

Accuracy of palpation, ultrasonography, and computed tomography in the evaluation of metastatic cervical lymph nodes in head and neck cancer

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Abstract

Introduction: India accounts for the majority of oral cancer cases occurring worldwide. The metastasis of oral cancer to the regional lymph nodes and distant sites determines the prognosis and the survival rate of this disease. **Objectives:** The aim and objectives of this study were to evaluate the accuracy of preoperative clinical methods such as palpation, ultrasonography (USG), and computed tomography (CT) in comparison with postoperative histopathological findings in determination of metastatic cervical lymph nodes and also to assess whether combining these techniques increases the specificity and sensitivity of lymph node metastasis in oral squamous cell carcinoma (SCC). **Methodology:** Totally, 26 consecutive biopsy proven cases of oral SCC were included, and the nodal status was evaluated by palpation, CT and ultrasound (US) and confirmed by histopathological examination. The results were presented in terms of sensitivity, specificity, predictive values, accuracy, and *P* value. **Results:** Palpation, USG, and CT findings were compared with histopathologic findings by Fisher's exact test and the "*P*" value for palpation, US and CT were 0.003, 0.000, 0.000, respectively, which are statistically significant. **Conclusion:** US examination combined with CT gives a better assessment of the neck for nodal metastasis.

Key words: Computed tomography, lymph node, ultrasonography

INTRODUCTION

Oral cancer is the sixth most common cause of cancer related death in the world.^[1] The global incidence of cancers of the oral cavity, pharynx account for 363,000 annual new cases worldwide and almost 200,000 deaths.^[1] India accounts for 86% of the world's oral cancer cases says the study conducted by the National Institute of Public Health in February 2011.

Squamous cell carcinoma (SCC) from the oral cavity shows metastasis to the nodes of the neck in a predictable manner.^[2] Once dissemination to regional lymph nodes takes place the probability of 5 years disease free survival, regardless of the treatment

rendered, reduces to nearly half of that seen in early stage disease. Consequently, bilateral nodal involvement reduces survival actually by 75% and extranodal involvement reduces this by another 50%.^[2] Hence various clinical, pathological, imaging parameters, and molecular markers have been investigated for their value as predictors/indicators of neck metastasis and for prognosis in oral cancer.

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How to cite this article: Shetty D, Jayade BV, Joshi SK, Gopalkrishnan K. Accuracy of palpation, ultrasonography, and computed tomography in the evaluation of metastatic cervical lymph nodes in head and neck cancer. Indian J Dent 2015;6:121-4.

Access this article online

Quick Response Code:



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DOI:

10.4103/0975-962X.163032

Currently, several methods are available for investigating the presence and extent of nodal metastasis including physical palpation, radiologic imaging by contrast-enhanced computed tomography (CT), magnetic resonance imaging (MRI), ultrasonography (USG), ultrasound (US) with fine-needle aspiration cytology (FNAC), fluoro-2-deoxy-glucose positron emission tomography (PET), and lymphoscintigraphy.^[1] However, none of these investigative modalities shows 100% accuracy in identifying neck node metastasis.^[1,3,4] Hence, this study was designed with the aim of evaluating the accuracy of clinical palpation, USG, and CT and also to assess whether combining these techniques increases the accuracy of detecting cervical lymph node metastasis in oral SCC.

METHODOLOGY

The source of data for this prospective study included 26 patients who were incisional biopsy proven cases of oral carcinoma requiring resection of tumor and neck dissection. Patients who were previously treated by surgery, radiotherapy or chemotherapy and patients with the inoperable disease were not included in the study. Ethical approval was obtained from Institutional Ethical Committee. Detailed clinical examination of the lymph nodes was carried out and the criteria to consider the node as metastatic on palpation were a firm to hard fixed node more than 10 mm in size. All the patients were examined by Dual slice Spiral CT (Seimens) of the neck and contiguously subsequent to the injection of water soluble nonionic contrast material, OMNIPAQUE Iohexol 350 mg/ml.

The criteria used to define a node as metastatic in our study were nodes with:

- Minimal axial diameter > 10 mm
- Long axis/short axis (L/S) ratio ≤ 2
- Central hypodensity and peripheral rim enhancement or conglomeration of three or more lymph nodes [Figure 1]
- Extranodal tumor extension seen as thickened nodal rim with infiltration of adjacent fat planes
- Arterial invasion is noting the degree of obliteration of the normal fat plane surrounding the artery.

