

A comparative study on CT scan and Ultrasonogram for the detection of metastatic lymphnodes from Oral squamous cell carcinoma

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Abstract:

Cervical metastasis has a tremendous impact on the prognosis in patients with carcinomas of the head and neck and the frequency of such spread is greater than 20% for most squamous cell carcinomas. It is possible to reduce the risk of undiagnosed metastasis with accurate imaging techniques and thus probably reduce the number of elective neck dissections. Aim of the study was to assess and compare the accuracy of CT scan and ultrasound in the prediction of lymph node metastasis in oral squamous cell carcinoma so that a suitable surgical neck dissection can be carried out and finally reduce the morbidity and mortality rate.

Materials and method: *Twenty six patients with oral squamous cell carcinoma who underwent neckdissections (6RND, 20 SONND) were included in our study. All the patients underwent examination of neck preoperatively by Ultrasound and Computed Tomography for number detection. The findings were correlated with the results of post-operative histopathological examination of the neck nodes specimen. The results were obtained after statistical analysis by SPSS software.*

Result: *The sensitivity for Ultrasound scanning was 80%, while the specificity was 72% and the accuracy was 52%. In CT scan the sensitivity was 93%, the specificity was 82% and the accuracy was 88%.*

Conclusion: *The CT scan is more accurate technique than USG in assessing metastatic lymph nodes in patients with oral squamous cell carcinoma.*

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Introduction:

Oral cancer is the sixth most common cause of cancer related death in the world.^{1,2} Squamous cell carcinoma is the most common malignant tumor in the head and neck region³. Lymphatic spread is the most important mechanism in the spread of the head and neck squamous cell carcinomas.⁴ The presence of metastases in a lymph node is said to reduce the 5-year survival rate by about 50 %⁵. The presence or absence of nodal metastasis has a great impact on prognosis and survival of patients with head neck cancer. Nodal metastasis to one side decreases the

survival by 50%, while bilateral metastasis decreases survival by a further 25 %.^{6, 11,2,4}

Various tools are available for investigating the presence and extent of nodal metastasis including computed tomography (CT), magnetic resonance imaging (MRI), ultrasonography (USG), ultrasound (US) with fine-needle aspiration cytology (FNAC)³. However, none of these investigative modalities shows 100% accuracy in identifying neck node metastasis³. The lymphatic dissemination of SCC is often detectable clinically or by USG but is most accurately assessed with CT imaging. Clinical palpation of cervical lymph nodes has many false negative and false positive results. It was said to be existed in 20 – 40% of cases.^{13,1} Ultrasound scanning has improved the overall accuracy of diagnosis of cervical metastases. It is a cheap and highly reliable method without hazards of radiation exposure.^{9,17} But its main drawback is it is fully operator dependent and it cannot recognize the lesion less than 5 mm. CT scan helps to determine the anatomical location of lymph nodes and is considered to be the most accurate imaging modality for detecting nodal metastases, because it simultaneously provides prompt and accurate co relation of functional and anatomical images⁷.

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Materials and method:

26 patients with oral squamous cell carcinoma were chosen from patients admitted to the Department of oral & maxillofacial surgery in BSMMU and Imaging was done in the dept. of Radiology and Imaging of BSMMU. Study period was Oct, 2013 to Sep, 2014.

Each patient was subjected to full history taking, then a complete head and neck examination was performed. Patients with distant metastasis, patients with previous radiotherapy and patients having previous neck resections other than skin lesions were excluded from the study. Ultrasound examination of the neck on both sides was carried out with high frequency (7MHz-10MHz). The criteria used to define a node as metastatic in ultrasound was the node with short axis diameter >8 mm, round in shape, with central hypoecogenecity, with loss of hilus, presence of necrosis, with irregular margin suggesting extracapsular spread and roundness index were considered malignant. CT scan examination was performed with Hitachi Sceneria 64 slice CT scan machine. Intravenous contrast (Omnipaque) was given as a bolus for all patients. A size of 11 mm or greater in the transverse plane was considered as a metastatic node. Central hypodensity with peripheral rim enhancement suggestive of necrosis also taken as metastatic lymph nodes. Besides, the post-operative histopathological data were analyzed. Ultimately CT and sonographic data as well as post-operative histopathological data from the surgically treated subjects were available as our database. Statistical analysis was performed using the sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and accuracy.

Results and observation:

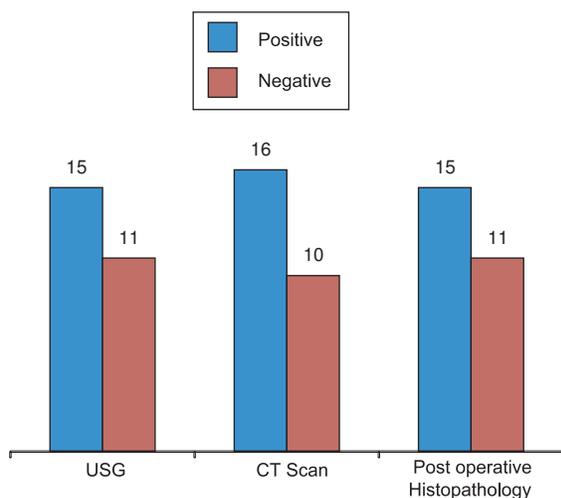


Fig.-1: Distribution of findings of lymphnodes status of diagnostic aids

Figure 1 shows 15 positive and 11 negative LN in USG, 16 positive and 10 negative LN in Contrast CT and 15 positive and 11 negative LN in postoperative histopathology.

