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Talha Ahmed Qureshi

Muhammad Wasif

Mohammad Sohail Awan

Adnan Yar Muhammad

Ainulakbar Mughal

See next page for additional authors

Authors

Talha Ahmed Qureshi, Muhammad Wasif, Mohammad Sohail Awan, Adnan Yar Muhammad, Ainulakbar
Mughal, and Abdullah Ameen

Role of contrast enhanced computed tomography in assessing cervical lymph node metastases in oral cavity squamous cell carcinoma

Talha Ahmed Qureshi[1], Muhammad Wasif[2], Muhammad Sohail Awan[3], Adnan yar Muhammad[4], Ainulakbar Mughal[5], Abdullah Ameen[6]

Abstract

Objective: To evaluate the diagnostic accuracy of contrast-enhanced computed tomography scan in detecting cervical nodal metastasis in oral cavity squamous cell carcinoma.

Methods: The retrospective cross-sectional study was conducted at Aga Khan University Hospital, Karachi, Pakistan. and comprised records from January 1, 2015, to October 31, 2016, of patients diagnosed with oral cavity squamous cell carcinoma and who underwent surgical resection of primary tumour along with neck dissection after having a contrast-enhanced computed tomography scan of head and neck. Diagnostic accuracy of the scans was calculated using final histopathology as the gold standard. All scans were reviewed by a consultant radiologist. Data was analysed using SPSS 23.

Results: Of the 100 patients whose records were reviewed, 70(70%) were female, 55(55%) had buccal and 32(32%) had tongue cancer.. The scans had sensitivity 83%, specificity 61.7%, positive predictive value 70.9%, negative predictive value 76.3% and overall diagnostic accuracy 73%.

Conclusion: Computed tomography scan was found to be a useful tool for preoperative staging of oral cavity squamous cell carcinoma. However, due to low specificity and negative predictive value, elective neck dissection should still be done in a negative scan for cervical lymph node metastases.

Keywords: Oral cavity, Squamous cell carcinoma, Lymph node, Metastasis. (JPMA 71: 826; 2021)

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Introduction

Head and neck cancers are among the most common ones in the world. Squamous cell carcinoma (SCC) of the head and neck is the sixth most common malignancy worldwide and accounts for approximately 62,000 cases and 13,000 deaths annually in the United States.[1] They account for approximately one-fifth (21%) of the cancers in males and about one-tenth (11%) in females.[2] Further, 90% of oral cavity tumours are SCCs.[3] Overall, the oral squamous cell carcinoma (OSCC) has a fairly poor prognosis and majority of patients present with advanced disease in our part of the world.

OSCCs have a propensity to metastasise to the regional cervical lymph nodes. Histopathological assessment of surgical resection specimen remains important in post-operative management, and important prognostic markers include margin status, tumour size, tumour thickness, skin and bone involvement, and lympho-vascular invasion. Among all these factors, affecting the prognosis, cervical lymph node metastasis is considered the most important

and is used in staging the disease according to tumour, nodes and metastases (TNM) classification.[4]

The usual imaging modalities used in head and neck cancers for the detection of lymphadenopathy are computed tomography (CT), magnetic resonance imaging (MRI) and ultrasound (US); CT and MRI being the commonly used tools.[5] However, CT scans are the most commonly used imaging modality due to their ability of better anatomical localisation and detection of nodal morphological features, like central necrosis, margins and encasement of vessels.[6]

Local data about accuracy rates of CT scan in detecting cervical nodal metastasis is very minimal. The current study was planned to evaluate the diagnostic accuracy of contrast-enhanced CT scan in detecting cervical nodal metastasis in OSCC

Patients and Methods

This retrospective cross-sectional study was conducted at Aga khan university hospital Karachi, Pakistan, and comprised record from January 1, 2015, to October 31, 2016, of patients diagnosed with OSCC and who underwent surgical resection of primary tumour along with neck dissection after having a contrast-enhanced CT scan of head and neck. Final histopathology was taken as the gold standard.

[1]Department of Otolaryngology, Patel Hospital, Karachi, Pakistan; [2,3,5]Department of Otolaryngology, Aga Khan University Hospital, Karachi, Pakistan; [4]Department of Otolaryngology, Hayatabad Medical Complex, Peshawar, Pakistan; [6]Department of Radiology, Aga Khan University Hospital, Karachi, Pakistan.

Correspondence: Muhammad Wasif. e-mail: mohammad.wasif@aku.edu

After taking prior exemption from the institutional ethics review committee, the sample size was calculated using OpenEpi calculator.[7] Taking 21% prevalence of positive clinical findings at 8% margin of error and 95% confidence interval (CI).[8] Using consecutive sampling technique, data was collected from manual and electronic medical records.

A comparison was made in terms of tumour size and lymph node metastases reported on CT scan with the final histopathology.

A lymph node was termed positive if it had size >10mm in short axis or showing enhancement equal to the enhancement of the primary tumour, or if central necrosis was present.

Data was analysed using SPSS 23. Frequencies and percentages were used to express gender, location of carcinoma, and size of tumour. Kappa analysis was done to see the degree of agreement between the two testing procedures for tumour (T) and node (N) staging using TNM classification. $P < 0.05$ was considered significant.

