Original Article

Preoperative evaluation of cervical lymph nodes for metastasis in patients with oral squamous cell carcinoma: A comparative study of efficacy of palpation, ultrasonography and computed tomography

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ABSTRACT

Introduction: Oral cancer is a major health threat in a country like India, where patients frequently present with advanced disease with regional dissemination to cervical lymph nodes. The management and prognosis depend on the status of cervical lymph nodes. Thus, it becomes imperative to diagnose and evaluate them preoperatively. **Aim:** This study aims to compare the efficacy of palpation, ultrasonography (USG) and computed tomography (CT) in the preoperative evaluation of cervical lymph node for metastasis in patients with oral squamous cell carcinoma. **Settings:** Department of Oral and Maxillofacial Surgery, SCB Dental College and Hospital, Cuttack, Odisha, India. **Methodology:** A total of thirty patients of either sex of age group 20–70 years, diagnosed with oral cancer were randomly selected for the study and subjected to palpation, USG and computer tomography followed by histopathology for confirmation. The results were evaluate statistically by sensitivity, specificity, positive predictive value, and negative predictive value and accuracy. **Results:** For level IA palpation, USG and CT were equally sensitive (100%) and specific (100%). Although palpation, USG and CT were equally sensitive (80%) for level IB, the specificity of palpation (70%) <USG (95%) = CT (95%). For level II sensitivity of palpation (25%) <USG (75%) <CT (100%) whereas specificity was CT (84.6%) <palpation (92.3%) <USG (100%). **Conclusion:** CT (96.1%) and USG (97.7%) were more accurate than palpation (92.7%), for detection of metastasis in cervical lymph nodes in patients with oral squamous cell carcinoma. CT along with USG should be used for accurate preoperative evaluation of cervical lymph node.

Key words: Cervical lymph node, metastasis, oral cancer

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INTRODUCTION

Malignant neoplasms are a major cause of fear, morbidity, and mortality worldwide. Oral cavity being exposed to both inhalational and chewable forms of tobacco; potential carcinogens have an easy first-hand access to it. Globally, oral squamous cell carcinoma ranks sixth most common cause of cancer-related mortality.[1]

The prognosis of oral squamous cell carcinoma depends on the primary tumor and the presence or absence of metastatic cervical lymph nodes. Since the lymph node involvement invariably influences the type of neck dissection, the pretreatment staging should be as accurate as possible.[2] Palpation done manually is the predominant diagnostic aid though sometimes it is not uniformly reliable even in experienced hands. The decreased reliability of palpation is because they are deeply seated in the neck, short, and fatty neck and there are small nodes which are metastatic. Recently, ultrasonography (USG), computed tomography (CT), and other modalities have taken center stage in imaging of regional lymph nodes.

Although many similar studies in head and neck squamous cell carcinomas have been conducted for preoperative evaluation of metastasis in cervical lymph nodes, studies on oral squamous cell carcinomas are rare.

In this study, we compared the efficacy of palpation, USG and CT in the preoperative evaluation of cervical lymph node metastasis of patients with oral squamous cell carcinoma.

METHODOLOGY

This study was conducted in the Department of Oral and Maxillofacial Surgery SCB Dental College and Hospital, Cuttack, during December 2014–December 2015.

After clearance from Institutional Ethical Committee, a total of thirty randomly selected patients diagnosed with oral squamous cell carcinoma of either sex of age group 20–70 years were planned for primary tumor excision, neck dissection, followed by reconstruction if necessary. Patients with ASA grade I, II having stable hemodynamic status were included whereas patients with previous primary surgery, radiotherapy, chemotherapy, pregnancy, were excluded from this study. Palpation was performed for all these patients by a single examiner who was blinded about USG and CT findings. The node to be examined was localized, the mesiodistal and anteroposterior dimensions were measured with a Vernier caliper as shown in Figure 1.[3] The site was determined according to the description of
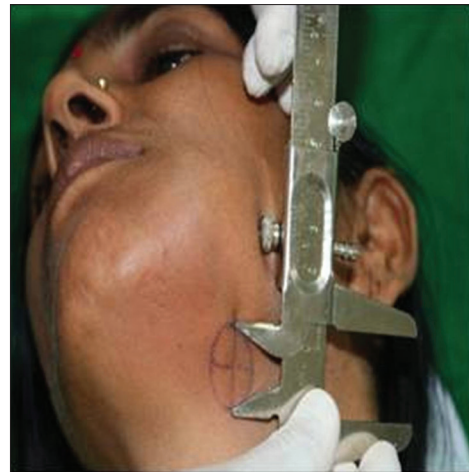

