Clinical Study

Evaluation of clinical assessment, ultrasonography and CT for detecting cervical lymph node metastasis in oral CA

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Abstract

Objectives : *The aim of this study is to assess the efficacy the available modalities clinical palpation, Ultrasound imaging (USG) and Computed tomography (CT) for staging the neck in patients with oral squamous cell carcinoma preoperatively by comparing their results with postoperative histopathology examination (HPE).*

Methodology: *Sixteen adult patients with HPE proven oral squamous cell carcinoma were enrolled in this prospective study. They underwent eighteen neck dissections. Preoperatively all patients were evaluated by clinical palpation, USG and CT for cervical lymph node involvement. The results of all the modalities were compared with postoperative HPE. Results were obtained after analysis.*

Results: *Eleven neck dissection specimens showed metastatic lymph node involvement in postoperative histopathology. Lymph node involvement was identified by palpation in six necks, USG in ten necks and CT in eleven necks. The sensitivity and specificity of palpation, USG and CT in detecting metastatic neck disease were 54.5% and 100%, 72.7% and 71.4% and 81.8% and 71.4% respectively.*

Conclusion: *Histopathologic staging is the most important diagnostic tool. Clinical examination is the least sensitive, followed by USG. Computed tomography imaging is the most sensitive and accurate modality among the non-invasive techniques evaluated.*

Key words : *Carcinoma, lymph node, metastasis*

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Introduction

The status of cervical lymph nodes is the single most important prognostic factor in head and neck cancer. A single ipsilateral node reduces survival by 50%; a contralateral node reduces survival by an additional 50%. Consequently bilateral nodal involvement reduces survival actually by 75% and extranodal involvement reduces this by another 50%[1]. Not only affecting the survival, but nodal spread also increases the chance of distant metastases[2], thereby affecting overall quality of life.

Detection of cervical lymph node metastases helps in deciding more effective local and systemic therapy, in order to achieve improved survival. In addition pre-operative assessment of the cervical lymph node status helps in planning suitable surgical management of the neck, wherein the justification to operate the neck is being questioned more often than not, owing to the fact that only about 30% of clinically negative necks are histopathologically positive once operated[3].

In the present study we have evaluated the efficacy of ultrasound imaging (USG) and computed tomography (CT) over clinical palpation in detecting cervical

lymph node involvement preoperatively, in patients with oral squamous cell carcinoma. The diagnosis obtained from clinical palpation, USG and CT have been compared with postoperative histopathologic examination (HPE).

Methodology

Sixteen patients who reported with oral malignancy to our department over a period of 2 years from January 2004 to December 2005 were included in the study. The study population included 11 males (68.8%) and 5 females (31.2%) in an age range of 37 to 63 years (Mean Age – 50.9 years). A detailed history was taken for each patient including complaint, history of presenting illness, medical history and personal history with special reference to tobacco related habits. Following clinical examination, incisional biopsy of the lesion was done to confirm the diagnosis of squamous cell carcinoma. Histopathologically the primary tumor was graded as well differentiated, moderately differentiated or poorly differentiated squamous cell carcinoma. Pre-operatively clinical palpation of the five levels of cervical lymph nodes were performed bilaterally. The site, size, consistency and fixity of all the clinically palpable nodes were documented according to AJCC/UICC staging criteria. TNM staging was recorded for every patient.(T1-2, T2-8, T3-5, T4-1; N0-12, N1-1, N2a-1, N2c-2).

USG of the neck was carried out bilaterally using two dimensional real time ultrasound and color Doppler (Philips HDI 1500), with high frequency linear transducer probe (7-11 MHz) to detect nodes in the five levels of neck. The neck was examined longitudinally and transversely in a continuous sweep technique. Lymph nodes were assessed for their size, shape, internal architecture, echogenicity and nodal border. The internal architecture of the lymph nodes were assessed for the presence of liquefaction necrosis, calcification and echogenic hilus. (Fig. 1).

CT scan of the neck was done using "SIEMENS SOMATOM - Emotion Duo" – Dual Slice 3D Spiral CT. The scanning of neck was done under 2.5mm collimation, with 2 slices per exposure and slice thickness of 2.5mm and using a 512X512 matrix. The slices were taken cranio-caudally from the base of the skull to root of neck and upper mediastinum. Non-ionic dynamic I.V. contrast (Iopamidol) was used. The lymph nodes were assessed for their size (minimal diameter on the axial plane), shape (axial diameter versus longitudinal diameter), evidence of central necrosis and nodal border. (Fig. 2)