US examination of the neck was carried out with SONOS 7500 (Philips Medical Systems, Andover, MA, USA) HD 11 - high frequency (7–12 MHz) linear transducer. The criteria used to define a node as metastatic in gray scale imaging were nodes with minimal axial diameter ≥ 10 mm (size alone was never taken into consideration), central hypoechogenicity, and distorted hilum [Figure 2], the

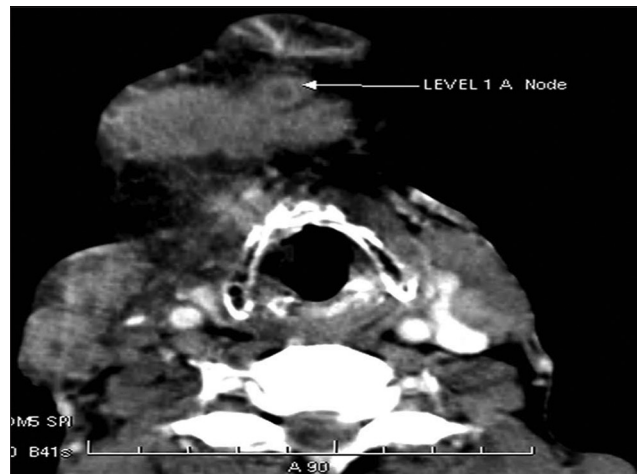


Figure 1: Computed tomography scan depicting submental lymph node showing central hypodensity and peripheral rim enhancement

presence of necrosis with irregular margin suggesting extracapsular spread and roundness index (L/S ratio) ≤ 2 were considered malignant. The nodes that were dissected from the specimens were grouped into different levels and sent for histopathologic examination.

Palpation, CT and USG findings were compared with histopathologic findings. The results were presented in terms of sensitivity, specificity, predictive values, and accuracy. *P* value was estimated using Fisher's exact test.

RESULTS

The preoperative assessment of metastatic lymph nodes was recorded by clinical palpation, USG, and CT; and compared with histopathological examination. Among 156 levels that were evaluated in 26 patients, clinical palpation had 31 levels, which were positive out of which 16 were true positive, and 15 were false positive when compared to histological examination. Clinical palpation also had 125 levels negative out of which 97 were true negative, and 28 were false negative.

Among 156 levels that were evaluated in 26 patients, USG had 40 levels that were positive out of which 24 were true positive, and 16 were false positive when compared to histological examination. USG also had 106 levels negative out of which 96 were true negative, and 20 were false negative. Among 156 levels, which were evaluated in 26 patients, CT had 21 levels, which were positive out of which 14 were true positive, and 7 were false positive when compared to histological examination. CT also had 135 levels negative out of which 105 were true

negative, and 30 were false negative. The results of the statistical analysis are presented in Table 1, and the *P* value was statistically significant.

DISCUSSION

Knowledge of the lymphatic system is essential in order to understand the pattern of spread of cancer in the neck.^[5] The importance of the true estimation of lymph node positivity is required to see if the neck has to be addressed considering the micrometastasis and occult metastasis. Thus, the treatment of the neck has become one of the actively debated topics in the field of head and neck oncology.^[1] Among the several methods available today physical palpation, USG and CT are the routinely performed procedures as they are easily available and minimum invasive. There is a strong experimental evidence of the concept that the cervical lymphatic metastasis takes place in a predictable and sequential pattern except in the tongue, floor of the mouth, and anterior oral cavity. This was first proved by Fisch and Sigel.^[5] Clinical palpation is the first line subjective method, and it is totally operator dependent and follows a learning curve with experience. The rates of determining the neck metastasis with only palpation were investigated by different authors, and the accuracy in our study was comparable to previous studies,^[1,3,4,6,7] and literature gives a range of values from 60% to 80%. It is apparent from this and other studies that clinical examination is a poor, unreliable, inaccurate method to determine the presence of occult cervical lymph node involvement.^[8]

CT has been used to determine neck metastasis since 1981. The accuracy can be compared to previous studies^[1,4] and the specificity, and positive predictive

value is more when compared to palpation and USG. The accuracy for CT ranges from 68% to 92.30% in the literature.^[1,3,4,6]

According to Som^[9] the lower limits of submandibular lymph nodes and other regional neck lymph nodes to be accepted as metastasis are 15 mm and 10 mm, respectively. The presence of more than one lymph node specially conglomerated, the presence of central necrosis, Capsular invasion, extranodal involvement, and irregular contours are other criteria of metastasis in CT investigation.^[4,9]

Som^[9] also reported that a “lima-bean” node is generally hyperplastic while a “round” shape generally indicates a neoplastic infiltration. In our experience, a grouping of three or more contiguous and confluent lymph nodes in the drainage chain of the tumor is pathognomonic of metastatic disease.

Van den Brekel *et al.* in 1990^[8] proposed the radiologic criteria in CT for assessing cervical metastasis in patients with primary SCC of head and neck. Based on their study, we used size criteria of 10 mm, rim enhancement and central necrosis as specific indicators of metastasis.