Figure 1: Measurement of cervical lymph node using Vernier caliper

level I–V given by head and neck service at Memorial Sloan-Kettering Cancer Centre in New York and American Academy of Otolaryngology-Head and Neck Surgery.[4]

The criteria for determination of metastasis with palpatory method were size <10 mm, hard consistency, fixity to underlying and or overlying structures and the laterality of the tumor (ipsilateral).[5]

USG assessment was obtained with real-time scanners with scan heads of 7.5 MHz frequency. A radiologist who was blinded about palpation and CT findings examined the neck longitudinally and transversely in a continuous sweep technique from thoracic inlet and scalenus muscle to submental and retroparotideal regions.[6] The criteria for determination of metastasis with USG were size >10 mm, roundness index (if L/W <2:1), heterogeneous inner structures and contour integrity (extra-nodular involvement).[5]

Contrast enhanced computed tomography (CECT; with nonionic water soluble iodinated contrast agent, Ultravist) evaluation was performed using multidetector spiral CT scanner using magnification, high mA seconds package. Three millimeters axial sections were taken both from primary lesions and regional cervical nodes. The CT scans were interpreted by a radiologist who was blinded about palpation and USG findings. The criteria for determination of metastasis with CECT were size >10 mm, round shape, rim enhancement, central necrosis, heterogeneous density in the node and border irregularity (extracapsular spread) as shown in Figure 2.[6]

Subsequently, the patients were operated, and the excised neck specimens along with primary tumor were sent to a pathologist who was blind about the palpation, USG and CT findings.
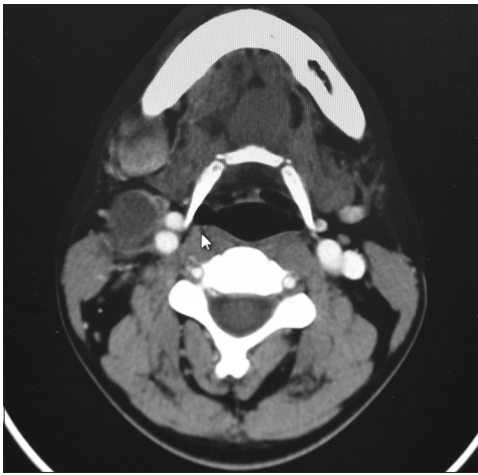
Figure 2: Computed tomography scan showing metastatic lymph node

The findings of palpation, USG and CT were compared with that of postoperative histopathological findings, and the results were evaluated statistically for sensitivity, specificity, positive predictive value, and negative predictive value and accuracy.

RESULTS

A total of 180 levels of lymph nodes in thirty patients were evaluated for metastasis by four different methods.

DISCUSSION

Palpation was found to be equally sensitive (100%) and specific (100%) as that of USG and CT for level IA [Table 1].

The sensitivity of palpation (80%) was equal to USG and CT, but the specificity of palpation (70%) was lower compared to USG (95%) and CT (95%) for level IB [Table 2].

Palpation (25%) was significantly less sensitive as compared to USG (75%) and CT (100%). The specificity of CT (84.6%) was less than palpation (92.3%) and USG (100%) for level II [Table 3].

Palpation revealed 18 positive cases out of which 10 true positives and 162 negative cases with 157 were true negatives in cervical lymph node levels (I–V) [Table 4].

USG revealed 13 positive cases out of which 12 were true positives and 167 negative cases out of which 164 were true negatives in cervical lymph node levels (I–V) [Table 4].

CT revealed 18 positive cases out of which with 13 were true positives and 162 negative cases out of which 160 were true negatives in cervical lymph node levels (I–V) [Table 4].

Table 1: Comparison of different methods for evaluation of metastasis in cervical lymph node level IA

Lymph node level	Diagnostic methods	Findings	Total, *n* (%)	Postoperative HP	
				Positive, *n* (%)	Negative, *n* (%)
IA	Palpation	Positive	1 (3.3)	1 (100)	0
		Negative	29 (96.7)	0	29 (100)
	USG	Positive	1 (3.3)	1 (100)	0
		Negative	29 (96.7)	0	29 (100)
	CT	Positive	1 (3.3)	1 (100)	0
		Negative	29 (96.7)	0	29 (100)

CT: Computed tomography, USG: Ultrasonography, HP: Histopathological

Table 2: Comparison of different methods for evaluation of metastasis in cervical lymph node level IB