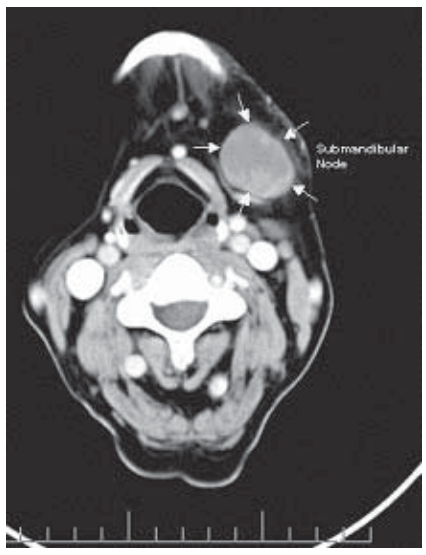

Fig 1. Ultrasound imaging of metastatic lymph node

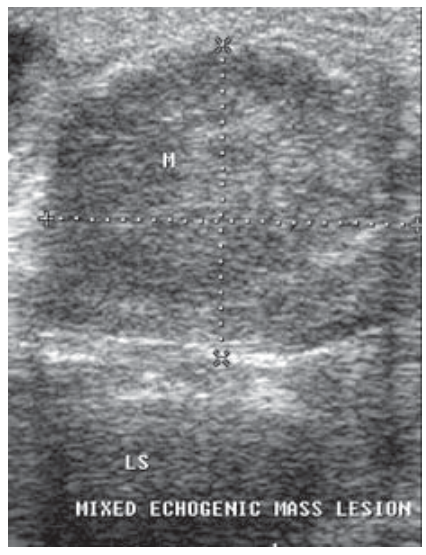

Fig 2. Computed Tomography imaging of metastatic lymph node

Based on the investigative diagnosis, all patients were treated by neck dissections with appropriate primary tumor resections. A total of 18 neck dissections were done (MRND – 8, SOHND – 6, RND – 4), 2 patients (N2c) underwent bilateral neck dissection with preservation of the internal jugular vein on one side. The resected neck specimens were oriented anatomically; levels marked and sent for histopathologic examination (HPE). Palpation, CT and USG findings were compared with histopathologic findings, which were accepted as the reference. The results were evaluated, and the sensitivity, specificity, predictive values, and accuracy of preoperative methods were estimated.

Results

Eleven of sixteen neck dissection specimens showed metastatic lymph node involvement in postoperative histopathology. Clinical palpation identified lymph node involvement in six necks (33.3%), USG identified ten necks (55.6%) and CT identified eleven necks (61.1%) as positive for lymph node involvement. The results of all methods and histopathologic examination were correlated (Table 1). The specificity, sensitivity, positive predictive values, negative predictive values, and accuracy for all tests were calculated (Table 2).

Discussion

The presence of cervical metastatic nodal disease is a major prognostic determinant for patients with oral cavity cancer, significantly reducing patient survival. Historically surgeons believed that a cure could only be achieved if the primary tumor site was controlled. However the embolic character of tumor deposits is now well accepted[4]. Thus it is now an established fact that patient mortality may result from recurrent cervical nodal disease and distant metastasis despite control of the primary tumor[5]. Clinical palpation is the routine first line in evaluating metastatic cervical lymphadenopathy. Of great concern is whether palpation alone is sufficient to evaluate whether the node is positive. We believe that we need extra diagnostic methods other than palpation for the correct evaluation of the neck.

Several authors have reported an incidence of false negative findings as high as 20-40% and increased false positive findings too. Atula et al have reported a 15-25% risk of occult metastasis, in spite of a normal palpation finding.[3] Fischbein et al have found clinical examination to have only 70% accuracy at best.[6] The positive predictive values as reported in literature varies from 78-92%. In our study clinical examination had a sensitivity of 54.5%, accuracy of 72.2% and false negative rate of 41.7%. The low sensitivity is attributable to the use of only physical characteristics such as size and consistency to diagnose positive lymph nodes, thereby missing out on smaller nodes which turn out positive on histopathology. Treatment of the neck disease on the basis of clinical findings only, would result in 4 out of 10 patients with metastatic lymph nodes being left untreated, considering the very high false

negative incidence as evidenced by our study.

Several imaging modalities are used in evaluating the status of lymph nodes in oral cavity cancer, ranging from Ultrasound imaging, Computed tomography, MRI to Positron emission tomography and lymphoscintigraphy[7]. Use of Ultrasound imaging in detecting cervical lymph node metastases is established since long[8]. The advantages being its ability to examine deeper planes of tissues, which are routinely inaccessible by clinical palpation. Detection of metastatic lymph nodes using ultrasound imaging involves assessment of nodal masses on the basis of characteristics like size, shape, internal architecture, echogenicity and vasculature (Doppler sonography)[9,10]. Lymph nodes with malignant infiltration usually are rounded, enlarged and show mixed or peripheral vascularity. Torabi et al have reported an accuracy of 89 to 92% for ultrasound imaging in detecting cervical nodal metastases[11]. However several authors have shown its sensitivity ranging from 69-81% and positive predictive value of 70-83%.

