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

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Abstract: There are many modalities, which are being used for detection of cervical lymph nodes in head and neck cancers clinical examination, computed tomography, ultrasound, magnetic resonance imaging and radionuclide scintigraphy. Various studies in past have highlighted their benefits and drawbacks used singly or in comparison with others. Here we present the study of 100 patients comparing the result of clinical examination, computed tomography and ultrasound.

Keywords : cervical lymphadenopathy detection ultrasound Computed tomography

INTRODUCTION

Cancers of Head and Neck region are the sixth most common cancers worldwide with lymphatic metastasis being the mode of spread. A prominent feature in head and neck cancers is the frequency of Lymph node metastasis without clinical evidence of involvement (occult disease). Not only the presence of lymph nodes but also their size, number, level in the neck and extranodal spread determines the treatment and prognosis of these patients. Patients with palpable lymph nodes undergo Surgery, radiation therapy or a combination of the two. The appropriate treatment of patients without palpable nodes requires other diagnostic investigations because a substantial number of these patients have non-palpable nodal metastasis (1-5).

Clinical examinations of Patients though easy and inexpensive have an estimated false negative result of 27%-38% (6,7,8). Its low sensitivity and specificity forced the way to further studies in search of other accurate diagnostic means for detecting neck nodes (9,10,11).

Studies have proposed the use of imaging techniques such as ultrasound (12,13,14,15), Computed Tomography (16,17,18,19,20), Magnetic resonance imaging (21,22,23,24), and radionuclide scintigraphy (25,26,27,28,29). These investigations have helped in improving the sensitivity and specificity for the detection of Lymph node

involvement to a great extent. There are many studies defining the role of these modalities individually but very few studies comparing them. Ultrasound and computed tomography have been studied and compared in this study for their accuracy in detection of Lymph nodes. The results were confirmed by the histopathological examination of the neck dissections.

MATERIALS AND METHODS

Between April 2002 and May 2004 at Safdarjung Hospital, Delhi, India, 100 patients with a variety of head and neck cancers were studied for metastatic Lymph nodes. A prospective study was done with patients getting CT scan and ultrasound done no more than Six weeks prior to the surgery. These 100 patients underwent a total of 142 neck dissections. Fifteen patients of them had received radiotherapy treatment to their necks at different time prior to their surgery but not between the time of investigations and surgery. The protocol for recording the findings of clinical examination, ultrasound, and computed tomography and histopathology examination of neck dissection specimen was finalized.

All the patients were examined for the metastatic Lymph nodes in neck preoperatively and the findings were recorded in terms of presence or absence of Lymph nodes, its number, site, size and its apparent relation to surrounding structures. The site of

Fig - I : showing C.T. Scan with two lymph nodes at level III of left side of neck—C.T. Scan upgraded nodal staging from N1 to N2b.

Fig - II : showing extracapsular spread of tumour as seen on C.T. Scan.

Fig - III : showing relation of lymph nodes to vessels as seen on ultrasound.

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the Lymph nodes was determined according to the description of level I-VI given by American Head and Neck Society in 1998.

After clinical examination all the patients were sent for contrast enhanced computed tomography (C.T.) done with spiral computed tomographic scanner using a magnification, high milliamperere seconds package. Axial sections were taken of 3 mm thickness from primary lesion and regional nodal areas. The remainders of area from base of skull to thoracic inlet were scanned in 5 mm increments. A rapid drip infusion of 150 ml of iohalamate meglumine injection was administered to all and scans were obtained only after the contrast material had been administered. The criteria selected for interpreting a node as malignant were :

- 1) Size greater than 1cm
- 2) Rim enhancement following intravenous contrast
- 3) Central necrosis
- 4) Spherical shape
- 5) Three or more lymph nodes in 1st drainage site
- 6) Extra capsular spread of disease.

All the images of computed tomography scan were assessed by a radiologist without prior knowledge of the clinical status of the patient. Nodes interpreted as malignant were registered and then distributed according to their position in neck.

After computed tomography scans patients were sent for ultrasound. Ultrasound sonograms were obtained with real time sector scanners with scan heads of 7.5 MHz frequency. The neck was examined longitudinally and transversely in a continuous sweep technique covering the neck region from the thoracic inlet and scalenus muscles to the sub mental and retroparotideal regions. The criteria taken for considering a node positive on ultrasound of neck were:

- ❖ Size greater than 1 cm
- ❖ Loss of normal outline
- ❖ Heterogeneous with a mixed cystic/solid pattern of echogenicity.