Literature suggests that the accuracy of USG ranges from 67% to 95%.^[1,3,4,6,7] Though the specificity of US is lower than other methods, it has the highest sensitivity and high negative predictive value. Van den Brekel *et al.*^[8] suggested that the optimal size criterion for US assessment of cervical metastatic nodes varies with the patient population, and the most acceptable size criterion in minimal axial diameter is 9 mm for sub digastric nodes and 8 mm for other cervical nodes. In our study, size alone was never taken into consideration as smaller size lymph nodes also proved to be metastatic.

Chikui *et al.*^[10] suggested that the presence of hilar echoes and hilar blood flow was seen in reactive lymph nodes and enlargement of the short axis diameter is predictive of metastatic cervical lymph



Figure 2: Ultrasonography showing submandibular lymph node with central hypoechoogenicity and distorted hilum

Table 1: Comparison of the results of the three groups with histological evaluation

| | Palpation (%) | USG (%) | CT (%) |
|-------------------------------|---------------|---------|--------|
| Sensitivity | 36.6 | 54.5 | 31.81 |
| Specificity | 86.61 | 85.71 | 93.75 |
| PPV | 51.6 | 60.0 | 66.66 |
| NPV | 77.6 | 82.75 | 77.77 |
| Accuracy | 72.43 | 76.92 | 76.28 |
| <i>P</i> (Fishers exact test) | 0.003 | 0.000 | 0.000 |

USG: Ultrasonography, CT: Computed tomography, NPV: Negative predictive value, PPV: Positive predictive value

nodes. Our study also considered the enlargement of the short axis diameter as a predictor of metastasis. Many other authors like van den Brekel *et al.*^[8] suggested that there is indeed a slightly better outcome with US than for CT or MRI, but it was not as precise as expected.

Advantages of US over other imaging techniques are it is economical, widely available and well-tolerated by the patient, absence of radiation, lack of need for a contrast medium, ability to easy on-screen node measurements, and can be combined with FNAC^[1,4] USG has additional advantages of detecting tumor invasion into the blood vessel.^[1]

From our study, we are able to conclude that CT scan is a good preoperative investigative modality for determining the primary and cervical node metastasis. However, with the addition of USG with or without FNAC, the sensitivity, specificity, the accuracy of the assessment of neck metastasis can be enhanced. If USG along with CT gives a good result in assessing metastatic lymph nodes, then more advanced invasive techniques such as PET, sentinel lymph node biopsy, and lymphoscintigraphy can be reserved only for NO neck with occult metastasis.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Geetha NT, Hallur N, Goudar G, Sikkerimath BC, Gudi SS. Cervical lymph node metastasis in oral squamous carcinoma preoperative assessment and histopathology after neck dissection. *J Maxillofac Oral Surg* 2010;9:42-7.
2. Shah JP, Johnson NW, Batsakis JG. *Oral Cancer*. London: Martin Dunitz; 2003.
3. Woolgar JA, Beirne JC, Vaughan ED, Lewis-Jones HG, Scott J, Brown JS. Correlation of histopathologic findings with clinical and radiologic assessments of cervical lymph-node metastases in oral cancer. *Int J Oral Maxillofac Surg* 1995;24:30-7.
4. Haberal I, Celik H, Gocmen H, Akmansu H, Yurok M, Ozeri C. Which is important in the evaluation of metastatic lymph nodes in head and neck cancer: Palpation, ultrasonography, or computed tomography? *Otolaryngol Head Neck Surg* 2004;130:197-201.
5. Fisch UP, Sigel ME. Cervical lymphatic system as visualized by lymphography. *Ann Otol Rhinol Laryngol* 1964;73:870-82.
6. Bergman SA, Ord RA, Rothman M. Accuracy of clinical examination versus computed tomography in detecting occult lymph node involvement in patients with oral epidermoid carcinoma. *J Oral Maxillofac Surg* 1994;52:1236-9.
7. Sarvanan K, Bapuraj JR, Sharma SC, Radotra BD, Khandelwal N, Suri S. Computed tomography and ultrasonographic evaluation of metastatic cervical lymph nodes with surgicoclinicopathologic correlation. *J Laryngol Otol* 2002;116:194-9.
8. van den Brekel MW, Stel HV, Castelijns JA, Nauta JJ, van der Waal I, Valk J, *et al.* Cervical lymph node metastasis: Assessment of radiologic criteria. *Radiology* 1990;177:379-84.
9. Som PM. Detection of metastasis in cervical lymph nodes: CT and MR criteria and differential diagnosis. *AJR Am J Roentgenol* 1992;158:961-9.
10. Chikui T, Yonetsu K, Nakamura T. Multivariate feature analysis of sonographic findings of metastatic cervical lymph nodes: Contribution of blood flow features revealed by power Doppler sonography for predicting metastasis. *AJNR Am J Neuroradiol* 2000;21:561-7.