Based on our series of cases we found ultrasound imaging to have a sensitivity of 72.7%, accuracy of 72.2% and false negative rate of 42.7%. (Fig. 7.2, Table 7.2). We used size criteria of 15 mm for level I and level II, and 10mm for the rest of lymph node levels. Round and enlarged nodes were regarded as malignant. Using the above criteria ultrasound imaging gave a better sensitivity than clinical examination, however it has its limitation by way of a greater false negative rate than clinical examination itself. Knappe et al and Castelijns et al have reported that Ultrasound guided FNAC had a better sensitivity and accuracy than ultrasound imaging alone.[12,13]

Use of Computed tomography imaging for evaluating metastatic cervical lymphadenopathy in patients with oral cancer has been reported since 1981. Computed tomography imaging is capable of imaging the neck in any plane, axial, coronal or sagittal. Thereby resolution and depiction of tissues in deeper planes is far superior compared to ultrasound imaging. Moreover CT enables evaluating the nodal mass by its dimension in any plane. Use of dynamic contrast agents along with routine CT imaging provides useful data regarding the perfusion of tissues, which may be seen by the intensity of contrast uptake[14,15,16]. Criteria for assessing neck lymph node metastasis in oral cancer using computed tomography varies with many authors. The

Table 1 – Comparison of palaption, USG and CT findings with HPE

Investigation	Findings	Histopathology Examination	
		Positive	Negative
Clinical Palpation	Positive	True Positive (n=6)	False Positive (n=0)
	Negative	False Negative (n=5)	True Negative (n=7)
Ultrasound Imaging	Positive	True Positive (n=8)	False Positive (n=2)
	Negative	False Negative (n=3)	True Negative (n=5)
Computed Tomography	Positive	True Positive (n=9)	False Positive (n=2)
	Negative	False Negative (n=2)	True Negative (n=5)

Table 2 – Sensitivity, Specificity, Positive and Negative predictive values of methods used

Statistical Test	Clinical Examination	Ultrasound Imaging	Computed Tomography
Sensitivity (%)	54.5	72.7	81.8
Specificity (%)	100	71.4	71.4
Positive Predictive Value (%)	100	80	81.8
Negative Predictive Value (%)	58.3	62.5	71.4
Accuracy (%)	72.2	72.2	77.8

important of them being size (minimal axial diameter), shape (Ratio of long axis diameter to transverse diameter), internal architecture, central necrosis and rim enhancement. Review of literature shows size criteria ranging from 8mm – 30mm[17]. Van den Brekel et al in their assessment of 2719 lymph nodes for radiologic criteria to diagnose metastatic nodes, have suggested the following criteria (1) Minimal axial diameter greater than 10mm (2) Long axis to transverse axis ratio(L/T ratio) > 0.5 (3) Rim enhancement with tumor. Mancuso et al in their study have accepted the use of a size criterion of 15mm. Curtin et al in their study used 15mm cut off point for metastatic lymph nodes and achieved a sensitivity of 85% and specificity of 89%. Reducing the cut off point to 10mm, they got a sensitivity of 92%, but a specificity of only 44%. In our study we used a size criteria of 15mm for sub-digastric (level I and level II) nodes and 10mm for other nodal levels, L/T ratio > 0.5 (round nodes) and rim enhancement following contrast injection, which is similar to the criteria suggested by Som et al[16,17]. In our study Contrast enhanced CT has the highest sensitivity of 81.8% and an accuracy of 77.8%. Compared to clinical examination and USG, false negative rate in CT is only 28.6% which is twice as low

as the other two modalities. Fig. 7.3, Table 7.2). In addition CT imaging gave a positive predictive value of 81.8% and negative predictive value of 71.4%, which implies a likelihood of metastasis in 8 out of 10 patients diagnosed as positive using the same modality.

In the study conducted by Haberal et al[17] to compare the efficacy of CT and USG in detecting cervical nodal metastases in head and neck squamous cell carcinoma, the sensitivity, specificity and accuracy of USG and CT were 72%, 96% and 85%, and 81%, 96% and 87% respectively. In our study too contrast enhanced CT has the highest sensitivity of 81.8% and an accuracy of 77.8%, compared to USG and clinical examination. This indicates the proven efficacy of CT over USG and clinical examination in detecting cervical lymph node metastasis.

Conclusion

Statistical analysis shows that all of the pretreatment evaluation methods (palpation, CT, and USG) yield results that are different from the histopathologic results. This means that no pretreatment study can accurately assess the lymph node status of the neck as accurately as histopathology examination. Though USG findings are more correlated with the pathologic findings than clinical examination, nevertheless it is CT that gives the most effective and reliable results. Histopathologic staging is the most important prognostic determinant; however it is of use only in the post-operative scenario. The use of advanced imaging modalities like MRI, Contrast (Paramagnetic Nanoparticles) enhanced MRI, PET-CT and gamma probe camera lymph node detection may perhaps give better results, but their cost is a major limiting factor for many patients. To draw conclusions on the basis of our study, we would like to stress the point, that it is imperative to have a pre-operative CT examination of the neck in addition to routine clinical examination and USG for diagnosis, staging, and therapy choices

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Source of Support: Nil, **Conflict of interest:** None declared.