The ultrasound findings documented were its site, number, internal architecture, relation to surrounding structures and vessels. All the patients in the study underwent surgical treatment for neck along with the excision of the primary. These neck dissection specimens were examined and reported by the Pathologists.

The laboratory assistant separated the nodes into level as indicated by the surgeon. The nodes were then fixed in formalin, embedded in Paraffin, sectioned and stained with haematoxylin and eosin. The pathologist examining the specimens was also blindfolded about the results of clinical examination, ultrasound or computed tomography. Hundred patients included under this study underwent a total of 142 neck dissections. Which included radical, modified radical and selective neck dissections.

All results were taken analyzed and comparisons made of the histopathologic findings with the clinical, ultrasound and computed tomography findings.

RESULTS

The results on comparing clinical examination and histopathological examination are shown in table below. The Table-I shows that on palpation 65 necks were diagnosed positive and 77 necks out of 142 were diagnosed as negative for metastatic lymph nodes. On comparing with the pathology report 60 of 65 necks showed metastatic disease but rest 5 necks which did not revealed metastasis were labeled as false positive (7.6%). Out of 77 necks diagnosed as negative on palpation 29 necks (37.6%) were labeled as false negative as they had metastatic deposits in the lymph nodes.

On the 142 necks evaluated by CT, (Table-II) 73 were interpreted as positive for disease and rest 69 as negative. Histopathologic findings show agreement in 69 of 73 necks to be called as true positive for metastasis. Rest 4 necks (5.4%) were diagnosed as false positive. In 20 patients, out of 69, which were labeled as negative for metastasis in CT Scan, the pathologic examination disclosed no tumor rests [29% false negative result].

On Ultrasound (Table-III) the radiologists gave results of 77 necks as positive and rest of the 65 necks as negative for metastasis. But the pathology reports confirmed 4 (52%) as false positive and 16 (24.6%) as false negative results.

All the results of clinical examination, ultrasound and computed tomography were compared in terms of sensitivity, specificity, positive predictive value, negative predictive value and accuracy assuming that the histopathological examination of neck has pointed out all the possible metastatic deposits in neck of the 142 necks examined, 89 necks were found to be positive on histopathologic analysis and rest 53 were negative (Table-IV). In our study computed tomography correctly upgraded the clinical examination result in 15 of the 142 necks examined. Four necks of these 15 were upgraded correctly from N_0 to N_1 , and rest six necks from N_1 to N_2 . Most of these necks were of patients with short and stocky necks with relatively more of adipose tissue present between the skin and lymph node.

Computed tomography correctly down staged the clinical examination result in one patient from N_2 to N_1 . Therefore, 16 of 142 (11.6%) had correct changes in the neck staging by computed tomography as compared to clinical examination. Similarly, ultrasound also changed clinical examination results considerably. It correctly upgraded staging of 19 necks out of which 6 necks from N_0 to N_1 , 7 necks from N_0 to N_2 , and rest 6 necks from N_1 to N_2 . It correctly down staged the clinical examination result in one patient in which a staging was changed from N_2 to N_1 .

The 29 necks diagnosed as false negative on clinical examination were referred to as 'occult'. These were necks which appeared normal on clinical examination were later found to have metastatic deposits on histopathological examination. Computed

tomography helped in identifying 9 and ultrasound in identifying 13 of this occult group.

COMMENT

Lymphatic metastasis is the most important mechanism in spread of Head and Neck squamous cell carcinomas. Cervical metastasis plays a major role in staging and management of head and neck carcinomas. In clinically No necks the whole treatment rests on the excision of primary. The indication for prophylactic neck dissection depends upon the possible chances of occult metastasis. If this is more than 15%, then a prophylactic dissection is indicated. To avoid unnecessary stress to patient by doing prophylactic neck dissection, an investigating modality with high specificity and accuracy is required to detect neck metastasis.

This study done in search of appropriate modality which detects maximum possible metastatic deposits in neck, compared results of clinical examination, computed tomography and ultrasound. Our results show that the clinical examination has highest false positive (7.6%) and false negative (37.6%) result, which decreased its overall accuracy (76.0%) to lowest among the three. The high false negative results are fairly in tune with the values reported in earlier studies (5,6,27). High false negative results are also reflected in the low sensitivity (67.4%) of clinical examination i.e. the number of pathologic necks that will be correctly diagnosed by clinical evaluation is not very high.

