and % denotes the percentage of the patients.

Table 3: Statistically significant correlation between radiological and histopathological lymph nodal status (p = 0.02)

			Pathological nodal status (pN)		Total	p-value*
			Positive	Negative		
Radiological nodal status (cN)	Positive	Count (n)	39	26	65	**0.02**
		% within Radiological positive	60.0%	40.0%	100.0%	
	Negative	Count (n)	8	16	24	
		% within Radiological positive	33.3%	66.7%	100.0%	
Total		Count	47	42	89	
		% within Radiological positive	52.8%	47.2%	100.0%	

n is the number of patients and % percentage.
**p-value is significant <0.05 by Pearson Chi-Square test*

Notably, 33.3% (n=8) of patients initially labelled as radiologically node-negative (cN0) were found to be node-positive (pN+) on histopathological examination (Table 3), including 16% (n=4) identified as N3 with extranodal extension (ENE+). A significant correlation was observed between radiological and pathological nodal statuses (p = 0.02). The correlation between specific radiological and corresponding pathological nodal stages was even stronger, with a highly significant p-value of 0.002. (Table 4).

Table 4: Statistically significant correlation between radiological and histopathological lymph nodal stage (p = 0.002)

			Pathological N stage (pN)				Total	P-value*
			N0	N1	N2	N3 with ENE		
clinical N stage (cN)	N0	Count (n)	16	1	3	4	24	p=0.002
		% within pathological N stage	38.1%	7.7%	33.3%	16.0%	27.0%	
	N1	Count (n)	16	4	2	2	24	
		% within pathological N stage	38.1%	30.8%	22.2%	8.0%	27.0%	
	N2	Count (n)	10	8	4	19	41	
		% within pathological N stage	23.8%	61.5%	44.4%	76.0%	46.1%	
Total		Count (n)	42	13	9	25	89	
		% within pathological N stage	100.0%	100.0%	100.0%	100.0%	100.0%	

*cN is the radiological nodal stage, pN is the pathological nodal stage, n denotes the number of patients, and % denotes the percentage of the cases. *p-value significant <0.05 by Pearson Chi-Square test*

The diagnostic performance of the CT scan in detecting lymph node metastasis was evaluated:

- Sensitivity: 82.98%
- Specificity: 38.04%
- Positive Predictive Value (PPV): 60%
- Negative Predictive Value (NPV): 66.67%
- Overall Accuracy: 61.8%

These results highlight the utility and limitations of CT scans in assessing nodal metastasis in patients with oral cavity cancer.

Discussion

This study evaluated the correlation between radiological and histopathological findings in cervical lymph node assessment among patients with oral cavity squamous cell carcinoma (OCSCC). Our key findings highlight that the CT scan demonstrated a sensitivity of 82.98% and a specificity of 38.04%, with an overall diagnostic accuracy of 61.8%. Notably, 33.3% of lymph nodes that appeared radiologically negative were confirmed positive on histopathology.

These results align with international literature reporting variable diagnostic accuracy of CT scans for cervical lymph node metastasis, ranging from 38% to 96%.[12-15] A recent study showed comparable CT sensitivity (83%) but a higher specificity (61.7%) and overall accuracy (73%), suggesting that while CT is reliable for detecting positive nodes, it may still miss subclinical metastases (16). Similarly, a local study found that 23% of radiologically negative nodes were positive histologically, leading to a drop in specificity.[16]

The prognostic impact of cervical lymph node involvement is well established; it reduces survival by up to 50%.[17,18] Therefore, accurate nodal staging is essential for treatment planning. While clinical examination is an important initial step, it is subjective and operator dependent. Imaging, particularly contrast-enhanced CT, provides objective staging and evaluation, although limitations remain.

Our findings reinforce the importance of elective neck dissection even in radiologically negative necks, especially in early-stage OCSCC, to improve both disease-free and overall survival.[19] Given that one-third of radiologically negative nodes were positive histopathologically, relying solely on imaging may lead to under-treatment.

Limitations of the study include its single-centre nature, limited sample size, and the potential for inter-observer variability in radiological interpretation. Additionally, the absence of advanced imaging modalities like PET-CT or MRI may limit generalizability.

Conclusions

In lower-middle-income countries, where financial constraints make advanced tools unapproachable, contrast-enhanced CT scans remain a viable and convenient option for assessing cervical lymph nodes. Although their specificity is low, these scans can significantly influence neck dissection decisions, improving patient survival and quality of life

Author Information

1. Resident, Radiation Oncology Department, DZUH 2. Assistant Professor, Radiation Oncology Department, DZUH 3. Consultant, Medical Oncology Department, DZUH 4. Consultant, Radiation Oncology Department DZUH 5. Resident, Radiation Oncology Department, AKUH

Corresponding author: Dr. Asma Saleem Khan dr.asmakhan2017@gmail.com

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