Table-1: Baseline Information (n=100).

Characteristics		n (%)
Gender	Male	70 (70)
	Female	30 (30)
Location	Buccal	55 (55)
	Tongue	32 (32)
	Lower alveolus	5 (5)
	Upper alveolus	2 (2)
	Retromolar trigone	3 (3)
	Hard palate	2 (2)
	Floor of mouth	1 (1)
Procedure	Wide local excision	31 (31)
	Glossectomy	31 (31)
	Composite resection with marginal mandibulectomy	24 (24)
	Composite resection with segmental mandibulectomy	10 (10)
	Maxillectomy	4 (4)

Table-3: Sensitivity and specificity of computed tomography (CT) scan in detecting nodal disease.

N staging		Histopathological		Total
		Positive	Negative	
Radiological	Positive	44 (True Positive)	18 (False Positive)	62
	Negative	9 (False Negative)	29 (True Negative)	38
Total		53	47	100

Results

Of the 100 patients whose records were reviewed, 70(70%) were female, 55(55%) had buccal and 32(32%) had tongue cancer (Table 1).

Radiological and histopathological T and N staging with significant values are shown in Table 2.

CT scans had sensitivity 83%, specificity 61.7%, positive predictive value (PPV) 70.9%, negative predictive value (NPV) 76.3% and overall diagnostic accuracy 73% (Table 3).

Discussion

Head and neck SCC is among the common cancers around the world, with South Asia sharing the major burden of the disease as the second most common cancer after breast in a study done in Karachi.[1,2] Along with the size of the tumour, lymph node positivity is also used in staging of head and neck SCC, and survival typically depends on the stage of the disease; good survival for early stages I and II and a poor survival for advanced stage disease.[8,9]

These cancers frequently metastasise to draining regional cervical lymph nodes, and lymph node positivity is reported as a significant independent predictor of recurrence in head and neck SCCs. Multiple metastases decrease the prognosis further, and, hence, lymph node positivity is one of the most important predictors of poor prognosis in head and neck cancers.[9,10] Therefore, every effort is made to correctly stage these tumours pre-operatively, although final staging is done histopathologically.

As clinical examination is subjective, radiological examinations are used for objective pre-operative staging of these tumours. CT scan of head and neck is routinely used to assess the TN staging of head and neck SCC. Conventionally, 3mm axial CT scans are

Table-2: Association between radiological and histopathological tumour and node (T&N) staging.

		Histopathological T staging				Total	Kappa Value
		T1	T2	T3	T4		
Radiological T staging	T1	11	7	0	2	20	38.8%
	T2	5	20	10	4	39	(p<0.01)
	T3	1	3	4	2	10	
	T4	2	5	3	21	31	
Total		19	35	17	29	100	

		Histopathological N staging						Total	Kappa Value
		N1	N2a	N2b	N2c	N3	N0		
Radiological N staging	N1	6	0	6	3	0	8	23	28.1%
	N2a	0	1	1	0	0	0	2	(p<0.01)
	N2b	3	0	9	2	0	3	17	
	N2c	5	3	1	3	1	7	20	
	N0	8	0	1	0	0	29	38	
Total		22	4	18	8	1	47	100	

used for the evaluation of OSCCs. A study showed that using thin 1mm slices did not have any additional benefit over the conventional 3mm scan.[11] Some studies have reported a limited diagnostic accuracy of CT in the detection of cervical lymph node status in OSCC patients,[12,13] while others found CT accuracy ranging from 70% to 96%.[14-18]

The current study found out CT sensitivity to 83%, specificity 61.7%, PPV 70.9%, NPV 76.3% and overall diagnosis accuracy 73%. These results suggest that CT scan has a tendency to over-diagnose the cervical nodal metastases as 29% of the total 62% positive radiological positive necks came out as negative on final histopathology. These findings may be attributed to the higher prevalence of infectious diseases in our part of th world. Also, 23% out of total 38% radiological negative necks came out as positive on final histopathology, reducing the specificity to 61.7%. These results may be attributed to micro-metastasis which could not be picked by CT scans pre-operatively High clinical suspicion is required in deciding the need of neck dissection and an elective dissection should be performed for OSCC even in radiologically-negative necks. A study showed that elective neck dissection had a better disease-free survival (DFS) and overall survival (OS) in early-stage OSCC, but the imaging modality used was ultrasonography, which has lower accuracy than contrast-enhanced CT scans in detecting lymph node metastases in OSCC.[18,19]

Recently there has been much debate on the use of positron emission tomography (PET) scan in pre-operative staging of OSCC, with a study reporting accuracy of 90% in assessing cervical lymph nodes, and another study also reporting it to be slightly more accurate than contrast-enhanced CT scan alone.[20,21] On the other hand, a systematic review concluded that the sensitivity of PET/CT scan was only 50% despite specificity being 87%, and another study reported there was no significant difference in results between two scans.[22,23]

The current study has several limitations, including its retrospective nature, and the fact that only those patients were included who had their CT scans done at the study site only which may have constituted selection bias.

Conclusion

CT scan was found to be a useful modality in pre-operative staging of OSCC although it had a relatively mediocre overall diagnostic accuracy of 73%.

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