Lymph node level	Diagnostic methods	Findings	Total, *n* (%)	Postoperative HP	
				Positive, *n* (%)	Negative, *n* (%)
IB	Palpation	Positive	14 (46.7)	8 (80)	6 (30)
		Negative	16 (53.3)	2 (20)	14 (70)
	USG	Positive	9 (30)	8 (80)	1 (5)
		Negative	21 (70)	2 (20)	19 (95)
	CT	Positive	9 (30)	8 (80)	1 (5)
		Negative	21 (70)	2 (20)	19 (95)

CT: Computed tomography, USG: Ultrasonography, HP: Histopathological

Table 3: Comparison of different methods for evaluation of metastasis in cervical lymph node level II

Lymph node level	Diagnostic methods	Findings	Total, *n* (%)	Postoperative HP	
				Positive, *n* (%)	Negative, *n* (%)
II	Palpation	Positive	3 (10)	1 (25)	2 (7.7)
		Negative	27 (90)	3 (75)	24 (92.3)
	USG	Positive	3 (10)	3 (75)	0
		Negative	27 (90)	1 (25)	26 (100)
	CT	Positive	8 (26.7)	4 (100)	4 (15.4)
		Negative	22 (73.3)	0	22 (84.6)

CT: Computed tomography, USG: Ultrasonography, HP: Histopathological

Table 4: Comparison of different methods for evaluation of metastasis in cervical lymph node levels (I-V)

Lymph node level	Diagnostic methods	Findings	Total, *n* (%)	Postoperative HP	
				Positive, *n* (%)	Negative, *n* (%)
I-V	Palpation	Positive	18 (10)	10 (66.7)	8 (4.8)
		Negative	162 (90)	5 (33.3)	157 (95.2)
	USG	Positive	13 (7.2)	12 (80)	1 (0.6)
		Negative	167 (92.8)	3 (20)	164 (99.4)
	CT	Positive	18 (10)	13 (86.7)	5 (3)
		Negative	162 (90)	2 (13.3)	160 (97)

CT: Computed tomography, USG: Ultrasonography, HP: Histopathological

Histopatholgical evaluation revealed 15 positive cases and 165 negatives cases in cervical lymph node levels (I–V) [Table 4].

Metastasis was not detected in level III, IV, V by either of diagnostic tests which corroborated with postoperative histopathology.

The reasons for higher number of false positives in palpation could be due to enlargement because of secondary infections[7] or due to nodes adjacent to

Table 5: Statistical analysis of different methods for evaluation of metastasis in cervical lymph node levels (I-V)					
Diagnostic methods	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	Accuracy (%)
Palpation	66.7	95.2	55.5	96.9	92.7
USG	80	99.4	92.3	98.2	97.7
CT	86.7	97	72.2	98.7	96.1

CT: Computed tomography, USG: Ultrasonography

the primary tumor which might be misconstrued to be metastatic. The false negatives can be primarily attributed to deep-seated nodes, short, thick and fatty neck, and occult metastasis.[6,8]

In this study, for detecting metastasis in level IA, all the diagnostic modalities were equally efficacious. For detecting metastasis in level IB, CT and USG were more accurate than palpation though all were equally sensitive.

While detecting metastasis in level II, CT was more sensitive than USG. However, the specificity and accuracy of USG were best among three modalities.

The sensitivity, specificity, and accuracy of palpation were the lowest among all three modalities. The accuracy of palpation (92.7%) was less as compared to CT (96.1%) and USG (97.7%) for detecting a cervical lymph node metastasis [Table 5].

The lowest sensitivity is in accordance with the results cited by Haberal *et al.*,[5] Rottey *et al.*,[7] Anand *et al.*.[6] The specificity is also corroborative of Anand *et al.*[6] and the values vary from that of Haberal *et al.*,[5] Shetty *et al.*[9] and Rottey *et al.*.[7] The findings of accuracy are also in accordance with that of Shetty *et al.*[9] and Anand *et al.*.[6]

Although size of the node is considered as a chief criterion, it is somewhat apparent for a number of reasons.[8] First, the larger nodes can be reactive[10-12] second, the metastatic nodes may not always be the largest.[12] Third, the small nodes can be metastatic.[10,12-14] Thus, along with size, other criteria also have to be taken into consideration simultaneously.