We compared these values with those of CT Scanning and ultrasound in an attempt to see if the latter has any advantage over clinical examination in the diagnosis of metastatic neck disease. With computed tomography the false negative results (29%) though slightly higher, were still better than clinical examination. Other statistics – sensitivity 77.5%, specificity 92.4%, Positive predictive value of 94.5%, negative predictive value of 71.0% and accuracy of 83.0%, also indicate that CT increases the potential in detecting metastatic cervical lymphadenopathy. This better accuracy was evident in 16 patients in which CT changed the staging of neck. It correctly upstaged clinical examination results in 15 necks and correctly down staged in 1 neck (as seen in Figure-1). Vast difference in the results of computed tomography in various previous studies is due to use of larger sections of scan, different criteria used for considering the node positive, bolus or continuous contrast infusion. Many surgeons think CT Scan, in spite of high false negative results for detecting metastatic disease, is advantageous because of its accuracy in detecting bony erosion of mandible, base of skull invasion, laryngeal cartilage invasion, extra capsular spread of tumor (Figure -2) or carotid encasement by tumor. These factors give surgeons the information to decide the most appropriate treatment for the patient.

In our study, ultrasound gave the best result in diagnosing the metastatic lymph nodes in 142 necks examined. Ultrasound with 24.6% false negative and 5.2% false positive results showed up maximum sensitivity (82.0%) and specificity (92.5%) among all three modalities. In previous studies there had been mixed results relating to ultrasound as a diagnostic tool. Prayer L. in 1990⁽¹⁴⁾

reported ultrasound to have sensitivity & specificity of 100% and 97% but at the same time Vanden Brekel in 1993⁽³⁰⁾ reported them as 60% and 77% respectively. There are other studies also which gave low results for ultrasound⁽¹²⁾ when used alone.

There are other studies in literature^(15,30,31,32) where ultrasound guided fine needle aspiration cytology has been used as a diagnostic tool to get specificity as high as 100%. The overall high accuracy of 85.9% in our study had been in tune with others^(14,15). As compared to clinical examination it up-staged the 13 patients who were clinically normal and four of these were diagnosed normal on CT scan also. Most likely explanation for missing nodes on CT scan is that the nodes were in oval shape, with the long axis in the coronal plane, and the axial CT cuts were therefore at right angle to the plane of enlargement of the nodes.

There were 6 necks whose staging was upgraded from N1 to N2, one of these patients who had a node apparently <3 cm on clinical examination was later found to be of 4.5cm with extra capsular spread to prevertebral muscles. The overall accuracy of ultrasound in our study was 85.9% as compared to 76.0% by palpation and 83.0% by CT scan. These statistics point out that the neck diagnosed as positive or negative on ultrasound examination will have 85.9% chance of yielding same results on histopathological examination.

In addition to the good results, we felt ultrasound advantageous in having low cost, minimum stress to patients, ease of application and possibility of frequent repetition with no exposure to radiation. Ultrasound clearly distinguished lymph nodes from adjacent vessels (Figure- 3), which was not possible just by clinical evaluation. But ultrasound has its own drawbacks. It is a dynamic investigation, which is highly operator – dependent with nodes near to the mandible or nodes smaller than 1 cm likely to be missed.

TABLE-I

Comparison of Clinical Examination and Histopathological result

Clinical Examination	Histopathological Result		
	Positive	Negative	Total
Positive	60	5	65
Negative	29	48	77
Total	89	53	142

TABLE-II

Comparison of Computed Tomography and Histopathology

Computed tomography	Histopathological Result		
	Positive	Negative	Total
Positive	69	4	73
Negative	20	49	69
Total	89	53	142

TABLE-III

Comparison of Ultrasound and Histopathology

		Histopathological Result		
		Positive	Negative	Total
Ultrasound	Positive	73	4	77
	Negative	16	49	65
	Total	89	53	142

TABLE-IV

Comparison of Clinical Examination, CT Scan & Ultrasound

	Sensitivity	Specificity	PPV	NPV	Accuracy
Clinical examination	67.4%	90.1%	92.3%	62.3%	76.0%
CT Scan	77.5%	92.4%	94.5%	71.0%	83.0%
Ultrasound	82.0%	92.5%	94.8%	75.4%	85.9%

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