Table-I

Comparison of ultrasonogram with histopathological examination

Investigation findings	Histopathological examination	
	True positive	False positive
Ultra sonogram	12(46.15%)	3 (11.54%)
	False negative 3(11.54%)	True negative 8(30.77%)

Table-I shows the findings of ultrasonogram where number of LN were 12(46.15%) true positive, 3(11.54%) false positive, 3(11.54%) false negative and 8(30.77%) true negative.

Table-II

Comparison of CT scan with histopathological examination

Investigation findings	Histopathological examination	
	True positive	False positive
CT Scan	14(53.85%)	2 (7.69%)
	False negative 1(3.85%)	True negative 9(34.62%)

Table-II shows the findings of CT scan where number of LN were 14 (53.85%) true positive, 2(7.69%) false positive, 1(3.85%) false negative and 9(34.62%) true negative.

Table-III

Comparison of USG with CT scan

Test parameter	USG	Contrast CT scan
True positive	12(46.15%)	14(53.85%)
False positive	3(11.54%)	2 (7.69%)
False negative	3(11.54%)	1(3.85%)
True negative	8(30.77%)	9(34.62%)

Table III shows on Ultra Sonogram 12(46.15%) specimens were true positive, both false positive and false negative were 3(11.54%) in number and rest 8(30.77%) were true negative. On CT scan 14(53.85%) were true positive, 2 (7.69%) were false positive, 1(3.85%) were false negative and rest 9(34.62%) were true negative.

Table-IV
Distribution of finding results according to the statistical test

Statistical test	Sensitivity	Specificity	PPV	NPV	Accuracy	P-value
USG	0.80	0.72	0.80	0.72	0.77	0.007
CT Scan	0.93	0.82	0.88	0.90	0.88	0.000

Table-IV shows sensitivity, specificity, positive predictive value, negative predictive value, accuracy, positive LR ratio, negative LR ratio and significant p values of statistical test of clinical palpation, USG and Contrast CT scan.

Discussion:

The lymphatic metastasis to various levels of neck nodes in case of oral squamous cell carcinoma was preoperatively diagnosed by USG and CT scan. Specificity of CT scan in our study is 82%. The specificity of CT scan in our study is comparable to the previous studies.¹⁴ In our study the values of CT scan were compared to USG for the detection of regional lymphnodes metastasis with other studies.^{16,10} In our study the sensitivity of CT scan is higher than USG which can be correlated with other studies reported in the literature.^{14,10} The specificity of CT scan is more or less similar to that of previous studies.^{15,10} In our study USG showed sensitivity of 80%. So USG will enable the correct diagnosis of metastatic neck disease in only 80% of the cases with proved pathologic disease. Specificity, PPV, NPV and Accuracy of USG is less than CT scan. The sensitivity of CT scan is more than USG. It seems that USG offers no advantage over CT scan. USG is more accurate less accurate than CT scan as a diagnostic tool for neck node metastasis in oral squamous cell carcinoma. CT scan has higher sensitivity that is it can detect more number of positive cases and high negative predictive value indicating that probability of predicting a negative node as actually negative is high. To reliably select patients who do not need elective dissection criteria with a high negative predictive value should be chosen. To obtain this high negative predictive value, the number of false negative results should be as low as possible. So accordingly CT has got higher negative predictive value. In our study 3 patients with nodal metastasis were missed by USG and 1 was missed by CT scan. USG and CT scan missed 1 of the same case. The main error incurred by USG and CT scan was false negative results which were high in USG. Therefore sensitivity of USG (80%) and CT scan (93%). CT scan inaccuracy may be due to erroneous interpretation of scan and presence of microscopic disease in nodes below the threshold level of detection for CT scan. The results of the postoperatively resected neck nodes histopathology and the results of imaging studies

are presented in Table-I to III. The results of the statistical analysis are presented in Table-IV. So that the results of higher value of sensitivity, specificity, PPV, NPV and accuracy of CT scan prove that the method CT scan is more accurate technique than Ultra sonogram for the detection of lymphnodes metastasis from oral squamous cell carcinoma. Using Pearson Chi-Square test CT scan ($p=0.000$) has reached statistically more significant in terms of predicting neck lymphnodes metastasis compared to USG ($p=0.007$). So CT scan shows statistically more significant in our study.

Conclusion:

All of the pretreatment evaluation methods CT and USG yield results that are significantly different from the histopathologic results, suggesting that no pretreatment study can accurately assess the requirement to histopathologically stage the neck. CT scan findings are more correlated with the pathologic findings than USG. So CT scan is more accurate imaging technique than ultrasonogram for the detection of metastatic lymphnodes from oral squamous cell carcinoma.

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