Our CT findings were somewhat different from certain authors. Haberal *et al.*[5] and Anand *et al.*[6] had relatively similar results. The findings showed mixed results when compared with that of Rottey *et al.*[7] and Shetty *et al.*.[9] The difference in results of CT could be due to the use of relatively larger sections of scan and undetected micrometastasis.[15-17]

Our ultrasonographic findings matched with that of Haberal *et al.*.[5] However, the findings showed mixed results when compared with that of Shetty *et al.*,[9] Rottey *et al.*[7] and Anand *et al.*.[6] The lower cost, relative ease of application, possibility of frequent repetition without radiation exposure is in favor of USG and the limitations

include it as a highly operator dependent, nodes adjacent to mandible and subcentimetric nodes are likely to be missed.[6]

CONCLUSION

No single preoperative diagnostic modality could accurately assess the metastatic cervical nodes as detected by postoperative histopathology. We found that palpation has low accuracy (92.7%), as compared to CT (96.1%) and USG (97.7%). For more accurate detection of metastasis in cervical lymph nodes, CT is required along with USG. Although each diagnostic modality has its own merits and drawbacks and considering our smaller sample size, we recommend further studies with a larger sample size.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Shah J, Johnson N, Batsakis J. Oral Cancer. 1st ed.. London: Martin Dunitz; 2003.
2. Rao VU, Shenoy AM, Karthikeyan B. Role of angiogenetic markers to predict neck node metastasis in head and neck cancers. J Cancer Res Ther 2010;6:142-7.
3. Lukić S, Marjanović G, Živanović J. Palpable lymphadenopathy in primary care. Acta Fac Med Naissensis 2011;28:17-23.
4. Shah JP, Patel SG, Singh B. Head and Neck Surgery and Oncology. 4th ed. Elsevier Mosby, Philadelphia: Elsevier Health Sciences; 2012. p. 427.
5. Haberal I, Çelik H, Göçmen H, Akmansu H, Yörük M, Özeri 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.
6. Anand N, Chaudhary N, Mittal MK, Prasad R. Comparison of the efficacy of clinical examination, ultrasound neck and computed tomography in detection and staging of cervical lymph node metastasis in head and neck cancers. Indian J Otolaryngol Head Neck Surg 2007;59:19-23.
7. Rottey S, Petrovic M, Bauters W, Mervillie K, Vanherreweghe E, Bonte K, *et al.* Evaluation of metastatic lymph nodes in head and neck cancer: A comparative study between palpation, ultrasonography, ultrasound-guided fine needle aspiration cytology and computed tomography. Acta Clin Belg 2006;61:236-41.
8. Atula TS, Varpula MJ, Kurki TJ, Klemi PJ, Grénman R. Assessment of cervical lymph node status in head and neck cancer patients: Palpation, computed tomography and low field magnetic resonance imaging compared with ultrasound-guided fine-needle aspiration cytology. Eur J Radiol 1997;25:152-61.
9. 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.
10. Close LG, Merkel M, Vuitch MF, Reisch J, Schaefer SD. Computed tomographic evaluation of regional lymph node involvement in cancer of the oral cavity and oropharynx. Head Neck 1989;11:309-17.
11. Feinmesser R, Freeman JL, Noyek AM, Birt D, Gullane P, Mullen JB. MRI and neck metastases: A clinical, radiological, pathological correlative study. J Otolaryngol 1990;19:136-40.
12. 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.
13. Friedman M, Shelton VK, Mafee M, Bellity P, Grybauskas V, Skolnik E. Metastatic neck disease. Evaluation by computed tomography. Arch Otolaryngol 1984;110:443-7.
14. Mancuso AA, Harnsberger HR, Muraki AS, Stevens MH. Computed tomography of cervical and retropharyngeal lymph nodes: Normal anatomy, variants of normal, and applications in staging head and neck cancer. Part II: Pathology. Radiology 1983;148:715-23.
15. van den Brekel MW. Lymph node metastases: CT and MRI. Eur J Radiol 2000;33:230-8.
16. van den Brekel MW, Castelijns JA, Stel HV, Golding RP, Meyer CJ, Snow GB. Modern imaging techniques and ultrasound-guided aspiration cytology for the assessment of neck node metastases: A prospective comparative study. Eur Arch Otorhinolaryngol 1993;250:11-7.
17. Yoon DY, Hwang HS, Chang SK, Rho YS, Ahn HY, Kim JH, *et al.* CT, MR, US,18F-FDG PET/CT, and their combined use for the assessment of cervical lymph node metastases in squamous cell carcinoma of the head and neck. Eur Radiol 2009;19:634-42.